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EDUCATION TO WHAT PURPOSE?

by
M. D. Taylor

One of the things we like to grumble about in this country is the state of education. I taught mathematics for thirty-five years at a state university in Florida and am now retired. My students were generally fresh out of high school or only a few years away from it, and I want to pass on a few observations about them.

Please keep in mind that these are only personal impressions, not a scientific study. I never kept any statistics on my observations, though I often heard them echoed by other faculty. Therefore one is at perfect liberty to dismiss them as being of a slight and casual nature. They are only what I thought I saw.

“I guess I wasn’t paying attention.”

One of my first impressions during my teaching career was this: My students’ basic skills and knowledge were often abysmal.

This is all too familiar—the students who think China is in South America, those who could not avoid misspellings if a gun were held to their heads, etc., etc. I have the impression that this sort of failing is usually taken as THE reason for education reform.

There has been a response to it in Florida in the form of something called the FCAT (Florida Comprehensive Assessment Test). This is a test that high school students must pass to prove that they really know the subjects for which they were given credit. Its existence seems to be a loudly unspoken statement of distrust of the public schools.

But gradually, over the course of years, I came to believe that poor preparation—blindingly evident as it was—was not my students' worst problem.

They had other, even more damaging ones.

“You’ve got to be kidding!”

My second observation was that, at least in an academic setting, it was difficult for them to understand the idea of hard—really hard—work.

I am not sure this should be characterized as laziness. I suspect that in the proper setting—for example, working on a job for money or in training as athletes—they would work like fiends.

But put them up against an academic subject and the mind-set was often like something I saw years ago in a Li'l Abner comic strip: An avalanche has just buried the home of the Yokum family, and the good citizens of Dogpatch come running to the rescue yelling, “We have to save them! We have to dig them out!” After five or ten minutes of frantic effort, the neighbors are worn out and begin to wander away. “No point digging any more. They’re likely dead by now!”

The idea that a problem might require more than ten minutes to solve—that often seemed as bizarre to the students as the fourth dimension. And it was, in general, hard for them to get their minds around the kind of strenuous effort that would be required, day after day, month after month, for, say, a calculus course.

(Perhaps in Florida the FCAT is at least a partial corrective to that. I now hear stories of students putting huge amounts of effort into preparing for the FCAT. A great deal of energy seems to have gone into telling them, over and over again, that failure to pass the FCAT is a disaster.)

“Picky, picky!”

My third observation was that students lacked the idea of *excellence*. If an assignment was done, this was sufficient. That it was poorly done, that it was blatantly sloppy, might never register.

This tended to be most obvious in the physical appearance of their work. Too often students had not learned to write legibly or to display

their thoughts in a sequence that could be followed—or even to display them at all.

Beyond appearance, the work itself was often sprinkled with careless errors—simple calculational mistakes, sentences that made no sense—things the students knew how to do but could not be bothered to do correctly.

As noted earlier, perhaps part of the problem lies in society's values. Perhaps for many students, academic studies lacked the value that would merit careful attention and excellent work.

Of course, what is really at issue here is not whether a homework assignment was done well or not. It is rather the idea of *quality*. This has significance far beyond the classroom. Someday you may find yourself watching a flight crew preparing a plane you are about to board or lying in front of a brain surgeon—and you may begin to reflect that it is never too early to begin teaching young people that any job worth doing is worth doing *well*.

“Don't explain—just tell me which buttons to push!”

My fourth observation, and the one most appalling to a mathematician, was the almost total lack on the part of my students of *analytical skills*.

What are “analytical skills”? Analytical skills are what we need to see that one fact follows from another or to anticipate the consequences of our actions. They are what move us to seek a fire extinguisher when we smell smoke. If you want a picture of what it means to *lack* analytical skills, imagine a self-important public official who has just been told that hurricane season is approaching and the levees are too low—yet fails to see any reason to act. Analytical skills are the marriage of logic and common sense.

Analytical skills show up in all sorts of places. A crime scene investigation, which presents the spectacle of lost events rising again into visibility on a foundation of physical clues and careful logic, is a good example. In a related instance, we are used to the idea that in a courtroom trial we will see a marshalling of facts and well-constructed arguments used to establish guilt or innocence. Analytical skills are what the engineer uses before the plane is built to convince himself the wings will not fall off. They are the means by which the medical researcher establishes that some particular virus or bacterium rather than another causes a disease. Indeed, one can argue that without at least a modest measure of analytical skills, even the most common problems—such as a work schedule for employees or an efficient way for

harried parents to get their children to all their classes and activities—cannot be solved.

