NEPC Review: Should Students Learn Science Through Inquiry? (American Enterprise Institute, August 2026)



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Summary

A recent American Enterprise Institute report offers one teacher's perspective about a core issue in science education: *Should Students Learn Science Through Inquiry?* The report draws on selected cognitive science research and the teacher's personal examples to argue instead for explicit instruction of science information. With a narrow focus on knowledge acquisition and memory retrieval, the report recommends a linear, four-step pedagogical model for explicit instruction aimed at mastery of content knowledge. In doing so, however, the report provides examples without context, making it difficult to evaluate how these examples might translate across contexts. Just as importantly, the report ignores key scholarship about how science communities make knowledge, how people learn science through cognition *and* participation, and how educational aims have been contested. This report is neither an empirical study nor a comprehensive review of research, but rather an argument built primarily from the personal experiences of one science teacher. In a way, this is notable because the perspectives of practicing teachers are so often overlooked in educational policy and decision-making. Nevertheless, the report should only be interpreted for what it is: a firsthand perspective of a single teacher making an argument based on personal perspectives with narrow grounding in research, resulting in very limited guidance for educators and lawmakers.

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I. Introduction

A recent report, *Should Students Learn Science Through Inquiry?,* by Adam Boxer for the American Enterprise Institute (AEI), questions the merits of instructional approaches, notably inquiry, in science education.[1] This report is likely emerging now against a backdrop of interest in the "science of learning."[2] However, the question raised in the title of this report, the argument for explicit instruction, and the research into how people learn science are not new for science education. Indeed, the report's advocacy for authoritative teaching focused on goals of knowledge acquisition has deep roots in science education scholarship. Teachers navigate conflicting messages about how science *should* be taught, creating tension between competing interests. This report offers a firsthand perspective from the classroom experience of one teacher who advocates for explicit instruction in teaching science.

Drawing upon selected insights from cognitive science research about the acquisition of knowledge, the report recommends explicit science instruction to support student learning and offers guidance for science educators and school leaders who make decisions about future directions for science education. The question of how students should learn science resurfaces enduring tensions that have been present in science education for over a century.[3]

II. Findings and Conclusions of the Report

The report's findings and conclusions are grounded mainly in personal experiences of a science teacher. First, the report portrays science knowledge as a bounded circle filled with a network of nodes representing discrete science ideas that an expert recognizes as interconnected but that a novice may only know in fragments. The report positions students as novices with partial knowledge of science compared to professional scientists. It envisions the teacher's role as moving the student from a novice position toward a more expert position through explicit instruction. The report argues for slow and steady acquisition of knowledge of science until the student reaches a point of mastery.

The report's summary of research in psychology and cognitive science distinguishes between the knowledge-building of expert scientists and the knowledge-acquisition of novice, school-aged students. This distinction grounds the remaining argument, focusing on recommendations for explicit instruction in science teaching. The report shares examples from one teacher highlighting explicit science instruction aimed at slow and steady acquisition of knowledge.

The report offers an ideological argument in favor of explicit instruction of science topics with a goal of quick retrieval when students answer questions from a teacher or on a test. The recommendation is a linear, four-step procedure for explicit instruction in science. First, the teacher maps out the nodes (discrete pieces of science information) and connections for each science topic. Second, before proceeding into new science content knowledge, the teacher checks students' prerequisite content knowledge to ensure that prior nodes of information are "secure."[4] Third, the teacher presents new science content through a teacher-led explanation mindful of students' limited capacities for acquiring new ideas. Finally, students consolidate new information, the teacher checks for correctness, and students connect new information to other, related questions through independent practice. Explicit instruction's longer-term goal is to support student proficiency with quick, accurate retrieval of science information from their memories.

III. The Report's Rationale for Its Findings and Conclusions

The report's argument relies on three assumptions about science, learning, and the aims of science education:

1. That science is a body of knowledge. For expert, professional scientists, the report portrays this body of knowledge as well-organized and interconnected, with clear boundaries. It is, presumably, agreed upon or *settled*. The report mentions scientists thinking critically and creatively, as well as scientists en-

gaging in common fundamentals of a scientific method to create new knowledge, but it does not address these aspects of science in detail. Instead, it primarily portrays science is as a static body of knowledge.

