Efficiency: Study Good Books

Hopefully, Science is entering a new era where industrialized nations acknowledge & enforce a Right to a Good Education equally applied to all its citizens. Certainly, modern democracies operate more efficiently when all their citizens are educated well & seek employment that maximizes their talents (ref [1]).

Restricting Knowledge Flow: In the past, knowledge has been intentionally withheld from less advantages segments of society for job security (ref [3]). With the World Wide Web, published information should be disseminated to those who can use it. Specifically, authors of technical reference books earn their living from selling their books & should benefit from the largest possible exposure of their efforts.

Scientists & Engineers should not bury their most useful references in a long list @ the end of published papers. These accomplished Science / Technology / Engineering / Mathematics (STEM) professionals can migrate toward educator professions & let everyone who wants STEM knowledge, have a place in society with a STEM career. Current STEM professionals will have to retool somewhat. However, there is presently a well documented shortage of STEM workers in the US (ref [5]). Looking forward, with more STEM educated workers employed, STEM disciplines should be applied in greater breadth across society & progress faster.

Disseminating Knowledge: There are greater sins in Science. However, if a STEM professional guards his / her library of ***good*** references, then that professional is a “keeper of other people’s great knowledge.” The buyer of a ***good*** book should show extreme gratitude to the author for writing the book & ***not*** demonstrate a false enlightened insight that only he / she possesses. Different perspectives are important; however, initially studying from ***good*** technical material is the most efficient. I propose lists of ***good*** reference material accessible online. These lists can be maintained by professional organizations & universities, updated by people who use the list. Take a book title … give a book title!

Formal & Informal Learning in STEM

These reference lists cannot take the place of a ***formal*** STEM degree & on campus learning. A college student undergoes an intense 4-years of learning along with his / her student peers who represent the type of people he / she will be working with. From my anecdotal experience (jefgResume.pdf) as newly invented personal computers were brought into the 1980’s STEM workplace, I gained some ***informal*** insight:

- For the most part, STEM jobs are never conducted alone (ref [7]). In critical tasks, it's far better for two 4-year degree Engineers to do a defined task (one to work – one to check) than to have a PhD Engineer do the same task with ***no check*** at all.

- If Technicians are incorporated into a STEM job, a Professional should be knowledgeable of the Technicians' contributions. A STEM graduate should assume the role of Technicians @ times, if but for nothing more than to develop documentation of the Technician's work. STEM professionals are trained to document their work for STEM posterity; Technicians are not.

- Feedback to the "Ivory Towers" is important (ref [8]). From hindsight, these higher institutions of learning can refine the 4-year degrees & the learning processes to produce better STEM graduates.

Sources of STEM Information: A STEM student trains 4 years in a traditional field, then goes into the market place to design a specialized widget. In all probability, there will be little documentation @ the new job on how to design this widget. Senior Professionals & Technicians will give a recent graduate verbal instructions & the new hire should jump up the learning curve with knowledge from past mistakes.

In STEM education, the student may learn through:

- lectures, textbooks & homework.
- study groups.
- mistakes made during exams.
- structured lab work.
- student co-operative programs within the STEM industry.

From my work experience, the graduated STEM Professional will learn through many other sources including:

- conversations with senior Technicians & Professionals.
- having work checked by knowledgeable Technicians & Professionals.
- checking work of other Technicians & Professionals.
- duplicating job roles & functions of Technicians.
- reviewing comments in source code.
- reading current & older contracts.
- reading applicable older reports.
- asking for / accepting feedback from end users.
- seeking out & reviewing ***updated*** textbooks.

In the STEM Disciplines, formal learning is vital. The student learns key concepts & performs problem solving during the entire 4 years of study. However, on the job training is always required for a new STEM graduate to some degree. STEM educators should

also strive to flag the ***best*** of current textbooks to STEM professionals plying their trades in the field.

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