

Contemporary Issues in Technology Education

Marc J. de Vries

Teaching about Technology

An Introduction to the Philosophy of
Technology for Non-philosophers

Second Edition

 Springer

Contemporary Issues in Technology Education

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Alister Jones

University of Waikato, Hamilton, New Zealand

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Marc J. de Vries
Technische Universiteit Delft
Delft, The Netherlands

Contemporary Issues in Technology Education
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Preface

Writing this book has been quite a challenge. Philosophy for many people as practical as teachers often has a reputation of being unpractical, difficult to understand, dull, and more of those not so positive connotations. Yet, it is my firm belief that teachers, at whichever level of education, could greatly benefit from philosophy. I had this experience myself when I became involved in the development of technology education as an example of teaching about technology at the primary and secondary level. It sometimes felt like one was inventing one's own school subject, and I strongly felt the need to search for a sound conceptual basis for that. Writings about the philosophy of technology helped me enormously to build up this basis for myself and communicate it to others. Whenever one wants to teach about something, it is necessary to be clear about what it is that one is teaching about. Philosophers are concerned in particular with questions like that, for example: what is this 'thing' called 'technology'. Thus I became connected to the philosophy of technology, and later on moved into this field fulltime. Still today I use the many opportunities to link philosophy and educational issues in my daily work. When having finished a philosophical study, I immediately start asking myself: what does this mean for teaching about technology? And most of the time, I find that this teaching can be improved by taking into account those philosophical considerations. With this book I hope I can enable others to have similar experiences. The challenge, though, was to present the philosophy of technology in such a way that it becomes fully accessible to non-philosophers. Those non-philosophers can be teacher educators who teach about technology to future teachers, or those who teach introductory courses about the philosophy of technology to students in engineering, either in colleges or universities. The book may even appeal to those who already teach about technology at the primary or secondary level. It may help them to become more aware of what it is that they teach about, and hopefully it will help them improve their teaching by means of the insights that philosophy of technology offers.

The title of this book is loosely related to other book titles. Carl Mitcham wrote an introduction to the philosophy of technology for philosophers under the title 'Thinking Through Technology'. Later, Joseph Pitt wrote his book on the philosophy

of technology under the title ‘Thinking About Technology’. My book is titled ‘Teaching About Technology’. To make a full circle someone should write a book titled ‘Teaching Through Technology’. That book, however, would not be about technology education, but about educational technology. As these two terms are often confused, I would like to emphasize here that my book deals with technology education not with educational technology (although in one chapter I pay explicit attention to the use of technology for teaching about technology).

The book ends with an annotated bibliography (Chap. 11), in which readers find the sources that I have used. To give the book a textbook character I have not included notes and references in the various chapters (except for Chap. 9). In most cases it is obvious in which book in the annotated bibliography the various quoted and discussed authors can be found; in cases where this is not obvious there was no source that I found accessible to an audience of non-philosophers, or the source was in a language different from English.

I am grateful to those people who read earlier versions of the text for this book. In particular, I want to thank Giacomo Romano and Krist Vaesen, Ph.D. students in our Eindhoven University of Technology Philosophy of Technology program (at least, that is what they were when they reviewed my draft texts). My thanks go to Lamber Royakkers, my long-term colleague in Eindhoven, who gave some useful advice for the chapter on ethics (Chap. 6). Thanks also to the staff of the technology teacher education program in Marseille, France, led by Jacques Ginesi , for the opportunity to try out the content of the book in a 3 day mini-course on the philosophy of technology that I conducted with them in Marseille in July 2004. That was truly a wonderful experience for me. I also want to thank the anonymous reviewer who read my text so carefully and gave some very useful comments.

I want to thank Bill Cobern for his efforts to get the book published as a worthy volume in the book series that is under his editorship. Finally, I want to thank Kluwer’s Michel Lokhorst, with whom I have now worked for several years on the International Journal of Technology and Design Education, and whom I have learnt to respect greatly, for his role in positioning the book in Kluwer’s (now: Springer’s) portfolio.

On the second edition:

It was a pleasant surprise to find out that in 2014, after ten years, chapters from this book were still frequently downloaded. For Springer, this justified a second edition and I happily used the opportunity to update the book and add a new chapter on concepts in technology and concept learning. I hope this will contribute to the book continuing to be used by teachers and teacher educators or whoever is interested in finding a philosophical basis for teaching about technology.

Delft, The Netherlands
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Marc J. de Vries

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Chapter 1

Philosophy of Technology: What and Why?

What do we mean by ‘philosophy’ of technology, and why would educators want to know about it? Those are the two questions that will be addressed in this introductory chapter.