2. That learning is primarily a process of knowledge acquisition, connection, and nimble retrieval from memory when needed. The report draws upon selected cognitive science and psychology research, and knowledge-oriented learning theories, to characterize science education as moving students from the clumsy, fragmented knowledge structures typical of a novice to the efficient, interconnected knowledge structures typical of an expert. The report defines this movement as mastery of content knowledge.

3. That mastery of content knowledge is the primary aim of science education. The examples highlight that successful science learning experiences should yield students who can quickly and accurately retrieve science information, such as being able to name the changes of states of matter and report what happens to particles of matter when heated.

IV. The Report's Use of Research Literature

The argument offered in this report builds primarily from the firsthand perspective of a science teacher citing a narrow body of research literature. The first assumption woven through the report—that science is a body of knowledge—is offered without citation. As such, the report fails to engage with a robust body of scholarship known collectively as "science studies." Historians, philosophers, anthropologists, sociologists, and social theorists have studied a multitude of science communities to understand and build theories about how the sciences make, refine, contest, and dispute knowledge claims.[5] This area of scholarship is a significant missing piece from this report's portrayal of science.

The report's assumption about learning draws narrowly from research focused on knowledge acquisition, working memory and cognitive load, and efficient retrieval of knowledge from memory. Valuable contributions from cognitive science that form the basis for contemporary understanding of knowledge construction are missing from this report. For example, the report's account of knowledge-building would be strengthened with citations about how people assemble and tap into knowledge "in pieces" depending on the situations, contexts, relevance, framing, and prompting.[6] This research, combined with the research already included in the report, would provide a stronger evidence base for claims about the complex work of cognition.

Furthermore, the report omits research focused on understanding how people learn through social, cultural, discursive, and participatory involvement in activities that

afford opportunities to learn collaboratively. Much of this research focuses specifically on science education contexts and should have been included. These studies document how young people learn science not solely through retrieval of information from memory but also through building and refining conceptual understandings through participation in social, cultural, and knowledge-building practices common within science disciplines.[7]

Research into the cultural and social dimensions of science learning echo a key point of the report—that practical science activity such as following a laboratory procedure or conducting theory-free experiments does not contribute very much to students' learning. However, contemporary science learning research has shown that participation in concept-, theory-, and model-rich practices of science with substantial guidance and scaffolding from a teacher does support students' science learning.[8] The absence of this line of research about science education is unfortunate because it would complement the claims about teaching and learning offered in this report. Thus, a comprehensive research base would broaden the applicability of the report to more teachers, students, and classrooms.

Woven throughout the report is an assumed sense of consensus about the aim of science education in schools. The report forwards one aim of science education—moving students from novice toward expert knowledge—without any grounding in scholarship. It overlooks the legacy of lively discussion about the aims of science education and the varied ways that science education might unfold in schools across contexts.[9] By offering only one narrow aim for science education without any context, the report creates a singular pathway for teachers and students. Although the report mentions possible civic aims of science education after students have completed schooling, these civic aims are not highlighted as salient during schooling. This, again, lessens the utility of the report.

V. Review of the Report's Methods

Rather than an empirical study or a comprehensive review of research, this report is an argument that makes a case in favor of explicit instruction in science teaching, employing methods of argumentation including personal examples, persuasive writing, and selective use of scholarship to present a series of claims and assumptions. A key strength of the report stems from the firsthand perspective of a practicing teacher since insights from practicing teachers are often overlooked in policy- and decision-making. Unclear from the report is how to interpret the teacher's examples in context because no context is provided. Further, these examples do not distinguish when learning goals are for young children or for adolescent youth.

