Book Review

A review of *Crossing the River with Dogs: Problem Solving for College Students*, by Ken Johnson, Tedd Herr, and Judy Kysh, 2004. Emeryville, CA: Key College Publishing, 490pp. ISBN 1931914141. $49.95 USD.

Reviewed by:

JÉRÔME PROULX
University of Alberta (Canada)

Conducting a book review of a college textbook felt at first somehow awkward. In some ways, the standards that I envisioned for reviewing a book had to be shifted into 1) a didactical analysis looking at the content offered, *and* 2) a theoretical analysis focusing on the ways in which it prompted ideas and notions in relationship to current discussions in the emerging field that consolidates complexity science and education.

In my own understanding of this fusion of complexity science and education—or simply to look at education within or through a complexivist lens—it is equally *what* is offered as *how* it is offered that enables an emergent complexity to be brought forth in the everyday classroom. This textbook offers rich mathematical problems that provide occasions to open up a diversity of solutions, and this *potentially* enables increased chances for the "bumping up" of ideas against one another to occur (Davis & Simmt, 2003). However, these moments have to be dealt with when they emerge, and they cannot be prescribed or predicted. This is to say that nothing guarantees that something *complex* will happen by the simple usage of the problems in this textbook, however excellent they might be. It is the complex interaction of these mathematical problems and the ways they are presented, talked about, and worked through by the teacher and the students (the collective) that will prompt contingent opportunities for new knowledge and possibilities to emerge. That said, the content of the textbook used obviously has an impact on these emerging events. With this

Complicity: An International Journal of Complexity and Education
Volume 3 (2006), Number 1 • pp. 125–128 • www.complexityandeducation.ca

framework in mind, I now turn to a review of the content of the textbook.

This textbook offers something explicitly different than other traditional textbooks, that is, an opening. The authors begin to explicate this opening by setting out to demonstrate that there are many possible viable solutions for solving the problems. Even if it seems obvious from an outsider point of view, to cite this explicitly in the introduction of a mathematics textbook, which have been historically designed to delineate definitive knowledge, is quite rare and unexpected. It is worth noting that this pedagogic practice is used as the basis for the problem solving work presented throughout the textbook. Using this approach, the authors constantly expose the reader/learner to diverse solutions to solve the same problems. Two important outcomes arise from this novel approach. First, the authors offer genuine student solutions to the problems presented. By "genuine" I mean actual solutions given for these problems by students with whom the authors have worked with. These diverse solutions lead the reader/learner to compare his or her solution to the text and possibly become aware of other ways of knowing. Second, this presentation of diverse solutions opens up possibilities for "bumping up" of ideas, which encourages the classroom collective to develop new and flexible lenses for exploring problems.

Despite the author's intentions to create the fertile grounds for emergence, an overview of the text's seventeen chapters demonstrates how the author's orientation sometimes slips into a prescriptive problem solving approach. At many places in the text, the authors offer (and even mandate or require) specific ways or strategies to use to solve the problems proposed. In other words, students are asked to solve a problem in a specific way and not with a strategy of their own choice.

As a mathematics educator, I contend that this traditional approach to mathematics education is problematic and it prompts me to ask a number of questions. The first question I raise concerns student's liberty and autonomy of intention. In prescriptive approaches the learner is not prompted to solve a problem according to his or her own knowledge, rather he or she is asked to solve the problem *with* the strategy recommended. The learner is not "free" in his or her actions, and is even forced into a strategy that *possibly* does not make any sense for him or her. This approach is denounced quite strongly in the mathematics education literature (Voigt, 1985; Bauersfeld, 1994; Brousseau, 1998). This prescriptive and restrictive approach keeps the learner from developing his or her own problem solving strategies. Hence, I question this approach in regard to their goals for problem solving. As the authors make clear in their introduction, the goal is to solve problems. Ironically, this goal is negated because of the imposition of specific strategies students are required to use. The problem-solving goal is transferred from trying to solve the problem (in any way

students like or can) toward succeeding in solving the problems using specific method X. The intention is then transposed, and in my view this is a problematic transposition. In this approach, the key mathematical concepts and notions to learn are the strategies and not simply solving the problems. I am sensitized to this problematic stance because my own roots are in the province of Quebec's mathematics curriculum, which has pioneered and fostered (since the mid-1980s) a problem solving based approach to K-12 mathematics education. In many instances in this curriculum, students are prompted to solve problems—independently of the strategies they use—and are simply encouraged to be able to solve problems.

