Advancing Science

Some studies have shown the general public lacks an overall knowledge of scientific facts and concepts. According to University of Michigan political scientist Jon D. Miller, for example, only 28% of Americans are informed enough to understand a daily newspaper report about a scientific topic. Figures for the EU and Japan are even lower.

One consequence of scientific illiteracy is a dearth of young people choosing scientific careers. This may be reaching a crisis point when it comes to both the quantity and quality of students in mathematics and basic sciences.

However, curing the public's indifference to science will require more than just getting the facts out, many observers say. A deeper problem might lie in public understanding of scientific methods – not just the data that scientists find, but *how* they find it. Citizens can always learn new facts. In fact, Miller has found that the proportion of "scientifically savvy" people in advanced societies has doubled since 1985. But if citizens reject scientific methods, they may not be able to recognize facts for what they are or discuss them in a reasonable manner

More importantly, when scientific experts disagree, for example, about the effects of climate change on Atlantic hurricane risks, interested parties look at the issue as a sign that no scientific consensus exists. In such discussions, the public wants to know what the outcomes will be in the future; yet this is precisely what scientists cannot say for sure. Whether the issue is a personal choice about diet or a policy on stem cells, anyone contemplating science, some say, should understand how it works.

Many educators say that what the public needs to understand is that the dichotomy between science and uncertainty is false. Rather, it is the nature of the scientific method to treat all results as subject to further proof and reconsideration. For scientists, unsolved mysteries are a sign of a healthy discipline; heated disagreements are business-as-usual; and no theory – not even relativity – is immune to being questioned. Hence, the most troubling forms of modern scientific illiteracy are those which stand the scientific method on its head, claiming that "good science" means all researchers agree, and all facts "fit" the going theory, and no one questions the results. This is exactly how we should consider the role of science, where strong disagreements among researchers are considered healthy, even necessary to progress.

Scientific illiteracy is exploited by interested stakeholders. The claim that global warming is a hoax, for example, is often buttressed by citations of scientific research that criticizes current models of climate change. Even as the scientifically literate remain a minority in democratic societies, those societies face challenges that require a correct grasp of scientific method.

Nowhere is this clearer than in realms of research where scientists follow the logic of scientific research or commercial potential into areas that make many people uneasy. An analysis of single nucleotide polymorphisms in your genome – the spots in your DNA that are different from generic human genes – can now be bought from Iceland's deCODE genetics or California's 23andme for only US$ 1,000. For scientists, it is a proud milestone. Many in the general public, however, worry about genetic discrimination and violations of privacy.

Meanwhile, central problems of economic and political direction cannot be reasonably grasped by citizens unless they can evaluate ongoing scientific research. One example recently noted by the UK weekly *New Scientist* is the question of

biofuels. The biofuel option is intuitively and emotionally attractive (about 12 million hectares, or 1% of world agricultural land, are already being devoted to biofuel production). But policy decisions will require a careful evaluation of data about the costs and benefits of this approach. According to the International Water Management Institute, studies indicate that quadrupling world biofuel production by 2030 would require an additional 180 cubic kilometres of fresh water from rivers and aquifers worldwide.

Can water-scarce nations afford the extra impact? Science can help answer that complex question, but only if the public is prepared to listen.

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