A second strength is that this report serves as a reminder that science teachers play

an essential role when designing, facilitating, and scaffolding student learning because teachers can provide students with meaningful access to central ideas and concepts within and across science disciplines.[10] Rather than imagining that schoolchildren and youth will somehow rediscover principles and underlying scientific theories that have taken science communities centuries to build, this report reminds us that science teachers can and should take steps to scaffold access to information as a resource for student learning.

However, the report is weakened by its limited review of research, contributing to several overly narrow and incomplete lines of argument. It falls into some common traps that have been addressed in science education research. For example, science educators often struggle to speak and write with precision about different pedagogical approaches for science teaching, using terms such as "inquiry-based pedagogy" without specifying exactly what that looks like. Such use of the broad label of "inquiry," with radically different meanings and interpretations, leads to miscommunication.[11] People often employ exaggerated cultural scripts full of stereotypical tropes and straw man arguments when trying to narrate the differences in possible approaches for science teaching, and these scripts prevent debate from moving forward.[12] This trap has been well-addressed in science education research—a point that the report seems to note and discard without review by stating that "much ink has been spilled."[13] The report would have been strengthened by engaging more deeply with this legacy of scholarship.

VI. Review of the Validity of the Findings and Conclusions

The report may resonate with some science educators providing a sense of "face validity" for teachers who share the dilemmas and concerns offered. Face validity is the perception that conclusions are valid because those conclusions mirror everyday experiences and seem logical and consistent "on the face of things."[14] But, for others, this report may not carry much face validity. Science educators who have built a repertoire of pedagogical practices grounded in broader perspectives on science, more expansive views of learning, and more comprehensive aims for science education will likely feel that this report offers only a partial story about the complex work of teaching science.

In research terms, the argument offered within this report is narrow and ignores vast scholarship. It should not be viewed as a comprehensive effort to synthesize research findings and draw valid conclusions. Instead, it should be viewed for exactly what it is—one perspective about science teaching presented through an ideological argument.

VII. Usefulness of the Report for Guidance of Policy and Practice

This report articulates one perspective about explicit instruction in science teaching, but it misses numerous opportunities to engage with long-standing dialogues about the complexities of science, of learning, and of science education. Its perspective could be useful if brought into conversation with other perspectives and with the substantial body of scholarship that has been conducted related to the claims and assumptions it raises. However, no single perspective about science teaching, including the singular advocacy from explicit instruction offered in this report, should drive broader policy decisions or inform directives guiding science teaching practice. Policymakers should not view this report as an authoritative case *for* explicit instruction or *against* inquiry in science teaching.

Notes and References

1 Boxer, A. (2026, August). *Should students learn science through inquiry?* AEI. Retrieved August 18, 2026, from https://www.aei.org/research-products/report/should-students-learn-science-through-inquiry/

2 Recent emphasis "science of learning" focuses narrowly on psychological studies, often with priority given to memory retrieval of factual information, but the broader field of learning sciences and human development has studied learning from many perspectives for decades. Critical analyses of these studies is essential before directly applying narrow findings to contexts and agendas beyond the scope of the original studies. Sakinah Alhadad offers a helpful way of comparing the ideas that are often labelled as "science of learning" and the broader work of research in the learning sciences:

Alhadad, S. (July 2026). *The science of learning is not the same as learning sciences – and neither explains the whole of teacher professional knowledge*. EduResearch Matters. Australian Association for Research in Education. Retrieved November 9, 2026, from https://blog.aare.edu.au/2026/07/21/the-science-of-learning-is-not-the-same-as-learning-sciences-and-neither-explains-the-whole-of-teacher-professional-knowledge/

For an introduction to foundational ideas about learning, please see the following:

Bransford, J.D., Brown, A.L., & Cocking, R.R. (2000). *How people learn* (Vol. 11). National Academy Press.

Hoadley, C. & Van Haneghan, J. (2011). The Learning Sciences: Where they came from and what it means for instructional designers. In R.A. Reiser & J.V. Dempsey (Eds.), *Trends and Issues in Instructional Design and Technology* (3rd ed., pp. 53-63). Pearson.

Sawyer, R.K. (Ed.). (2022). *The Cambridge handbook of the learning sciences* (3rd ed.). Cambridge University Press.

