

TOTAL SCIENCE - FANTASY OR FEASIBLE REALITY?

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Let's imagine a world where people do what they want. Depending on an individual's worldview, the images could range from very bright and joyful to quite dark and sad. However, in all possible scenarios, the number of people engaged in scientific activities would likely be small. Why do I think so? Currently, such activities are the prerogative of the few "survivors" in the education system, which, at almost every stage, is not geared towards preparing researchers. Although elementary school (for the majority) and graduate school (for an absolute minority) offer a decent chance for the development and realization of a research-oriented mindset, which is natural for every person from birth - a young child explores by consuming and consuming by exploring. Certainly, scientific activity is just one sphere of a human explorer, but for analyzing the existing situation in human society and education in particular, it serves as a good example.

Again, a question: did you enjoy studying in school and university? Was it interesting there? There will likely be a few more positive answers for universities for understandable reasons, but almost no one wants to return to school. Why is that?

The answer is simple - school education is built on the principles of a religion without a founder: follow the established curriculum, and happiness (success and all opportunities) will be yours in adult life. If it were so, this text would not exist. Moreover, school graduates not only fail to learn how to study, but for the most part, they lose their natural curiosity and desire to continue learning further.

However, there are technical details of implementing this dead-end strategy:

- numerous and diverse (which is not bad) facts in various areas of human experience are studied. Curricula usually require memorizing all these facts (which is bad);
- the ways of obtaining these facts are rarely provided (which is very bad).

I'll provide an example from my field - chemistry (and chemical technology). Textbooks contain numerous reactions from various chemistries, but the method used to establish the reaction (of the type $aA + bB = cC + dD$) is NOT known:

- what laboratory installation was used for the reaction?
- what analytical methods for reagents and products were employed?
- how were the obtained numerical data processed?

One can say that this is the history of science, and it is. However, an article published last month is also already history.

To emphasize the general nature of this problem (studying facts and using them without analyzing the source of their acquisition), let's mention the "New Chronology" (described as "a pseudohistorical conspiracy theory" according to Wikipedia) by Anatoly Fomenko and Gleb Nosovsky. They addressed the issue of the actual century from the birth of Christ in which we live. Joseph Justus Scaliger and Denis Pétau fixed the chronology we currently use in the 16th-17th centuries. Does anyone after school and university know these names?

Fomenko began to delve into this issue, writing a dissertation on anomalies in the speed of the moon's movement during different observation periods. He found that there were no anomalies; there was an erroneous chronology of observation dates. The 13th world chess champion, Garry Kasparov, wrote the foreword to one of their books, recalling the questions that puzzled him when studying history in school:

- where did the "Dark Ages" come from, and why did they suddenly end (spoiler - they never existed)?
- why couldn't progressive Greeks invent steel and fight with iron swords (we don't see this in movies - swords don't bend), and so on?

It should be noted that the authors of the New Chronology separate their works into determining the dates of historical events (in which they are confident) and the corresponding reconstruction of history (an authorial approach that allows for scientific discussion).

A few details about the situation in universities - in most of them mandatory scientific activity is absent at the bachelor's level. Such activity is welcomed and documented in separate attachments to the diploma (in the best cases), but it doesn't earn educational credits. Universities actively use Erasmus mobility to attract foreign students to research, as they struggle to engage their own.

This situation leads to an interesting psychological effect: after 3-4 years of bachelor's without real research activity, students lack motivation to pursue a master's, and when they finally do at the age of 20-21, they are formed adults, entirely unprepared for research activities.

What specifically should be done with textbooks? The foundation of such textbooks is proposed to center around Research-based Teaching (RBT) incorporating elements of Research-based Learning (RBL):

RBL, an active learning methodology, hinges on students' engagement in research activities, with the teacher assuming the role of a tutor or supervisor for these investigations.

RBT is a method of passive (traditional) learning grounded in previously conducted research. This could range from studies published just last year to those dating back a century or more. The objective of this approach is to significantly stimulate the research-oriented thinking of students and, consequently, to activate research endeavors within universities.

Therefore, the emphasis lies in teaching through scientific monographs, articles, and dissertations. Naturally, these materials should be adapted from the complexity of scientific discourse to suit students at various levels—be it at the master's, bachelor's, or even school level.

What should be done with numerous facts? Study and utilize SQL and noSQL databases in various fields of activity. Just as Steve Jobs said, we should turn the computer into a means of enhancing the human mind, much like the bicycle significantly amplified the human body for long-distance travel at greater speed.

Returning to school, the role of the school teacher needs a radical change, incorporating school teachers (natural science subjects in our case) as researchers in the proposed Total Science system:

- a significant portion of research does not require being in specialized laboratories. In the format of scientific articles, this includes literature reviews and diverse processing of obtained data.
- it is necessary to substantially reduce the classroom burden on teachers, equating their rights to university lecturers.
- simultaneously, there is a need to stop terrorizing pupils with "factomania" by developing and utilizing proprietary teaching programs based on the research activities of a teacher.

Without graduates from schools and universities who didn't become professional researchers, the proposed system cannot be complete. Various hobbies currently serve as a support for many individuals compelled to engage in work that doesn't overly satisfy them and fails to realize their potential. Therefore, creating a club system for adults (working title "All Researchers") similar to the Ukrainian "National Center Junior Academy of Sciences" for schoolchildren will allow for harnessing the potential of people significantly exceeding what we have today.

The "Open Science" initiative is a natural response to the problem of human potential in scientific research, even though at first glance, it only provides access to already completed studies at different stages. Of course, Total Science incorporates it as part of its framework.

In conclusion, let's remember the TV series "Star Trek," whose characters excellently illustrate the potential benefits and practice of Total Science: "To boldly go where no man has gone before."