

Editorial

Teaching and learning in medicine

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Introduction

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I recently had a discussion with close friend Dr. Alan Robinson about the importance of teaching and learning in medicine. We shared our ideas and worries, including the problems of not having adequate funding for teaching in medicine and the dearth of medical teachers with a full understanding of educational research in pedagogy and learning. I subsequently asked Al to write an editorial for *The Pharos* on the topic.

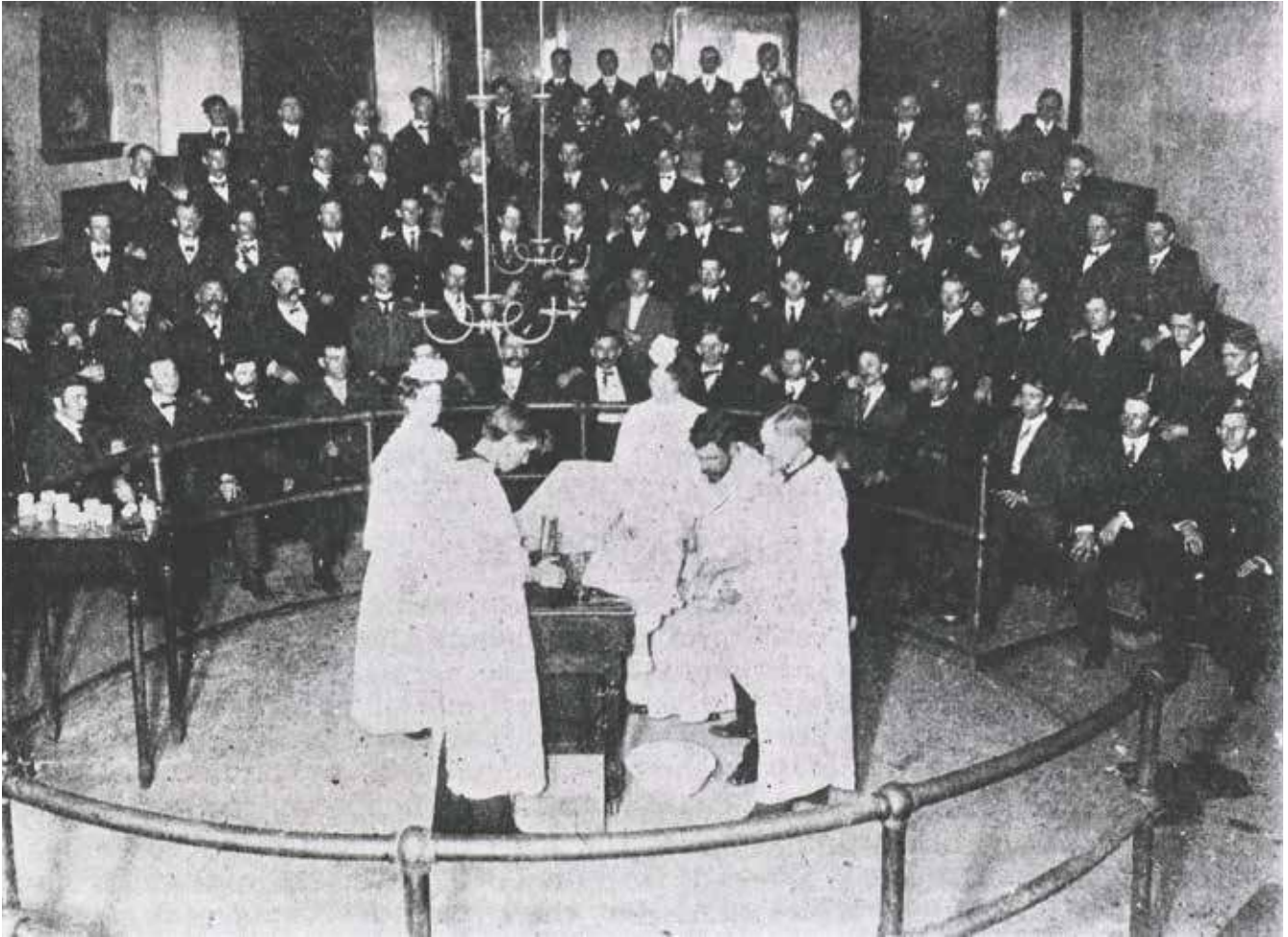
Like many teachers in medicine I learned to teach by observing my teachers and adopting or rejecting their teaching methods and style. I also used the “see one, do one, teach one” pedagogy described by Al and others. I spent one summer with Dr. Kelley Skeff at the Stanford Faculty Development Center for Medical Teachers to learn how to become a better bedside teacher and worked hard to become an excellent physician, teacher, and scholar. I was surprised and flattered to receive some teaching awards and excellent evaluations from medical students, residents, and patients.

