Roles of IT in Improving Our Educational System. Part 4: Brain and Body Tools.


Figure 1 captures the essence of a person or team of people working with brain and body tools to solve problems, answer questions, and accomplish tasks. The brain and body tools are getting steadily better, propelled by continued rapid progress in science, engineering, technology, and all other areas of human intellectual endeavor. IT is playing a major role in the development of new brain and body tools. The compelling applications I have discussed previously (Moursund, 2000a, 2000b) are now important brain tools for hundreds of millions of people. I discuss brain tools more fully in the next section. Body tools include hoes, clubs, bicycles, telescopes, microscopes, cars, and so on.

![Figure 1](image)

**Figure 1. Problem-solving, question-answering team.**

**Five Closely Related Brain Tools**

Here is a list of five general-purpose brain tools. These tools are important components of the science of teaching and learning (SoTL). You will notice that the last two specifically relate to IT. However, IT also plays a significant role in contemporary use of the first three.

1. Writing, beginning in approximately 3100 BC—Reading and writing literacy were greatly aided by Gutenberg’s development of moveable type and mass production of printing in about 1450 AD.
2. Mathematics, beginning in approximately 3100 BC.
3. Science, beginning in approximately 1500 BC.

4. Computers, beginning in approximately 1950 AD—The focus is on use of computers to represent and help solve problems. Many school districts want all of their graduates to be computer literate.

5. Internet [and Web], beginning in approximately 1990 AD—The focus is on the development of a global communications and library system. Internet use has spread rapidly, and it is now a common component of K–12 schooling.

All five of these brain tools share much in common. They are aids to communicating and to representing and solving problems. We expect our students to develop a reasonable level of expertise, such as can be acquired by the end of the third grade, greatly empowers a person. Thomas Jefferson, the third president of the United States, recognized this when he worked to have his home state of Virginia provide three years of free public education to those who could not afford to pay tuition. (This was such a far-out idea, it was handily rejected.) Logan (2000) calls each of these tools a language. A person who knows how to make effective use of these languages is empowered—he or she can do many things that cannot be done without the use of these brain tools.

Notice that each language depends on the languages developed before it. Thus, science is heavily dependent on writing and mathematics. Effective use of computers is highly dependent on writing, mathematics, and science. The development of a new brain tool language does not obviate the need for the previous brain tool languages.

This creates a major challenge for a formal educational system. Over a period of approximately 5,000 years, our educational system learned to deal with writing, mathematics, and science. A significant portion of each school day is focused on these three languages. Even then, many critics of our current educational system suggest that students are not acquiring appropriate levels of expertise in the use of these three tools. Now, two new tools have been developed in the past 50 years. These two new languages are quite important. Moreover, it takes a substantial amount of time and effort to develop a reasonable level of expertise in the use of these tools.

**Expertise**

For any brain tool or body tool, we can talk about a person’s level of expertise in making use of the tool. Figure 2 suggests that expertise is an open-ended scale. The points marked are intended to suggest that a person learning to use a tool moves from being an absolute novice to having a useful level of expertise, then to meeting contemporary standards that are expected for adults using the tool, and then to higher levels of knowledge and skill.
In the Land of the Blind

There is an old saying that in the land of the blind, the one-eyed man is king. This has certainly proved to be the case in terms of the five brain tool languages. For example, even a modest level of reading and writing standards for reading and writing literacy are far beyond what most third graders can achieve. [Note added 12/22/04. This is certainly a poorly written sentence. It refers back to Thomas Jefferson's educational proposal made earlier in the paper. What the sentence is trying to say is that contemporary standards in reading and writing are far higher than what a typical third grader can achieve nowadays.]

Most students now entering college have rudimentary skills in using a word processor, sending and receiving e-mail, and searching the Web. They have a useful level of expertise, but they are far from meeting contemporary standards. Compared with typical adults in our society, they are the one-eyed people in the land of the blind.

The National Educational Technology Standards for Students (NETS•S [ISTE NETS Project, 1998]) provide guidelines for levels of students’ expertise with IT. Many adults look at these standards and dismiss them as completely unreasonable; after all, relatively few adults can meet them. Many students entering college do not meet the fifth-grade standards. Of course, we have good evidence that students can meet these standards if they are given appropriate education and experience.

Final Remarks

The model given in Figure 1 suggests one major direction for the future of education: Students need an education that helps them gain a contemporary level of expertise in using brain and body tools. This education needs to prepare them to deal with a steady in-crease in the range of tools available as well as in the power and usefulness of these tools.

This will require major changes in our contemporary educational system. It also creates a major challenge for teachers. What is your current level of expertise in each of the five brain tool languages discussed here? As contemporary standards continue to increase, what are you doing...
to keep up and/or to stay ahead of the curve? What specific things can you do in your teaching to help both you and your students continue to gain increased expertise in each of these areas?

References