As for mathematics, analytical skills are its heart and soul. Of course one can learn to do calculations—even very complex ones!—without such skills. Indeed, many people mistake the ability to perform calculations for the ability to do mathematics. But in the absence of understanding, one cannot *use* mathematics, and analytical skills are inextricably intertwined with what the mathematics *means*. Though we may have the quadratic formula memorized backwards and forwards and the Pythagorean theorem burned into the folds of our cerebral cortex, if we do not understand the significance of the mathematics, we cannot hope to use it to design a bridge, predict the weather, build a spaceship, or accomplish anything of significance.

Yet here is something I know for certain: For too many of my students, the idea of proof—of being able to justify a position purely on the basis of logic and facts—was a strange and alien one. To actually see it used to solve a problem was a wondrous revelation. To be expected to do something similar, no matter how trivial, was often unnerving, unreasonable. Sometimes in their anxiety and frustration, they would tell me, “Don’t explain—just tell me which buttons to push!”

What was not said

I suspect my students had a number of other deficiencies not touched on here. Deficiencies, for example, in creativity—in awareness of the aesthetic side of their work—in ability to frame insightful questions—etc., etc. These can all be viewed as important parts of a person’s education. Creativity is vital in, for example, art or writing or corporate accounting. As for aesthetics, you will even hear engineers talk about solutions that are “elegant” and those that are “ugly”. With regard to the ability to form insightful questions, investigators and researchers of all stripes need this, and ordinary people often need it to defend themselves from the pitches of salespeople. If I have not paid attention to these other deficiencies, it is not because they are less important than those I dwelled upon. Rather, the deficiencies I discussed were the ones that stood out most sharply in an undergraduate mathematics curriculum.

Moreover, not all my students suffered from these problems. It is too easy, when one speaks about disease symptoms, to get the idea that everyone is

ill. Certainly I had students who were well-prepared, who worked hard, who understood excellence and strove for it, who could follow a close logical argument and were fascinated by it. These “good” students were rarely a majority. Indeed, over the years, it seemed to me their numbers, relative to the other kind, dwindled. Perhaps this was simply because the proportion of high school students entering college was increasing. Or perhaps this was only a misperception on my part, the natural result of that sour and crabbed disposition for which old professors are famous.

And not all the students who suffered from these deficiencies suffered to the same degree. There were some who were not well-prepared, who did not have the right habits and outlooks but who recognized that this was what they had to learn. Not necessarily outstanding, these were students who actually heard my words. These were the ones who were not the strongest but who tried their hardest. They were, in some sense, the ones to whom I felt the greatest responsibility.

A senile fancy

There is a very strange notion that keeps surfacing in my mind. If I share it with you, you will be certain of my senility. Still . . . I wonder if a basic problem with education might be simply this:

We have absolutely no clear idea what we mean by “a good education”. Worse, we do not have the foggiest idea that we do not know this.

Now when I say “we”, I mean the public at large and that leadership, considered as a whole, that determines educational policy (newspaper editors, legislators, business leaders, etc.).

There are, to be sure, many people who *do* feel they know the purpose of education. Some say it is about knowing things, like the multiplication tables and the capital cities of all the states. Some say it is about moral values, which I gather may have something to do with religion, others that it is about good citizenship, which seems to be connected with patriotism. Still others say it is about learning to think for oneself, which, I gather from conflicting sources, has to do with vegetarianism and acts of disloyalty.

Such people usually appear to proclaim what is wrong with the educational system and how to fix it. They may gather a chorus of support or blasts of criticism, but I do not recall comments about the fact that these would-be reformers often have *different* visions about the purpose of education.

So I am led to wonder, if, instead of spending time arguing over how to fix the educational system, we tried to figure out what we wanted it to do, would that help us know when and how to fix it?

When I talk about deciding what we want the educational system to do, I mean a publicly agreed upon and generally accepted purpose. I think it is important that such purpose be understood by the public, not simply by educational experts. If ordinary citizens cannot tell when the machine is broken, then we will never find the resources to fix it. And whatever purpose is agreed upon, I think it should be something that the majority accepts and believes in. To be sure, there will always be people who do not accept a particular goal or goals. This is why, for example, we have had tremendous growth in recent years of religiously oriented schools. However a diversity of opinions about the purpose of public education should not be a major problem so long as we have general, overall agreement.

As it is, I think such a general purpose is lacking. Right here in Florida I see what looks like confusion as to what we want from our school system. The FCAT was introduced in Florida to fix the state's educational system. The faith our former governor placed in it was so strong, I was at one point tempted to think the state philosophy was

FCAT = EDUCATION!

Of course, if, as I suspect, we really have no clear idea of the purpose of education, it is not surprising that we might be tempted to believe the purpose of teaching is this: To achieve high scores on tests meant to measure how well we are teaching.