The answers to these questions are by no means self-evident. The word ‘philosophy’ in the first question is used in different ways. A teacher could, for example, state that his or her ‘philosophy’ in dealing with classes is based on making humans do what they are good at. In that case the word ‘philosophy’ does not refer to a scientific discipline, but rather to a certain ‘approach’. If the word is used in that sense, there is often an interest to get to know this ‘philosophy’. If, however, we take ‘philosophy’ in the sense of a scientific discipline, it is certainly not to be taken for granted that educators would be interested in it. Educators tend to be concerned primarily with day-to-day and down-to-earth types of questions. Why would they take a book like this one other than for personal interests that are not directly related to their teaching profession?

The second question cannot be answered properly without having answered the first one. So let us first consider the meaning of the term ‘philosophy’ of technology. What is meant by that word in this book?

1.1 What Is Philosophy?

In general, philosophy is the scientific discipline that aims at systematic reflection on all aspects of reality. In philosophy we try to gain insight into the real nature of those aspects. We can do this by asking the following question: “what do you mean when you say ?” This can be called the *analytical function* of philosophy. Asking such a question can have a practical purpose. It can, for example, help us to get out of dead-ends in debates, in particular when these are caused by naïve use of terms. An example of such a dead-end is the following. For many years people have debated about the issue of whether or not technology can be properly called ‘applied

science'. Such debates were often frustrated because both for the 'technology is applied science' opinion, as well as for the opposite opinion, examples could easily be found. Seemingly there was a paradox: the 'technology is applied science' opinion could be supported by evidence and falsified by evidence at the same time. The example of the transistor could be used as evidence for the 'technology is applied science' claim, but at the same time the steam engine could be used to falsify it. However, the paradox appears to be a fake one only when one asks the question: what did we mean when we said 'science' and what did we mean when we said 'technology' in our debate? It is only then that we start realizing that the paradox is the result of our limited use of the terms. Thanks to that consideration, we are now aware that we have to be careful not to make too general claims about science and technology, because there are different types of sciences and different types of technologies. Because we used a particular type of science and technology to support one opinion and a different type of science and technology to support the other opinion, but failed to be explicit about the different use of the terms, we were not able to reach a consensus. The example illustrates how useful it can be to reflect carefully about what we mean by the words we use. This is where philosophy comes in to help us.

Apart from the analytical function of technology there is a *critical function* of technology. By using the proper language and concepts that were developed by means of the analytical function of philosophy, we can now reflect on things in such a way that we can make value judgments.

Because there are many aspects of reality, there are many 'philosophies'. In this book we will deal with philosophy of technology. That is a relatively young discipline compared to another 'philosophy' that deals with a related aspect of reality, the philosophy of science. In the philosophy of science one deals with questions such as: how does scientific knowledge emerge, what criteria do we use to determine whether or not we are prepared to reckon a certain activity to be 'scientific', what is a scientific theory and how does it relate to reality, what different types of sciences can be distinguished? A third example of a philosophy is the philosophy of mind. This type of philosophy focuses on various aspects of the mental aspect of reality. Some questions that are discussed in the philosophy of mind are: what do we mean by 'intentions', by 'desires', by 'beliefs', what do we mean by 'rationality', and how do intentions, beliefs and desires relate to one another in rational minds? As rationality plays a role in science, there are relationships between the philosophy of science and the philosophy of mind. Likewise, there are relationships with the philosophy of technology. That is evident when we realize that technology is not only a matter of our hands, but also of our minds. When in philosophy of mind literature we read about general concepts such as 'rationality' of 'agents' that have 'intentions' and 'desires', and by 'reasoning' about 'means-ends relationships' 'plan' their 'actions'; these are all concepts that play a role in technology too. Therefore, when in later chapters we study the various aspects of the philosophy of technology, we will come across such concepts again.

Within the discipline of philosophy several fields can be distinguished. Just as in physics we have solid-state physics, nuclear physics, optics, and mechanics

(classical and quantum); we can also identify different parts of philosophy, each with its own focus. Let us now see what the main fields in philosophy are that we will recognize when a survey of the philosophy of technology is presented in the remaining chapters of this book.

One field in philosophy is *ontology*. It deals with being, with what *is*, what *exists*. At first sight it may seem trivial to ask the question what do we mean when we say that something *exists*, and many people will wonder what the relevance of asking such a question might be. Yet, there can be situations in which the answer to this question does make a difference. For example, one could ask if technological products really have a systems nature or if this is just something that we have ‘invented’ to make sense of them. Ontology also asks for the *essence* of things. For example: what makes technology different from nature? When do we call something ‘technological’ or ‘artificial’, and when do we call it ‘natural’?

