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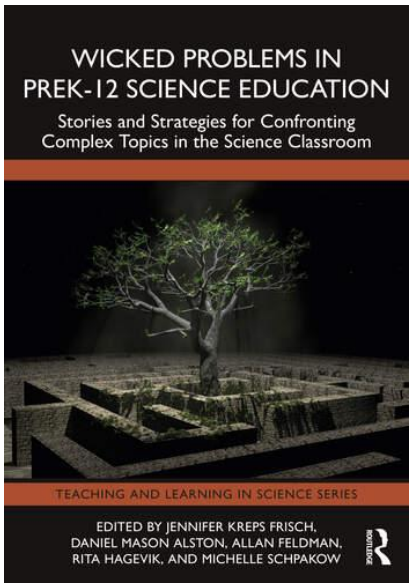

Science education is often organized around solvable problems: define the variable, control the conditions, collect data, and reach a defensible conclusion. That structure is pedagogically useful, but it does not fully resemble the conditions under which many contemporary scientific questions now appear in public life. Climate change, environmental justice, public health, biodiversity loss, energy transitions, and political disputes over schooling are not simply hard science topics. They are problems in which evidence, values, institutions, identities, economics, and uncertainty collide. *Wicked Problems in PreK-12 Science Education* offers a timely response to this challenge. Its strongest contribution is the claim that science education should not only teach about complex problems; it should help students and teachers learn how to think within complexity.

This focus is well grounded. The "wicked problem" concept originates in work by Rittel and Webber (1973), who argued that many social planning problems cannot be definitively described, solved, or settled through technical expertise alone. Wicked problems are unstable, contested, and value-laden. They resist the clean closure associated with textbook exercises. The editors of this volume use that framework to reconsider science education across classrooms, teacher preparation, and professional learning. The result is a collection that asks what happens when science teaching no longer treats uncertainty as something to eliminate, but as something learners must understand, analyze, and responsibly navigate.

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The book is organized into four major sections: PreK-12 students, in-service teachers, teacher candidates, and science teacher educators. This structure matters because it prevents the book from reducing wicked problems to classroom activities alone. The contributors show that complexity is not only located in the topics that students study. It is also embedded in curriculum design, teacher preparation, community relationships, professional development, and institutional constraints. The movement across the book is therefore developmental and systemic: first, students are invited into complex socioscientific reasoning; then teachers and teacher candidates are shown confronting the pedagogical and institutional conditions that make such teaching possible or difficult; finally, science teacher educators are asked to reconsider their own roles in preparing educators for work that is ethically, scientifically, and politically complex.

One of the book's clearest strengths is its refusal to separate scientific understanding from social consequence. In this respect, the volume aligns closely with socioscientific issues scholarship, which has long argued that scientific literacy includes the ability to reason about evidence, ethics, uncertainty, and civic decision making (Sadler, 2011; Zeidler et al., 2005). The chapters do not frame topics like climate change, disease, or environmental justice as distractions from science content. Instead, they present such topics as contexts in which scientific knowledge becomes meaningful. Students are asked not merely to know scientific explanations, but to use them while considering stakeholders, consequences, trade-offs, and competing claims.

This orientation is especially visible in "Addressing Wicked Problems Using Multiple Models," which describes students investigating a fictional viral disease outbreak through systems modeling, mechanistic reasoning, stakeholder analysis, and policy recommendation. The instructional sequence is valuable because it translates the abstract language of wicked problems into classroom practice. Students do not simply learn that diseases spread. They examine how biological mechanisms interact with social behavior, institutional decisions, and public consequences. Modeling becomes more than a diagramming exercise; it becomes a way of reasoning through uncertainty. This is one of the book's most practical contributions because it gives teachers a structure for moving students from scientific explanation toward evidence-based deliberation.

The modeling work also connects the volume to broader visions of science education. *A Framework for K-12 Science Education* emphasizes practices, crosscutting concepts, and core ideas, including the importance of systems and system models (National Research Council, 2012). *Wicked Problems in PreK-12 Science Education* extends that vision by showing why systems thinking matters beyond formal science standards. In the world students inherit, systems thinking is not only a scientific practice; it is a civic necessity. Students must learn to see relationships among environmental processes, human behavior, policy decisions, technological tools, and unequal social effects. The book is strongest when it makes that connection visible.

The chapter "Teaching About the Wicked Problem of Global Climate Change in Secondary Science" is another central example. Climate change is

perhaps the signature wicked problem for science education because it is scientifically complex, politically contested, economically consequential, and emotionally charged. Rather than presenting climate education as a simple matter of correcting misconceptions or supplying more data, this section recognizes that teachers work within communities shaped by political pressure, misinformation, curricular expectations, and uneven professional preparation. That framing is important because it shows that the difficulty of teaching climate change is not only conceptual but also institutional. Teachers must understand the science, but they must also know how to manage controversy, support student inquiry, and help learners distinguish evidence-based reasoning from ideological dismissal.

