Progress in the Science of Adult Education

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It is of value to stress that the educators, or professional teachers, have a rather characteristic behavior which is quite in contrast to learning. The experts in learning are you, the training program directors. This is true because you are the professional learners.

In Homeric Greece, the value system emphasized youth. Gods were deified in their youth as a result of having performed great tasks or solved great problems. Innovations were made by the younger people, most probably, because they were not carrying with them the baggage of tradition and prior knowledge. In point of fact, the moral of Greek stories is that prior knowledge is a handicap, not an asset, in the solution of new problems.

The evolution of society and its value systems went through the Parmenidian concept of reality as a stable absolute and the Judeo-Christian absolute truths. These could be learned by man and passed on from one generation to the next as absolute verities. The world was then stable. Movement of peoples was occasional (except in mass migrations, in which case their cultural values were brought with them in total) and changes were rare and trivial. Reality, then, until the mid-19th century, was a very stable thing.

In the world of work, as in that of thought, there was conformity. Man did what his father had done and did it in much the same way; consequently, it would have been irrational for man to behave in a way different from that of his predecessors. In medical education, accordingly, as it developed, the curriculum was designed for people who came from a known segment of society and whose behavior in medicine was predictable. Variables were screened out because all students were considered a kind and it was known that all were going to go out and do the same thing. And so a very rigid codification system, designed to prevent variability, was developed. This was the rational, sensible thing to do. Teachers behaved in a very predictable way: "I have the truth because I have been around the mountain longer. You, student, listen to me, follow me around, let me tell you these things and eventually you may be like me."

Thus the whole concept of dogmatic authoritarian education was justified by man's educational experience. It was reasoned that things change so slowly that those who knew facts ought to pass them on and share them in a direct way. The behavior of students was known to be predictable. The world of education had come to reward a willingness to sit and listen, to revere and honor age, to honor wisdom, to honor knowledge. The system then said to people "What you remember is what we care about. It is storing and carrying about with you great bits of information. That's what we do so well, and that is what we want you to do so well." Examinations were designed for that kind of behavior.

At the present time, there is considerable occupational mobility. Careers do not last as long as a man's life. It is not now rational to tell a student that you, the teacher, have the answers, or that the student should be like you—for the student comes with the absolute conviction that everything you do is wrong. He is also convinced that everything which is now done could be done better. The cultural broadcast tells him "look for that better way." He prefers to stand on the shoulders of his teacher rather than imitate him. Consequently, the generation gap. It is appropriate to ask what proper behavior of teachers is in this kind of world, and whether we are exercising that proper kind of behavior. Formal education has always been the perpetuation of traditions, a classroom filled with sounds of teachers' voices, students learning trivial information as evidence of work.
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I wish to contrast this with the way the residency training program developed in America—not specifically neurosurgery, but certainly including neurosurgery. This has developed into a system which is problem-oriented, task-oriented, largely non-didactic (almost no lecturing going on), where residents spend their time solving problems, real problems, live problems, with the teacher at his side. The concept of collaborative solving—"You do your part, I'll do my part; but I need you to do your part, or I can't do my part"—has become the reality of American residency education. This is the nearly perfect model of good education, good learning, not necessarily good teaching, at least not the Parmenidian-Aristotelian concept of stable, absolute truths.

The best way to increase our knowledge of learning is to observe the best of learners in action. Certainly, people who are in the frontiers of inquiry in the academic disciplines are professional problem solvers, professional adders of new information, the world's best learners. Most of you in this room are now dealing with skills in your profession which were not known 5 years ago. If you are still able to be dealing with the frontiers of your field, it is because you have completely retrained yourselves, developed entirely new careers.

Isn't it strange that people who have this superb model of what good learning is suddenly forget it when they start talking about teaching? Suddenly they believe that the young people around them (who they want to be good learners) learn in some other way. In evaluating your training programs, you ought to make sure you understand that people learn the skills they practice. If you keep them sitting in a classroom, taking notes, then that is what they are going to get good at. If you keep them soaking in trivial information, or even important information then that is what they are going to get good at. If you want them to develop skills in the analysis of problems, it would then be advisable to expose them to these situations.

It is important to separate learning from teaching. I believe that teaching usually is imatical to learning, that the two are almost competitive. Generally, where there is good teaching, learning cannot take place, except in the head, the eyes, the mind of the teacher. He is the person who is going about the process of analyzing, dissecting, solving a problem. No one else, then, is getting the right practice.

The necessary and sufficient causes for learning entail several factors. One of them is a reason to know, perceived by the learner. He cannot be told it is important to know; he has got to feel it is important. Unless he sees a reason to be different, no learning is apt to take place. Another factor entails some kind of "acting" involvement (he does it, he works with it). The third factor which the learner needs, is immediate feedback. These three elements are necessary and sufficient causes for learning.

Where then, does the teacher enter the picture? Certainly, not in the role of gathering information and analyzing it for the student. This is the one thing which he must not do! What he must do is to establish relevance in the classroom situation, and in the teacher-student relationship. He must also provide online, immediate feedback. It is of negative value to provide the student with information, with questions, with answers, for these are the things which he must do for himself. It is also a negative value to seek out better ways to pass along trivial information, since this preempts the student of his involvement in searching out data.

The trend toward programmed learning is disconcerting. We should not be preoccupied with having better and better film clips, better and better ways to show the student (in some kind of "canned" unreal way) little things we think he ought to know. It is certainly true that the computer has more significance in the evolution of man and man's ideational system than anything that has ever happened since the invention of the alphabet and grammar. However, computers, as people, are bad teachers.

Now, let me turn to the young surgical trainee. I would submit that 95% of the variability and output of a trainee is determined by the input. That means that the quality of the student is of fundamental importance. The better the student the better the output, no matter what you do. It is apparent that neurosurgery, as a discipline, ought to explore ways of recruiting better candidates. If