However, it wasn't until I served as the Chancellor of the University of Colorado at Boulder that I really learned about the science of teaching and learning. There, distinguished research faculty applied what has been called “scientific teaching” in their courses for undergraduate students, using the principles set forth in the National Research Council's report,

How People Learn: Brain, Mind, Experience, and School.¹ The report's major points were:

- Individual learning is built on one's own prior knowledge from instruction and experience.
- Learners differ in styles of learning, prior instruction, previous experience, and other factors.
- Learning is facilitated by formative evaluation with feedback for understanding of concepts.
- Learning requires reflection, awareness, and self-questioning of one's understanding and learning process.
- Learning is enhanced for those who value the knowledge learned.
- Active learning results in better understanding and retention of knowledge and information.
- Learning is a continuum from novice to expert, where knowledge and information can be effectively retrieved, understood, and applied.

The most effective medical teaching requires not only medical and scientific knowledge, but also the knowledge of education science and the ability to apply these educational principles. Most basic science courses in medical school could utilize the principles of education science to organize their courses, *or* could apply the principles of education science to course organization. This involves changing the perspective from what is often instructor-centered teaching to student-centered learning. Incorporating instruction around student engagement with a case or problem early in medical education and then pursuing this during the clinical education experiences enhances learning and motivation. This shifts learning from the model of teaching of facts followed by application to one of inductive teaching that begins with a case or clinical problem and students learning the relevant concepts and facts in the process of understanding and solving the problem. The



An instructor demonstrates the surgical procedure for amputation, circa 1903.

Courtesy of the National Library of Medicine.

shift takes advantage of the ability of technology to facilitate just-in-time learning.

Reflection is another important learning strategy. I was always surprised when I asked a group of students or residents to tell me one thing they had learned during rounds or the session and found that most couldn't do it. Repetition of the request taught them to reflect on lessons learned. The challenge for us in medical education is not so much in what we teach medical students, but more in how we teach them to develop as expert physicians.

Medical schools are placing increasing emphasis on professionalism, one aspect of which is the willingness and ability to work within a team—including those in medical education, where a member of the team might be an education specialist skilled in the science of education. Faculty members who devote themselves to medical education are by the nature of the work dedicated to what is termed servant leadership. Their commitment is to serving the medical students in an effort to

make them better servants of the people they care for.

Among AΩA's core values is "to improve care for all by encouraging the development of leaders in academia and the community." At its annual meeting this year, AΩA's Board of Directors approved an AΩA Leadership Award and Development Program. I hope that some of the applicants will seek to develop their leadership skills in the science and programs described in Dr. Robinson's editorial.

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It was my first meeting with the Senior Associate Dean for Medical Education in my new position as Executive Associate Dean at the UCLA School of Medicine. Sitting across my desk was a petite woman who is a big player on the national stage of medical education, LuAnn Wilkerson. I immediately exposed my unconscious ignorance about medical education by indicating that I thought the major

