

*To whom should the case for increasing technological literacy be made?*

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Since 1992 the United States has experienced an extended period of economic growth with high productivity and low unemployment. This has occurred in an era of rapid technological innovation and expansion. New companies are being born and mature companies are merging and acquiring. The standard of living for most citizens appears to be at a level that was beyond their dreams. Given these conditions it appears as if it will be difficult to make the case for technological literacy. If the population is not technologically literate, how then could we have achieved these heights?

The argument might be that while the economy as a whole continues to outperform expectations, the gains in income enjoyed by the majority of American workers have not matched the growth in the economy. More and more of the higher incomes are going to a relatively small proportion of the total work force. Also, those at the lower end of the range are working more to stay even with the fairly low rate of inflation. Perhaps the reason is that the growth in income is going to those who are technologically literate. Further, as the rate of technological innovation continues to expand, the number of technologically illiterate will increase and the wage gap will expand. This was the theme of a column by Laura D'Andrea Tyson in the December 14, 1998 issue of *Business Week* in which she stated "This economy demands high education levels, which many schools, especially those serving low-income families are not providing."

It is apparent that many opinion leaders recognize the need to enhance the way in which students are taught and some of them even recognize the need for technological literacy. The issue is then, to whom should the case for increasing technological literacy be made? The easy answer is to make the case to parents, politicians, government officials, business and industry, educators and administrators at all levels; e.g., all of the above! However, there needs to be a focus on how this is done.

When the IEEE began planning the Technological Literacy Counts workshop, it was done with a common perception among the planners that the need for technological literacy was essential. However, before the workshop was completed it became apparent that the perceived need for a technologically capable society was not universal. As a result, two of the eight strategies drafted by the workshop participants addressed the need to communicate this message to key policymakers and leaders in education, business and government. Too often the term technology is used only in reference to computers. This is disappointing, particularly it appears in publications of the Department of Education and in those publications of leading teacher organizations.

Other panelists have addressed the need to make the case to key leaders and policy makers. My focus will be on the need to make the case to teachers, teacher educators, and leaders in the education community. The education system in the U.S. is based on a factory school and an agrarian calendar. This may have served very well in the past but it is totally inadequate and very inefficient in the knowledge era.

Teachers - Teachers are experts in their areas. However, with the high rate of technological change, there are few technology experts, and many of those are not teachers. The case must be made to encourage teachers to reach beyond their current level of comfort and explore ways in which technology and its impacts can be introduced to students. Students have a natural curiosity and willingness to learn. It is only when the teaching is not relevant that they fail to learn. In the past there were many learning moments on the farm and in the home. These were hands-on experiences at a time when students could take things apart (and sometimes put them back together) under the watchful eye of a senior family member. They learned how things worked first-hand. Those opportunities are very limited today for a number of reasons including the nature of the workplace, the unavailability of senior family members, and the transparency and inaccessibility of technology. This is particularly true in urban areas and in economically disadvantaged rural areas. Teachers could make a difference by introducing more hands-on and technology applications learning moments in the classroom. Teaming with engineers may be a way for teachers to develop technological skills and obtain resource materials.

Teacher Educators - To provide teachers with the skills necessary to enhance learning in a rapidly advancing technological era it will be necessary to change the way in which pre-service and in-service teacher education is presented. Teachers in all subjects should have an awareness of technology and its impacts. This might be done in pre-service education by developing courses that are conducted jointly by faculty in the schools of education and engineering. Some technical universities today are offering students an option to minor in education along with a major in engineering. Including education practice as a part of students' interdisciplinary project makes it possible to complete requirements for both an engineering degree and a teaching certificate. Other innovative programs might also be developed.

Education Leaders - The demands on teachers and the limited time available to meet these demands are an on-going concern. To provide teachers with an opportunity to acquire the skills needed to facilitate learning in the 21<sup>st</sup> Century will require significant changes in the school day and calendar. Teachers must be given time for learning as well as time for teaching and administration. With the changing role of the teacher there is a need to examine the way in which teachers are compensated. It is past time to consider an extended school day and an annual calendar not tied to the growing season.

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