Another question that I raise concerns the students' perceived relevance of the strategies offered in the textbook. Often, when the authors are introducing a new problem solving strategy, the students are asked to solve the same set of given problems that they had previously solved with a different strategy. Clearly, if the goal is to simply be able to solve the problems this would make no sense at all since students have already solved these problems! So why give the same problems back to the students? Perhaps the authors could argue that they are demonstrating a stronger, more powerful conceptual tool to solve these problems. My response to this assertion would be that there is a need to offer harder problems that are not solvable with the previous strategies in order to demonstrate that strength. This approach would prompt the learners to see the relevance of using/learning a new strategy to be able to solve the problem at hand. The power of the new strategy would be brought forth to them by the need to use it, because their former strategy is no longer sufficient for the task at hand. Perhaps a metaphor would be helpful to explain the perplexities of what I intend: "I do not need a canon to kill a fly, because my good old flyswatter can do the job efficiently." Using a canon makes as little sense as a method to kill a fly, as using a new and more powerful strategy to solve a problem that I can already solve with previously known strategies. The relevance of a strategy is not inherent in the strategy itself, but lies in its unmatched strength to solve problems that previous strategies cannot. In this case, it is the choice of problems that will make the difference, as Marchand and Bednarz (1999) contend for algebraic problem solving:

> In effect, the choice of the situations is not haphazard, since it is determining the way in which the students will see or not see the relevance of a passage to the algebraic reasoning, and will seize the eventual power of algebra to solve a class of problems for which the arithmetic reasoning becomes insufficient. (p. 40, my translation)

If the text's authors' intention is to promote or show the unmatched power of specific strategies, then they need to offer problems where these strategies succeed and previous ones fail.

To conclude, I believe that despite its limitations, this textbook offers a great deal of interesting problems that are mathematically challenging. In this regard, the textbook offers a vast reservoir of useful and powerful strategies that can be used to solve a wide variety of mathematical problems. When these problems are combined with a complexivist orientation to teaching and learning they can be used to help prompt or "occasion" many diverse and novel solutions to solve mathematical problems. Overall, this textbook provides a type of "how-to" guide that will be of significant value to mathematics teachers. Its richness resides in its comprehensive approach and its constant leaning toward diversity. One noticeable drawback of the textbook is the sheer density of its words and pages. As such, there is almost too much to read about strategies, solutions, and authorial commentaries. To use a familiar francophone expression, it makes the book a very "heavy" read.

As a mathematics educator, simply because of its richness and the impressive number of problems and diverse solutions/strategies that it provides, this textbook is a great classroom resource. As a "how-to" guide for students, I recommend that mathematics educators add this textbook to their curricular library.

References

Bauersfeld, H. 1994. Réflexions sur la formation des maîtres et sur l'enseignement des mathématiques au primaire. *Revue des Sciences de L'éducation* 20(1): 175–198.

Brousseau, G. 1998. *Théorie des Situation Didactiques.* Grenoble, France: La Pensée Sauvage.

Davis, B., & E. Simmt. 2003. Understanding learning systems: Mathematics education and complexity science. J*ournal for Research in Mathematics Education* 34(2): 137–167.

Marchand, P., & N. Bednarz. 1999. L'enseignement de l'algèbre au secondaire : Une analyse des problèmes présentés aux élèves. *Bulletin AMQ* 39(4): 30–42.

Voigt, J. 1985. Patterns and Routines in Classrooms Interaction. *Recherche en didactique des mathématiques* 6(1): 69–118.