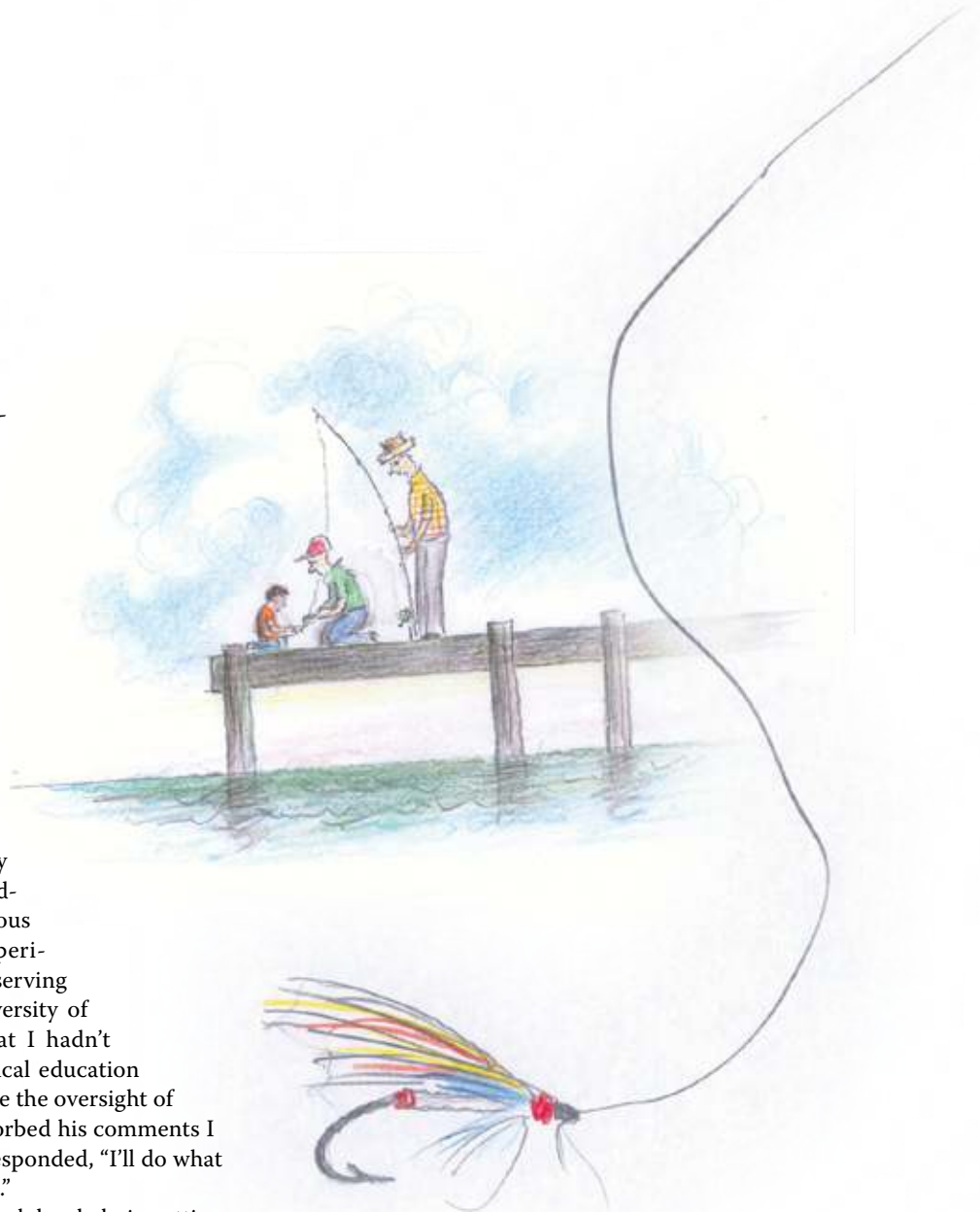
educational problem facing academic medical centers was to educate the public about the benefits of our wonderful research and clinical care . . . and, “oh yes, training future physicians.” Over the next few weeks I rapidly became consciously ignorant of my understanding of medical education.

My direct reports were the deans responsible for research and for education, while finance, department chairs, and the clinical system reported directly to the dean. My unconscious to conscious ignorance of medical education was further brought to my attention in a discussion with the Senior Associate Dean for Faculty Affairs. He noted that I had an outstanding record in medical research, continuous NIH funding, and administrative experience by running a large division and serving as Vice Chair of Medicine at the University of Pittsburgh. However, he observed that I hadn't done much specifically related to medical education and wondered aloud how I would handle the oversight of that area. In the few minutes that I absorbed his comments I made a life-changing decision when I responded, “I'll do what I've always done; I'll start a journal club.”