The recent interest in "Science of Learning" tends to focus narrowly on memory, cognitive load, or recall of factual information and is often grounded—tacitly if not explicitly—in research such as the following examples:

Carpenter, S.K., Pan, S.C. & Butler, A.C. (2022). The science of effective learning with spacing and retrieval practice. *Nature Review Psychology, 1*, 496–511. Retrieved November 9, 2026, from https://doi.org/10.1038/s44159-022-00089-1

Hattie, J. & Donoghue, G. (2016). Learning strategies: a synthesis and conceptual model. *npj Science Learn, 1*, 16013. Retrieved November 9, 2026, from https://doi.org/10.1038/npjscilearn.2016.13

McDermott, K.B. (2021). Practicing retrieval facilitates learning. *Annual Review Psychology, 72*, 609-633. Retrieved November 9, 2026, from https://doi.org/10.1146/annurev-psych-010419-051019

3 For useful overviews and summaries of longstanding discussions about how students should learn science, please see the following:

Crawford, B.A. (2014). From inquiry to scientific practices in the science classroom. In N.G. Lederman & S.K. Abell (Eds.), *Handbook of Research on Science Education* (Vol. II, pp. 515–541).

Routledge.

Duschl, R.A. (2008). Science education in three-part harmony: Balancing conceptual, epistemic, and social learning goals. *Review of Research in Education, 32*, 268–291.

Hodson, D. (2014). Learning science, learning about science, doing science: Different goals demand different learning methods. *International Journal of Science Education, 36*(15), 2534-2553.

Osborne, J. (2014). Scientific practices and inquiry in the science classroom. In N.G. Lederman & S.K. Abell (Eds.), *Handbook of research on science education* (Vol. II, pp. 593–613). Routledge.

Rudolph, J.L. (2005). Epistemology for the masses: The origins of "the scientific method" in American schools. *History of Education Quarterly*, *45*(3), 341-376.

4 Boxer, A. (2026, August). *Should students learn science through inquiry?* (p. 4). AEI. Retrieved August 18, 2026, from https://www.aei.org/research-products/report/should-students-learn-science-through-inquiry/

5 For an overview of how scholars studying the sciences envision science as a practice rather than as a bounded body of knowledge, please see:

Bárdos, D. & Karakas, A. (2025). The practice turn. In F. Padovani & A.T. Tuboly (Eds.), *The Routledge Handbook of the History of Philosophy of Science After Kant* (1st ed.). Routledge.

The following texts from scholars in science studies have been particularly influential in shaping how science educators and researchers view science as complex cascades of practice where people work together to build ideas through modeling, representing, experimenting, observing, arguing, and revising:

Knorr Cetina, K. (1999). *Epistemic cultures: How the sciences make knowledge*. Harvard University Press.

Lynch, M. (1993). *Scientific practice and ordinary action: Ethnomethodology and social studies of science*. Cambridge University Press.

Nersessian, N.J. (2005). Interpreting scientific and engineering practices: Integrating the cognitive, social, and cultural dimensions. In *Scientific and Technological Thinking* (pp. 17–56). Lawrence Erlbaum.

Pickering, A. (1995). *The mangle of practice: Time, agency, and science*. University of Chicago Press.

Rouse, J. (2002). *Scientific practices matter: Reclaiming philosophical naturalism*. University of Chicago Press.

Traweek, S. (1992). *Beamtimes and lifetimes: The world of high energy physicists*. Harvard University Press.

6 Research into conceptual change and especially the knowledge-in-pieces framework would complement the cognitive science research already included in this report. Please see the following as a starting point for research into conceptual change and the knowledge-in-pieces framework:

diSessa, A.A. (1988). Knowledge in pieces. In G. Forman & P. Pufall (Eds.), *Constructivism in the Computer Age* (pp. 49–70). Lawrence Erlbaum.

diSessa, A.A. (2006). A history of conceptual change research: Threads and fault lines. In R.K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 265–282). Cambridge University Press.

