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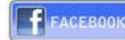
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Abrahams, Ian. (2011) *Practical Work in Secondary Science: A Minds-On Approach*. London: Continuum.

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Reviewed by Brian Perone
Stanford University

“Hands on, minds on.” “You learn science by doing science.” “I hear and I forget. I see and I remember. I do and I understand.” These are common refrains in school science departments everywhere, used to endorse the use of laboratory experiments in science classrooms. It would be unthinkable for a modern science teacher to teach a course without an experimental component. And educators assert that it is that very interactivity and exposure to real scientific practice that keeps kids interested in science, both in the short-term and for life. These ideas are so engrained in our collective mindset as science teachers, how could anyone question them?

And yet that is exactly what Ian Abrahams does in *Practical Work in Secondary Science: A Minds-On Approach*. A former secondary school science teacher himself, now professor of education at the University of

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York, Dr. Abrahams shifted to educational research to explore those same ideas. In deciding to move into research, he found that “[t]he only firm conclusion that I was able to reach was that there was little useful research-based information on the general effectiveness and affective value of practical work that could be used to help teachers within the context of their own teaching practice” (p. 3). And yet, teachers feel that “part of the essence of being ‘a science teacher’ entails the use of practical work whenever possible in their teaching practice” (p. 122). It is this contradiction that forms the foundation of Abrahams’ work, and the substance of *Practical Work in Secondary Science*.

The book is a recasting of the author’s academic works as a text for classroom science teachers, “to present a piece of academic educational research, that would not have been accessible to the vast majority of teachers, in a more readily accessible format so that teachers can use the findings to inform, and hopefully further develop, their own practice” (p. 3). All of the data used within the book are the author’s own, originally collected and published as academic research. The book is a bit of a hybrid, occasionally awkwardly so, with a mix of research paper rigor and popular press tone. Some sections are bogged down by citations and a recitation of previous work in the field, but overall Abrahams presents his arguments and data clearly and paints a compelling picture for its target audience. Unlike a purely academic work, “[the] primary aim is not to convince you of the validity of my findings – although it is certainly part of what I hope to do – but rather to cause you to think about *why* you believe that *how you* use practical work is effective and has affective value and the *evidence* that you have to support this” (p. 4, emphasis in original).

Abrahams begins with a brief overview of the English educational system and a history of hands-on science activities therein. He then examines the most often-cited reasons for the necessity of practical work. Quoting several decades of academic literature and his own research, he methodically concludes that none of the popular justifications for students’ hands-on work in science are supported by research, a claim that may enrage some readers. Interestingly, he spends the most time analyzing the claim that practical work motivates students’

interest in science, highlighting the decreasing numbers of scientists as both a motivation for challenging the assumption as well as evidence in support of his conclusion. If practical work motivates student interest in science, then the historically increasing amount of practical work in English science education should be producing more and more scientists. Instead, their numbers are declining. Moreover, “[i]f... practical work does motivate then, given that biology arguably offers the least amount of practical work of the three sciences, it might be expected that it would be the least popular science to be pursued” (p. 25). Yet current findings show the opposite—biology enrollment has held roughly steady while physics and chemistry enrollments have declined. He does gloss over the multitude of other factors that could lead one to choose one discipline over the other, but the overall conclusion is hard to dispute, and hardly unique to England.

While many students interviewed did profess to like hands-on work, many of the students’ own explanations of why they liked it were comparisons between practical work and “just writing”. Or, as one of the students interviewed said, “[w]ell, it’s not exactly exciting but it’s better than working all the time in the lesson” (p. 37). For many of the teachers interviewed, practical work has become a classroom management strategy, rather than a higher-level teaching tool. The implicit accusation there is uncomfortable, but that seems to be by design.

Following similar research and reasoning, Abrahams finds that, in addition to not motivating students, practical work has not been shown to be a better way to teach them about the science behind the experiments. They may remember a particularly vivid experiment, but they remember the experience itself, not the phenomenon explored. Even in the short term, the deeper purpose of the experiment is often lost in the mechanics of managing the equipment and collecting the expected data. “[T]here is little evidence to show that teachers frequently design, or use, practical tasks with the specific intention of developing conceptual understanding, or see the need to do so” (p. 127). Here is where we are forced to trust the body of work that comes before—Abrahams’ own, at least the portion covered here, does not provide a completely convincing argument that all science classes are so flawed.

Fortunately, it is not all doom and gloom. The author highlights one physics teacher who has effectively employed practical work into his lessons. Rather than treating the experiments as a separate part of the class, he integrates practical and theoretical work together. “You want your pupils to do things so it makes sense that you need to devote time to procedural instructions. However, if you also want your pupils to learn, then it is imperative that you devote a similar proportion of the lesson time to scaffolding and developing ideas” (p. 121). This is the message that Abrahams wants to leave us with. Of course this is much easier to say than do, and the real challenge is putting such statements into practice. In this, the book could have benefitted from more examples of successful hands-on work, serving as more of an inspiration than just a cautionary tale.

Practical Work in Secondary Science is not always an easy read, either mechanically or emotionally. But some of that is its strength; it forces you to examine your own teaching, even if just to refute the more startling claims. And it is that self-examination that is Abrahams’ real goal.

About the Reviewer

Brian Perone is a doctoral student in Learning Sciences and Technology Design at the Stanford University School of Education. He earned his master’s degree in physics from Boston College. His current research is focused on hands-on technology in science classrooms.

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Editors

Gene V Glass

glass@edrev.info

Gustavo Fischman

fischman@edrev.info

Melissa Cast-Brede

cast-brede@edrev.info