I went back to LuAnn Wilkerson to ask her help in setting up a medical education journal club. She embraced the idea as a wonderful venue in which people interested in medical education could exchange information about recent publications and discuss research opportunities in our school. *What I wanted was for the journal club to educate me.*

I came from the “see one, do one, teach one” generation that believed that any competent and good physician was a good teacher. Academic medicine has built a marvelous system of training physicians to become experts in a broad range of specialty disciplines. Rigorous standards define the experience necessary to be considered an expert. But for the most part less or little attention has been given to the method of the pedagogy.

Especially in the last decade medicine has begun to accept the concept that there is a “science” of education, just as there is a science that underlies each of our specialty disciplines. In 2001, experts from the Institute of Medicine joined members of the National Academy of Sciences and the National Academy of Engineering to publish a book by the National Research Council titled *How People Learn*.¹ Physicians readily



embrace the science of education when it is considered within the neurosciences and how the brain functions. Now, however, there is also a growing broader acceptance of the science behind the psychological approach to learning. The book *How Learning Works*² is directed to college teachers, but is equally useful to medical school educators and stresses the science behind the authors' *Seven Researched-based Principles for Smart Teaching*.

There are two areas in which the science of education could make an enduring contribution to medical education:

1. Making every graduating physician a better teacher
2. Growing a cadre of medical faculty whose expertise, research, and faculty commitment is based on applying the science of education to medical education.

When we think about community practitioners as teachers, we usually think of the important contribution they make as volunteer faculty teaching our medical students. However, an

even more important role of teaching is the interaction with patients. Virtually every patient contact with a physician requires communication between the physician and the patient that “teaches” the importance and timing of an appropriate medical therapy. The science of education, the science of how people learn, can inform the teaching of patients as well as the teaching of students. Many of the principles of smart teaching are immediately recognized as principles of good medical care:

- What is the patient’s prior understanding of their disorder (correct or incorrect)?
- What is their motivation to adhere to therapy?
- How might their ethnic and intellectual status affect their adherence to therapy?
- Etcetera.

These are all things that we know as physicians and hopefully gain as practice skills as we learn to take care of patients. But the science of patient care and education is not generally considered equally important to, for example, the science of clinical pharmacology. We all accept that there is not one dosage of one drug that fits every patient, so we think of pharmacology science in administering a drug, but do we think of education science in our conversations with patients?

A new technique used in teaching patients is the “teach back” at the end of the clinic visit. After the physician explains the recommendations to the patient, the patient is asked to tell the physician what the patient was asked to do. I was impressed with the value of teach back in a recent experience taking my ten-year-old grandson fly fishing with a guide in Utah. The young adult guide asked my grandson if he would like to learn how to tie the hook on the end of the line. When my grandson eagerly answered in the affirmative, the guide said, “Here’s what I’m going to do. I’ll describe every move of my fingers while you watch me tie the hook onto the line; then I will do it again with you telling me every move my fingers should make while I tie the hook onto the line; finally you will repeat the directions to yourself as you tie the hook on the line.” I thought, “Wow, this guy is a good teacher! No wonder he’s the person that was suggested by the marina when we requested a guide who was good with children.” I don’t have any data that my grandson knows how to tie the hook on the end of a fishing line better than if he had been asked to try it after showing him once. I don’t have a controlled trial. I do know by his response that he understood the directions and I believe he learned it better because of the teach back. Interestingly, the guide learned this technique when he was in training for his Mormon mission. It is encouraging that in a scientifically controlled study reported from UCSF titled, “Closing the Loop,”

teach back improved insulin therapy in diabetics.³

One day I was talking with a medical student about his plans for a career. The conversation was rather laborious until I asked him about his experience as a volunteer mentor helping students in lower classes who were having difficulty. He brightened immediately and told me how he first evaluated the student’s type of learning: visual, aural, or written; then he evaluated how the student organized his or her course material for study. I was so impressed with this scientific approach to teaching that I asked if he had had a course in education in medical school (not UCLA). He responded, “Oh, no. I learned that in training to become a skiing instructor.”

