What's the role of virtues in the lab?

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Just because we can doesn't mean we should. There are values at play in the lab. Credit: O. Usher (UCL MAPS), CC BY

The evolution of science and engineering in the 21st century has transformed the role of these professions in profound ways that affect research, scholarship and the practice of teaching in the university setting.

The traditional division between the liberal arts and the STEM disciplines of science, technology, engineering and mathematics is, I

believe, artificial and obsolete.

As a physicist, a former dean of engineering at Brown University, and dean of the College of Science at the University of Notre Dame, I have come to recognize and appreciate the vital role that the humanities, social sciences and arts play in the lives and careers of scientists and engineers—perhaps more now than ever before.

The acceleration of discovery and invention in this century has reached a point where the question "Can we do this?" is almost always answered "yes."

Meanwhile, the question "Should we do this?" takes on new urgency. Society is looking for STEM graduates to address the global challenges that affect the medical, environmental and economic well-being of billions of people. To succeed with in these difficult tasks, graduates need to be schooled in the intellectual and moral virtues.

Research is not purely objective

Genomic mapping is routine, stem cell research holds promise for a wide range of cures, nanoscience and technology open near-limitless possibilities in some fields.

The complexity of increasingly sophisticated STEM research requires collaboration with people both within one's field and beyond. For example, hundreds of physicists work at CERN, the European particle physics laboratory, to understand the most fundamental nature of the universe's building blocks: subatomic particles. The nature of their work and future discoveries will inspire new collaborations among experts from different disciplines, spin-off technologies applied in other fields, and even raise new and profound questions about nature and human beings.

STEM is a human enterprise—an investigation of the physical world carried out by individuals and groups whose interests and backgrounds influence their choices and focus.

STEM is not value-free; it's not always purely objective. Researchers in these areas need to rediscover and exercise virtue—that is, to consider the moral good and maintain high moral standards – in order to succeed and to ensure that their work promotes the well-being of everyone, avoids inflicting damage on others, and earns the respect and support of the larger society. Critically, STEM should be about advancing a flourishing human community.

My own awakening

My personal awareness of this dimension of my work came into focus when I moved from my original interest, fundamental physics, into applied physics.

The potential impact of my research on real people—both positive and negative—became clear in a way I had not considered deeply when I was working with formulas, hypotheses and laboratory experiments on the fundamental properties of matter. Each step of the process involved choices that I had to make, choices that would move both the research and the final product in one direction rather than another.

This was no longer just an intellectual exercise to see what was possible—it had become a personal responsibility to see what was good. Beyond any cost-benefit analysis, I had to consider the health and safety of the person who might use the end product. At the same time, I found a deeper motivation for research in order to discover and invent products that could have a positive benefit on people's quality of life.

Science is not simply the objective measuring of materials or solving of

equations—it depends on the integrity, diligence, transparency, honesty, prudence, and so on of scientists. It depends on the virtues.

Valuable virtues

The study of intellectual and moral virtues should be part of any STEM student's education. Virtues are qualities of excellence that a person acquires by habitual practice in the pursuit of living a good life—and this is not just the exclusive domain of the humanities.

The field of virtue ethics, rooted in the work of Aristotle, has provided a structure for evaluating personal actions for centuries. This approach describes right action as a mean between excess and defect—the virtue of courage, for example, avoids both the excess of rashness and the defect of cowardice.

Virtue ethics has received renewed attention since the late 20th century, as people recognize the importance of character as well as proficiency in the modern world. This includes classical virtues such as prudence, justice, temperance, and fortitude, as well as newly identified qualities like grit, a hybrid of perseverance and passion. Because virtues are about individual responsibility, they are not linked to a particular religion or group. Virtue ethics looks beyond rules and formulas to focus attention on the value and purpose of life.

What teaching the concept of virtue adds

A virtues-focused approach to life fosters reflection, deliberation and moderation, while warning against excess and defect. It enables the highest ethical choices in the important and complex issues STEM graduates face, from introducing new materials to the environment, to making the results of research discovery accessible to developing

countries.

We here in the College of Science constantly introduce questions related to the human dimension, especially in the life sciences.

We have focused on rare and neglected diseases in our undergraduate curriculum, asking why these diseases are not adequately funded and comparing the price of a drug to its market size. As we consider how profit should affect saving lives, such virtues as justice, wisdom, passion and compassion naturally arise. We have courses in stem cell research where we discuss the ethics of saving lives at the expense of destroying embryos. We have developed courses on scientific ethics, both professional integrity and personal responsibility, and on leadership in science based on servant-leader models that places a high value on interpersonal ethics.

In addition to these explicit conversations, students experience the virtues required to conduct research. These include personal character such as commitment to finding an answer, courage to break new ground and create new basic knowledge, as well as wonder, imagination and creativity. In addition, the importance of virtue-driven STEM research has significantly increased since much research has shifted from individual exploration to large teams. Scientists must learn to collaborate effectively on diverse teams that call for respect, honesty, trust and humor.

Innovative solutions to significant challenges call for openness on the part of researchers to consider the contributions of others, even from other disciplines. The choice of a research question should involve prudence, a careful evaluation of the outcome's potential impact for harm as well as good. Researchers in nano, stem cell and other research fields should accept accountability and avoid unleashing harmful products, as has happened in the past, for instance when thalidomide was

prescribed in nausea medicine for pregnant women. Scientists and engineers also should resist exacerbating the divide between rich countries and developing ones.

Scientific challenges require thoughtful approach

Carrying out collaborative research, vital to solving complex problems and grand global challenges, calls for old-fashioned perseverance, as well as the virtues required to foster a well-functioning team—honesty, humility, generosity, kindness and so forth. Reporting results requires a high level of integrity and responsibility. The researcher who decides to translate the discovery for commercial benefit will need personal courage, determination, and dedication, as well as all the virtues required for relating to the research team, including patience and flexibility.

STEM education is arguably one of the most rigorous academic tracks that a student can take, and incorporating this human and humane dimension requires creativity and innovation. Ultimately, I believe this understanding and practice of virtues must permeate everything we do as faculty and administrators in training and developing our students.

In the future, we will be evaluated in the education marketplace, not by ACT scores and class rank of our elite incoming students, but by the quality and impact of our graduates. Institutions that instill habits of excellence in their students will flourish along with their graduates.

When I speak about virtues, ethics and leadership, people ask, sometimes in jest, whether I am a scientist or a humanist. When this happens, I reflect on what we want our students to strive to become and answer: both.

Source: The Conversation