



DLMPST/IUHPST
Division of Logic, Methodology and Philosophy of Science and Technology
of the ***International Union of History and Philosophy of Science and Technology***

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The Helsinki Manifesto of the Division for Logic, Methodology, and Philosophy of Science and Technology of the International Union of History and Philosophy of Science and Technology

The DLMPST/IUHPST affirms that logic, methodology, and philosophy of science and technology (LMPST) are disciplines that should play a central role in the education of scientists and in the education of a science-literate citizenry.

A grasp of ideas from LMPST is important in designing experiments, data collection, formulating and testing hypotheses, appraising competing theories, identifying the legitimate and illegitimate role of values in science, appreciating the ethical dimensions of scientific research and its technological applications, and much else in the daily practices of science and technology. LMPST materials need to be included in the education of scientists, and should also have a place in the education of non-scientists because they live in a world that is permeated with scientific ideas and technologies.

Scientists participate in a distinctive and unparalleled tradition of understanding the world and changing it; this scientific tradition, and its associated ‘habits of mind’ and ‘scientific attitudes’, are embodied in science’s logic, methodology, and philosophy. These habits and attitudes are often implicit; they need to be made explicit in science education so that scientists can develop their scientific skills and advance the tradition of which they are a part—a tradition that is frequently threatened by political, cultural, economic, and intellectual forces.

The study of LMPST provides students with tools of reasoning that remain relevant as scientific ideas grow and change. The pressure to include more and more scientific content in science education should not exclude the study of LMPST. At an elementary level, and with good teaching, these reasoning competencies can be acquired by children and they can be further developed in subsequent education. Most countries now require scientists, engineers, and science-based professionals to have had formal exposure to the ethical and value dimensions of science and technology. This should occur within the wider context of LMPST training for scientists and non-scientists alike.

Philosophy of science and technology is concerned with understanding and critically appraising science as a knowledge-creating enterprise and technology as an essential component of that enterprise. Philosophy of science seeks to understand the nature, roles, and limits of theories, models, hypotheses, experiments, instruments, and data. It studies the nature of scientific explanation, refutation, revolution and method, and the nature and limits of scientific knowledge in relation to wider social domains of human experience. For its part philosophy of technology is concerned with the nature of technical manipulation in science, both positively through improved instrumentation, communication, and laboratory control and negatively because of implicit biases and erroneous assumptions. It is also concerned with technology’s widespread social impact and asks what its biases and limits might be in structuring the pursuit of wider human goals.

Logic is the discipline that deals with the theory and practice of human and artificial reasoning. It extends from the formal study of human cognition to abstract mathematical logic and is central to

the study of the scientific method, the collection of procedures that scientists use in the pursuit and justification of scientific knowledge. A firm grasp of how we reason, judge, and conclude is a necessary foundation for philosophers who study scientific method and for the scientists who use it.

Methodology is the set of procedures that scientists use in the pursuit and justification of scientific knowledge. Philosophers have almost universally adopted the view that science yields knowledge because of its distinctive methods. There has been vigorous discussion and debate concerning what those methods are a discussion and debate to which scientists and statisticians have often made important contributions. Deductive logic, inductive reasoning, the method of conjecture and refutation, inference to the best explanation, analogical reasoning, probability reasoning, decision theory, and game theory have all been developed as tools for understanding the multi-faceted scientific enterprise. There also has been lively discussion of whether science is the unique source of human knowledge and if not, how it is related to other types of human knowledge and experience.

Studying the history of science and technology is also vitally important in science education. Our sister Division, the Division of History of Science and Technology, has made this point eloquently in its *Manchester Manifesto*, which we whole-heartedly endorse. Indeed, an integrated approach to the history and philosophy of science and technology has been shown to yield excellent results in science education. The IUHPST Teaching Commission, which serves both Divisions of our Union, has developed many useful resources for using history and philosophy of science and technology in science teaching. Its web site is very much worth consulting. Given the considerations just described, we the participants of the 15th International Congress of Logic, Methodology, and Philosophy of Science and Technology held in Helsinki, Finland in August 2015 declare that

(1) Education in logic, methodology and philosophy of science and technology, planned and facilitated by trained logicians and philosophers of science and technology, should be supported and financed regularly and continuously by state and private institutions to ensure that younger generations understand how logic, methodology, and philosophy of science are relevant to science and technology;

(2) Logic, methodology, and philosophy of science and technology should be integrated into the curricula of high schools, colleges, and universities. Local and national practices should guide this integration.

The DLMPST/IUHPST General Assembly
6 August 2015, Helsinki, Finland

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