7 As a starting point, the following articles are essential reading for an understanding of contemporary science education based on sociocultural theories of learning and an expansive view of science:

Berland, L.K., Schwarz, C.V., Krist, C., Kenyon, L., Lo, A.S., & Reiser, B.J. (2016). Epistemologies in practice: Making scientific practices meaningful for students. *Journal of Research in Science Teaching, 53*(7), 1082–1112.

Duncan, R.G., Chinn, C.A., & Barzilai, S. (2018). Grasp of evidence: Problematizing and expanding the next generation science standards' conceptualization of evidence. *Journal of Research in Science Teaching*, *55*(7), 907-937.

Ford, M.J. (2012). A dialogic account of sense-making in scientific argumentation and reasoning. *Cognition and Instruction*, *30*(3), 207-245.

Ford, M.J. (2008). 'Grasp of practice' as a reasoning resource for inquiry and nature of science understanding. *Science & Education, 17*(2–3), 147–177.

Herrenkohl, L.R., Palincsar, A.S., DeWater, L.S., & Kawasaki, K. (1999). Developing scientific communities in classrooms: A sociocognitive approach. *Journal of the Learning Sciences, 8*(3–4), 451–493.

Kang, H., Windschitl, M., Stroupe, D., & Thompson, J. (2016). Designing, launching, and implementing high-quality learning opportunities for students that advance scientific thinking. *Journal of Research in Science Teaching, 53(*9), 1316–1340.

Manz, E. (2015). Resistance and the development of scientific practice: Designing the mangle into science instruction. *Cognition and Instruction, 33*(2), 89–124.

Rosebery, A.S., Ogonowski, M., Dischino, M., & Warren, B. (2010). "The coat traps all your body heat": Heterogeneity as fundamental to learning. *Journal of the Learning Sciences, 19*(3), 322–357.

8 In particular, Furtak and colleagues' meta-analysis highlights the importance of teacher guidance, explicit access to science information, and scaffolding in supporting student learning in science.

Furtak, E.M., Seidel, T., Iverson, H., & Briggs, D.C. (2012). Experimental and quasi-experimental studies of inquiry-based science teaching: A meta-analysis. *Review of Educational Research*, *82*(3), 300-329.

9 Two books from John Rudolph provide windows into longstanding discussions and deliberations about the aims of science education looking both historically and into the future:

Rudolph, J.L. (2019). *How we teach science: What's changed, and why it matters*. Harvard University Press.

Rudolph, J.L. (2023). *Why we teach science (and why we should)*. Oxford University Press.

10 Please see the following for examples of highly interactive and skillful facilitation and scaffolding of student science learning in a variety of classrooms:

Benedict-Chambers, A., Kademian, S.M., Davis, E.A., & Palincsar, A.S. (2017). Guiding students

towards sensemaking: Teacher questions focused on integrating scientific practices with science content. *International Journal of Science Education*, *39*(15), 1977-2001.

Colley, C. & Windschitl, M. (2021). A tool for visualizing and inquiring into whole-class sensemaking discussions. *Research in Science Education*, *51*(1), 51-70.

Deverel-Rico, C. & Furtak, E.M. (2025). How can features of classroom activity systems center students' ideas and experiences in formative assessment? A study of sensemaking and answer-making frames. *Educational Assessment*, *30*(2), 91-114.

11 Furtak, E.M. & Penuel, W.R. (2019). Coming to terms: Addressing the persistence of "hands-on" and other reform terminology in the era of science as practice. *Science Education, 103*(1), 167–186.

12 Windschitl, M. (2006). Why we can't talk to one another about science education reform. *Phi Delta Kappan, 87*, 384–355.

13 Boxer, A. (2026, August). *Should students learn science through inquiry?* (p. 1). AEI. Retrieved August 18, 2026, from https://www.aei.org/research-products/report/should-students-learn-science-through-inquiry/

14 Drost, E. (2011). Validity and reliability in social science research. *International Perspectives on Higher Education Research, 38*(1), 105-124, 116.