The deeper questions about pedagogy and technology are necessary for Christian educators to ask in the face of rapid technological change. Too few voices are asking questions or providing insight about technology in elementary and secondary schools. We should not only ask deeper questions in consideration of student learning, but also questions about how technology is shaping beliefs, values, and practices in Christian education.

Enhancing the Art & Science of Teaching with Technology offers great promise, but falls short. While written with administrators and teachers in mind, only a limited audience should read this book as a stand-alone text. Educators with well-developed knowledge about effective teaching and learning strategies may find the book useful as they seek examples of technology use in the classroom, but even they should ask relevant questions about what is missing. Educators with limited experience or lacking deep, conceptual knowledge about effective teaching and learning strategies should only consider *Enhancing the Art & Science of Teaching with Technology* if paired with Magaña and Marzano's more comprehensive books in The Classroom Strategy Series.

Reviewed by Kara C. Sevensma, Assistant Professor of Education, Calvin College, Grand Rapids, MI 49546.

GEEK HERESY: Rescuing Social Change from the Cult of Technology by Kentaro Toyama. New York: PublicAffairs, 2015. 334 pages, including notes, references and index. Hardcover; $27.99. ISBN: 9781610395281.

Why does applying technological solutions to social ills rarely work? Why do small-scale pilot projects succeed, but subsequent large-scale deployments fail? Can access to computers, the Internet, microcredit, and smartphones help raise large groups of the population from poverty to wealth?

Kentaro Toyoma asks these questions and more in his book *Geek Heresy: Rescuing Social Change from the Cult of Technology*. As a Microsoft researcher sent to India to open a research office there, Toyoma had a lot of experience building and deploying technology to solve social ills. His experiences caused him to ask himself why some technological solutions to problems seem to work, and others fail.

The "geek heresy" is, of course, that applying new technology to a social ill will not automatically and efficiently solve the problem. To make such a statement is to question the work of many well-funded high-tech companies, philanthropists, and technological utopianists. Making such a statement is probably not a smart career move for someone in the high-tech industry. Yet, the author makes the argument well, pulling many examples not only from the computer and smartphone world, but also from the realms of health, education, finance, agriculture, and so on.

To explain why some applications of technology to social problems work and others do not, the author defines the *Law of Amplification*: "Technology's primary effect is to amplify human forces. Like a lever, technology amplifies people's capacities in the direction of their intentions" (p. 29).

This Law of Amplification explains why giving computers to schools with excellent teachers and motivated students amplified their abilities to learn, while giving computers to schools with subpar teachers, students, and infrastructure only served to distract the teachers and students and actually led to less learning. It also explains why giving a child a computer outside of school only proved to amplify the child's stronger natural desire—to be entertained rather than to learn.

This definition of the Law of Amplification is useful, but it does not help the reader determine how to help fix the problems of the world. Part 2 of the book begins to answer that question. The key to fixing the world's problems is not to throw prepackaged interventions at a problem, but instead to "amplify people." The author found through his research that successful interventions always incorporated strong partners "on the ground." That is, the success of the project was determined by the qualities of the partner using a new technology, not by a technology itself.

A good partner exhibits three important qualities: good intention (heart), discernment (mind), and self-control (will) (p. 111). According to the author, heart, mind, and will "are necessary complements to packaged interventions. Even vaccines and medications—which are as close to a complete solution as packaged interventions ever get—require the heart, mind, and will of willing patients, caring nurses, and expert doctors" (pp. 112–13).

Where good partners do not exist, technological solutions to problems fail. The author gives an extended example using the inequality that exists in the US educational system. Many politicians believe that the inequalities can be fixed by equipping schools with more computers and better network access. However, the author's research shows that this is wishful thinking. Instead, "technology amplifies preexisting differences in wealth and achievement. Children with greater vocabularies get more out

of Wikipedia. Students with behaviorial challenges are more distracted by video games" (p. 117). The proper way to use computers to reduce inequality is to invest primarily in the people in the schools—teachers, administrators, and support staff—by training them to use the computers well. That is, you need not upgrade the technology, but you must "upgrade" the people.

The latter part of the book discusses the research about how best to invest in people. Chapter 8 discusses Maslow's hierarchy of aspirations in detail. Chapter 9 investigates mass intrinsic growth, or how entire societies have changed to solve societal problems. Chapter 10 discusses the importance of mentoring.

I don't know if Kentaro Toyama is a Christian or not, but the attitudes and recommendations of his book certainly should resonate strongly with a Christian audience. His recommendation to invest primarily in people, not technology, aligns with biblical themes that stress the importance of relationships. Toyama uses Christian terms, such as "idolatry," "discernment," and "wisdom" periodically in the book. For example, when criticizing technological utopianists for their indiscriminate application of technology rather than careful investment in people, he states, "To do so [...] is to make an idol of the easy part and neglect the rest—the finding or nurturing of the right heart, mind, and will" (p. 112).

And, of course, the entire premise of the book should resonate with Christians who see themselves called by God to be agents of change in the world. Christians are just as likely as non-Christians to look for quick, prepackaged solutions to the social ills we are called to address. Instead, Christians should concentrate on investing in people (i.e., loving), perhaps using technology where appropriate to assist along the way.

This book has caused this reviewer, a Christian and a computer science educator, to re-examine his work in computer science education. *Geek Heresy* has shown me that my work to build and widely deploy a better mechanism for computer science outreach programs in middle schools and high schools will necessarily fail if I do not invest heavily in the training of the people (i.e., the middle and high school teachers) who would be the partners, working with the students to learn computer science.

The book's title may be a little deceiving. Its topic is applicable and important not only for those in the tech industry, but also for any person seeking to work to restore shalom in the world. I recommend that international development organizers, relief workers, educators, and preachers should all understand the lessons from this book.

Reviewed by Victor T. Norman, Assistant Professor of Computer Science, Calvin College, Grand Rapids, MI 49546. ◊

Letter

Important Development Concerning the Impact of Fracking

PSCF published Bruce Beaver's piece, "Should we Frack?," in its latest issue (*PSCF* 67, no. 3 [2015]: 175–87). A number of articles have indeed blamed fracking for polluting ground water or creating mini-earthquakes, including those by the *The Economist* (see, for example, the issue July 4–10, 2015). Most people do not know that there is a more recent, alternate fracking technique that has proven to be more effective, is of much lower cost, and does much less damage to the environment. The technique uses a solid propellant, sent down the hole, which undergoes controlled deflagration shortly after shape charges perforate the horizontal section of the casing. The two major advantages of the process are that (1) it avoids the use of millions of gallons of pressurized water, and (2) it requires only 2–3 operators working for half a day, as opposed to hydro-fracking in which 25 operators are needed for 2–3 days, to produce the same amount of shale gas.

The propellant used is ARCADENE 489 (used in Stinger missiles). It is ignited circumferentially and produces gas at a specific rate to cause multiple fractures without entering the explosive regime. The deflagration is stable and environmentally safe, leaving no combustion products which may be harmful to the formation.

The process has been used successfully by Halliburton in over one thousand wells, producing more shale gas over a longer period than a comparable hydro-fracking technique. It causes no well bore or casing damage. A software using finite element analysis is employed to select the proper size of the propellant to meet the specific requirements of the formation to be fracked.

Kenell J. Touryan
ASA Fellow
Indian Hills, CO 80454
Email: kenell@comcast.net ◊