A third notable contribution is the chapter "Be Like Fungi: Mycorrhizal Pedagogy," which uses fungal networks as a metaphor for relational, interdependent learning. Mycorrhizal networks suggest forms of connection, reciprocity, communication, and mutual support. Applied to education, that metaphor challenges schooling practices that isolate subjects, teachers, students, and communities from one another. Activities such as wonder walks, place-based investigations, and collaborative inquiry encourage learners to encounter science as relational rather than detached. The chapter's guiding sensibility is captured by the phrase "we make the road by walking," which reflects the book's larger argument that educators cannot wait for perfect solutions before engaging complex problems. They must learn through participation, reflection, and shared inquiry.

The book's emphasis on student agency is another strength. Across the chapters reviewed, students are positioned as model builders, question generators, evidence evaluators, and participants in decision making. This matters because wicked problems cannot be taught effectively through passive reception. If students are expected to engage issues that have no single correct answer, they need opportunities to practice judgment. They must learn how to weigh evidence, recognize uncertainty, consider multiple perspectives, and justify claims without pretending that every issue resolves neatly. In this sense, the volume offers an important corrective to narrow versions of science instruction that prioritize coverage over reasoning.

The book is also valuable because it treats teachers as learners within wicked systems. Many educational texts celebrate ambitious pedagogy without sufficiently acknowledging the constraints under which teachers work. This volume is more attentive to those constraints. Teaching wicked problems requires time, curricular flexibility, institutional support, and professional confidence. It may also require teachers to navigate community disagreement or administrative hesitation. By including sections on in-service teachers, teacher candidates, and teacher educators, the book makes clear that wicked problem instruction cannot be sustained by individual teacher courage alone. It requires preparation, collaboration, and structures that support risk-taking and reflective practice.

The likely limitation of the book is therefore not its conceptual ambition, but its implementation difficulty. Many of the approaches described in the volume require conditions that are unevenly distributed across schools. Extended inquiry,

outdoor learning, interdisciplinary collaboration, and stakeholder-centered deliberation can be difficult in classrooms governed by pacing guides, high-stakes testing, limited planning time, or restricted access to local field experiences. Teachers may agree with the book's vision while still wondering how to enact it within tightly standardized systems. The volume could be strengthened by more sustained attention to scalable implementation, assessment of student learning, and examples from schools with limited resources or constrained autonomy.

Another caution is that the language of wicked problems can become expansive. If every difficult issue is described as wicked, the term risks losing precision. The best chapters avoid that problem by showing how specific instructional designs help students engage uncertainty, stakeholder conflict, and systems interaction. The weaker risk of the collection is that readers may sometimes want clearer distinctions among complex, controversial, ill-structured, and genuinely wicked problems. This does not undermine the book's contribution, but it suggests that teacher educators using the text should help readers define the concept carefully rather than treating wickedness as a general synonym for difficulty.

Despite these cautions, *Wicked Problems in PreK-12 Science Education* makes a significant contribution to science education. It is recommended for science teacher educators, methods course instructors, curriculum developers, graduate students, professional development facilitators, and classroom teachers interested in socioscientific issues, climate education, systems thinking, environmental justice, and place-based learning. It would be especially useful as a supplemental text in science methods courses because it gives teacher candidates language for understanding why real-world science teaching is often contested, uncertain, and ethically demanding.

In the end, the book's most important message is that complexity should not be treated as an obstacle to science education. It should be treated as part of the curriculum. Frisch, Alston, Feldman, Hagevik, Schpakow, and their contributors show that students need more than correct answers to inherited scientific problems. They need practice thinking with evidence when answers are incomplete, values are in tension, and consequences matter. That is the promise of the volume. It moves science education from the margins of content coverage toward the center of civic, ecological, and intellectual preparation.

References

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* National Academies Press. https://doi.org/10.17226/13165

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(2), 155-169. https://doi.org/10.1007/BF01405730

Sadler, T. D. (Ed.). (2011). *Socio-scientific issues in the classroom: Teaching, learning and research.* Springer. https://doi.org/10.1007/978-94-007-1159-4

Zeidler, D. L., Sadler, T. D., Simmons, M. L., & Howes, E. V. (2005). Beyond STS: A research-based framework for socioscientific issues education. *Science Education*, 89(3), 357-377. https://doi.org/10.1002/sce.20048

About the Reviewer

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