So some of these approaches to education may find as ready application in the business and religious communities as in schools of medicine.

A new technique for classroom teaching that is receiving attention is the flipped classroom, in which students listen to the lecture material and/or read the material before the scheduled classroom time. Time in the classroom is then spent with question/answer or a more interactive workshop approach. This was reported in an article in *Science* to increase retention in an introductory physics course.⁴ I tried this for a lecture I give in the endocrinology block for second-year students. The week before the lecture I gave the students information that I was going to use this approach and provided a video lecture and written material before the classroom teaching. The students seemed engaged during the class, but the evaluations were not good, with most students preferring a straight lecture. I now think such a novel approach can’t be introduced as a single event. I ignored one of the Seven Research-based Principles for Smart Teaching. I did something that was not consistent with the overall intellectual climate of the endocrinology block.

These examples indicate that science is being used to evaluate outcomes of some new pedagogic techniques. We propose that scientifically evaluating teaching of medicine should continue and increase. In the September 2, 2013, issue of the *New York Times*, science writer Gina Kolata described work being done in the Institute of Education Sciences to support randomized controlled trials in education similar to randomized clinical trials for new drugs.⁵ A new cadre of scientifically trained medical education specialists might regularly perform randomized trials to determine what works in medical education.

It is readily understood and accepted in academic medicine that to gain expertise in a specialty requires an immersion educational experience devoted entirely to the science of the specialty. Yet, those few medical faculty members who



choose to become experts in the science of education often have to fit this additional training into their multiple commitments for clinical care and research. Fortunately, there is some evidence that this is changing. In the September 2013 issue of *Academic Medicine* the AM Last Page describes the increase in master's degree programs in health professions education, noting that fifteen years ago there were fewer than ten programs and today there are 121.⁶ In a 2006 article in *Academic Medicine*, Larry Gruppen and coworkers reviewed nine fellowship programs in medical education and described some of the common elements among the programs.⁷ They noted that the Accreditation Council for Graduate Medical Education (ACGME) was then changing the requirement that something be taught, to requiring that a specific competency actually be accomplished. They further noted that the skill set required to develop tools to reliably measure competencies is one firmly based on the science of education. The master's degree programs in health professions education are described in the AM Last Page as being "very prescriptive with many required courses and very few electives," while the fellowship programs described by Gruppen and coauthors usually involve a scholarly research component leading to publications or presentations.

How do we better train clinicians as teachers and develop medical faculty devoted to the science of education? If we produced more education specialists and populated medical

schools with a cadre of these specialists, that would increase the quality of teaching and learning in our medical schools. This increase in quality of education would help make all medical school graduates and ACGME trainees better teachers of patients as well as students. Training medical disciplinary specialists to also become education specialists requires a significant commitment of time: the school must first have a division or center with faculty who are specialists in the science of education, then the medical trainees must commit the time for specialty training in education. Academic medical centers will have to support the education expert faculty in the division or center and additionally support the physicians who want to obtain degrees or fellowship training in the science of medical education. Here at UCLA during my sixteen years as Executive Associate Dean in the School of Medicine we hired six PhD professors with expertise in the science of education (a couple of whom have gone on to other schools). Dr. Wilkerson has trained more than 140 faculty members who were supported by their departments to take her fellowship in medical education (many of whom have taken leadership positions in medical student and/or resident education). Five members of the Center for Educational Development and Research or the division of Student Affairs have obtained a doctorate in education. UCLA now has a cadre of faculty who are consciously competent in the science of medical education. They have, as described in *How People*



Learn, “pedagogical content knowledge.” This was not cheap. It required intellectual and financial commitment from the departments and from the Dean’s office, but considered as a return on investment the expense is often less than supporting new research or recruiting new faculty, while the payback to the medical school in the education of its students is real and lasting, equivalent to or exceeding other investments.

P.S. The journal club at UCLA is ongoing and strong and has outgrown Dr. Robinson’s apartment as a meeting space. Anyone interested in Dr. Robinson’s ten rules for a successful journal club can request them by e-mailing Dr. Robinson.

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