PEER-LED TEAM LEARNING
LEADER TRAINING

WHERE DO ANSWERS COME FROM?

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It is tempting when designing problem sets for peer-led team learning workshops to construct a set of worked-out answers, similar to the traditional answer key. However, many of us in the Workshop Project are convinced that the best practice of PLTL workshops is obtained without reliance on answer keys. Lack of an answer key creates some discomfort for both faculty and students. Faculty are concerned that without the availability of answer keys students are in danger of obtaining false information. Students and peer leaders may feel more comfortable with a handy set of answers to which they can refer. However, if we define the development of the skills and attitudes of *critical thinking* as a key objective in our courses, then we can understand the desire to conduct workshops without readily available pre-prepared answers.

John Dewey has been credited for coining the term "critical thinking" by defining it as "active, persistent, and careful consideration of any belief or supposed form of knowledge in light of grounds that support it and further conclusions to which it tends."*

A cursory survey on the internet finds multiple divergent definitions and examples about what constitutes the details of critical thinking, (i.e., the ability to solve open-ended problems with more than one solution, ability to arrive at the correct solution utilizing logical inference (*sic*), engaging in "reflective" practice, etc). Not surprisingly, there does not seem to be a full consensus on what constitutes "critical thinking." Sometimes, it is phrased in terms of what it is not, (e.g., rote learning and memorization of algorithms). However, the learning of algorithms is important for complex problem-solving as they automate certain processes and reduce the load on the working memory, which Herron (101-102) suggests is limited to "seven bits, plus or minus two." Many advocates of critical thinking propose that it is "context free" in contradiction to substantial research that indicates that thinking is situated in or tied to certain contexts (Herron). Without pursuing all of these possible elements and controversies of critical thinking, perhaps one thing that can be agreed on is that critical thinking is the ability to reach conclusions through a process such as described by John Dewey**,** *independent of appeal to an external authority.*

How can we relate this elementary statement of critical thinking to the preparation of materials, and, in particular, the question of answer keys? Let me recount the dynamics of my own experience with answer keys in school. In confronting a textbook problem, the tendency was to consider the problem briefly, but if the path to solving it was not rather obvious, I'd quickly consult the back of the book for the answer. It is embarrassing to admit this, but perhaps others may have had the same experience? And once we have the answer, the process of problem-solving is turned upside down, becoming a process of reverse engineering, working backward from the solution to the problem.

We can examine the PLTL process and discern, without the existence of an answer key, how the development of critical thinking attitudes is encouraged.

1. In the PLTL process, students are imbued with the feeling of embarking on a venture of self-discovery, in collaboration with their peers. The existence of an answer in black & white has the effect of undermining the spontaneity of the workshop. Answer keys short-circuit the PLTL workshop.

2. In a PLTL workshop it is likely that several different and equally valid approaches to solving a problem will be explored. Answer keys typically present one view of solving the problem, which then becomes the "standard." Yet the problem-solving path and even the answer are not always unique.

3. In PLTL workshop students build self-confidence by the authentic experience of problem-solving. This is quite different from a process of verifying an answer prepared by an external authority.

4. Similar to a research group meeting, the focus of a PLTL workshop is to engage in a spirited discussion and debate of scientific principles and their application, arriving at conclusions by the process described by John Dewey. Clearly, in research there are no "prepared" answers.

5. The verification process in problem-solving is authentic, and will produce much deeper and longer lasting learning than by consultation with an answer key. Answer keys are often promoted as an "error" checking mechanism. The deeper understanding we desire will occur in the debate and consensus of the workshop, not by consultation of an answer key.

Finally, we can examine the alternative forms of building constructive supports for students as they engage in solving the more difficult problems. This can be achieved in a multitude of ways, which is at the heart of preparing workshop problems and the training of workshop leaders.

Problems can be graduated in complexity, carefully building the "scaffolding" which students require to move up in problem-solving difficulty.

By working through the problems in workshop style, with faculty as guides, both faculty and student leaders appreciate the actual complexity of the problem-solving process, and can work with more natural and "home grown" answers that exist in their understanding and confidence in leading a PLTL workshop.

References
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