Epistemology is a second field in philosophy. It focuses on the nature of knowledge. What, for example, do we mean when we say that we ‘know’ that the moon circles around the earth? Or what do we mean when we say that we ‘know’ that the object in front of us is a CD player? In our time, knowledge is seen as an important issue in society. We often speak of a ‘knowledge economy’, and many people nowadays are interested in what is called ‘knowledge management’. What, then, do we mean when we use the term ‘knowledge’ in those expressions? In education, knowledge of course plays a vital role too. For a long time we have considered education to be the transfer of knowledge. Now our view on education is more varied. Knowledge is not always transferred, but sometimes has to ‘grow’ in individuals. Related to this field is the *philosophy of mind*, in which we reflect on how minds function and can have knowledge and other types of intentions.

In the third place we have *methodology* as a field in philosophy. Here confusion can easily arise. Methodology is often associated with methods. But that is only part of the truth. The word ‘methodology’ is composed of three Greek words. ‘Metha’ means ‘through’, ‘hodos’ means ‘way’ and ‘logos’ means ‘word’, but also can have the meaning of ‘study’. Literally methodology, or meth-hodo-logy, means: study of (logos) the way (hodos) through which (metha) something happens. When we think of ‘methods’, such a way is well paved and straightforward. But things do not always come about in such a well-organized manner. Often that way is crooked and rough. Methodology deals with all sorts of ways.

A fourth field in philosophy is *metaphysics*. Metaphysics deals with our vision of reality, and the way we try to make sense of reality. An important issue here is the question of the purposes of our activities. Reflections on purposes are called: *teleology*. This term is not to be confused with ‘theology’, which is a discipline in its own right. Teleology deals with aims and purposes. For what purpose, for example, do we live, work, play, eat, think, etcetera? The answers to such questions are usually closely related to one’s worldview. This worldview can be a religion, but it need not be so (hence we should be careful not to confuse teleology and theology). Of course teleology assumes that there are aims and purposes for life. For that reason lots of philosophers consider teleology to be a theory rather than a field of study in philosophy. For non-philosophers, though, the issues that are debated in teleology are

probably what they think of in the first place when they hear the word ‘philosophy’. It deals with very fundamental questions. For technology it means that we try to understand what drove – and drives – humans to develop and use technologies. Is it just a matter of survival? Or are there other possible motives for behaving like a ‘homo technicus’?

In the fifth place, there are *ethics* and *aesthetics* as fields in philosophy. They are taken together here because they both deal with the issue of values. Ethics is concerned with the issue of what is good to do and what should not be done. Ethics not only deals with specific ethical guidelines, such as those that have been derived from religions (and people sometimes shy away from because they fear indoctrination), it also deals with logical analyses of ethical dilemmas. *Logic* is a field in philosophy that plays a role in ethics, but also in the other fields of philosophy. It helps people make proper arguments when reasoning for or against certain decisions with ethical aspects. So ethics is both a field in which specific ethical opinions are discussed, and also provides logical tools for ethical reasoning. Aesthetics deals with values of beauty. What does it mean for something to have beauty? Here logic also plays a role. A popular saying is that beauty cannot be argued about. That suggests that reflecting on beauty is just a matter of feelings. But in philosophy it is more, and logic can be used to support rational reasoning about beauty as much as about other issues.

All of these fields can be recognized in the philosophy of technology. There is, for example, a growing amount of literature on the ‘ontology of technological artifacts’. In that literature philosophers try to get a grip with the nature of technological artifacts. When can we say that a certain object *is* a technological artifact? Teleology also features in the philosophy of technology. We can be interested in the question: for what different purposes human beings do technology. In this book, Chaps. 2, 3, 4, 5, and 6 will deal with each of these five fields in the philosophy of technology.

One more way of splitting up the whole field of philosophy into subsections is by dividing this field into analytical and Continental philosophy (Continental because most authors in this strand were German or French, while most of the ‘analytical’ authors were from the UK or the USA). Although nowadays these two philosophical streams are not as separated as they used to be in the past, and certainly the geographical terms like Continental are now inappropriate. However, many contemporary philosophers can still be recognized as belonging to one of these two. The difference between the two is roughly that in analytical philosophy the main aim is to conceptualize, and that continental philosophers are more interested in making value judgments about (aspects of) reality. Sometimes the same difference is described as philosophy of language on the one side (because conceptualization to a large extent has to do with the way we use language – words and expressions – to define concepts), and philosophy of culture on the other side (because the value judgments in most cases refer to developments in culture and the role technology has in that). In fact this means that the two functions of philosophy (the analytical and the critical) have been dealt with by separate streams in philosophy. Probably most people get to know the philosophy of technology by reading books in the