Design Matters, and so does Philosophy of Design
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Why bother about philosophy of design?

The theme of the 2003 DATA International Research Conference is 'Design Matters'. If there is one country in the world that has shown this to be true for design and technology education, it is the UK. Design has had a well established place in general technology education for many years. This is demonstrated in the names of this subject: 'Craft, Design and Technology', and more recently 'Design and Technology'. The particular emphasis on design becomes even more evident if one realises that internationally the name Technology Education is more common. This, of course, does not necessarily mean that in what is called 'Technology Education' design is always underestimated, but the fact that the word 'design' is an explicit element in the subject's name in UK practice is meaningful.

Many countries still struggle with the identity of Technology Education. Several of those countries have studied UK practice to find answers to questions about this identity. The uptake of design as a serious component in the Technology Education curriculum in countries such as the United States of America and the Netherlands, indisputably follows the example made by the UK. At the same time those countries have experienced that the mere uptake of design certainly does not solve all identity problems. Finding answers that appeal to both the public and policy makers is most certainly not easy. In several countries the position of Technology Education in the general school curriculum is contested. In many cases these threats are related to a lack of clarity about the reasons why Technology Education should be a distinct part of the curriculum, and this has to do with a lack of clarity about the identity of the subject. It will no doubt be shocking for the rest on the world to find out that even in the UK the position of D&T is no longer sacrosanct. In particular the position of Design and Technology in Key Stage 4 (upper secondary education) seems to diminish. What then is to be expected for countries with a less sound tradition in Technology Education. Some years ago in South Africa the position of Technology Education as a compulsory school subject was seriously threatened and more recently in the Netherlands a decision was made to integrate Technology Education into Science Education, just to mention two examples.

Such experiences illustrate the need to work on clarifying the identity of Technology Education and D&T. This, though, is not an easy matter as the situation is different from that of science, for example. Science educators have the possibility to study what goes on in the academic world to see what the basic principles of their subject area are. For technology educators this is much less clear. Is it sufficient to go to the various engineering disciplines? But do those offer broad concepts that can be used for a basis of a general education school subject? It seems not. What other options are there then? Here an answer can be: philosophy of technology. Philosophy particularly deals with questions such as 'What do you mean when you use the word . . .' (and 'technology' of course is the word that is to be inserted in the case of philosophy of technology, but also words like 'design', 'technological knowledge', 'technological competencies'). Although the philosophy of technology is a fairly young discipline there is a lot to be gained from it in terms of elements for a conceptual basis of the school subject Technology and hence for the building of the identity of that subject.

Areas in the philosophy of technology

An often quoted survey of the philosophy of technology by Carl Mitcham has shown that roughly speaking all research in this field can be described in terms of four areas, each of which relates to a subdomain in philosophy (although Mitcham himself does not refer to that relationship). Each of them can be linked to the conference theme 'Design matters' as follows:

1. Design matters, sure, but to what? To artefacts. They will be different thanks to design. In philosophy of technology the ontology of technological artefacts is studied intensively. Ontology is the subdomain of philosophy that deals with 'being'(what do we mean when we say that something 'is'?).
2. Design matters, sure, but why? How do you know? This brings us to the area of knowledge. In philosophy we have epistemology as a subdomain that deals with issues related to the nature of knowledge. In the philosophy of technology this is an area that gets increasing attention.
3. Design matters, sure, but for what purpose? Teleology is the subdomain in philosophy that asks about the aims and purposes of what we do and why we exist. Mitcham in his survey of the philosophy of technology refers to this area as that of 'volition'. Somehow human beings feel the need to behave as a being that behaves technologically and changes the environment according to his/her needs. Ethical issues are also addressed here.
4. Design matters, sure, but how? How can be design be practiced to make a

difference. This brings us into the realm of methodology as a subdomain in philosophy. A caveat should be made here. Methodology does not necessarily deal with well defined methods. Literally 'methodology' means 'study of the way through which . . .' something comes about (design in this case).

Each of these four areas will be described in some more detail now. The purpose of this description is just to give a first impression of what goes on currently in these subdomains of the philosophy of technology. This can help us to identify what issues needs to be addressed when we search for a clearer identity of our school subject Design and Technology, Technology Education or whatever it's name may be.

The ontology of technological artefacts

A recent way of reflecting on the nature of technological artefacts is by ascribing to them a dual nature. Artefacts have a physical nature (length, weight, colour, structure, geometry, etc.) and at the same time a functional nature (they are objects that allow us to use them for a specific purpose). In fact the purpose of design can be described as finding a right match between these two. In other words, designers seek for realising objects that have a physical nature that fits with the intended functional nature. But users in fact also deal with the relationship between the physical and the functional nature when they seek ways to use the artefact. For this reason in the ontology of artefacts we distinguish between the proper function (which is the one that the designer had in mind when designing the artefact) and accidental functions (other ways that users find to use the artefact). For a screwdriver the proper function is to turn screws, but many people will use it to open lids of tin cans (that is an accidental function). Good designers will not only take into account the proper function, but they will try to anticipate in what other ways people may use the product, if only to prevent that accidents may happen (this is a particular issue in the USA, where companies can be litigated for unexpected dangerous use of products). The concept function and the difference between proper and accidental function is certainly basic enough to deserve attention in education about design. This issue offers good opportunities for cross-curricular work, as the concept of function can be found also in biology. In that discipline functions of organs and limbs are used to explain the shape and position of those organs and limbs in bodies. The issue of functions is one of the issues that can be used to make clear that technology is different from science (in this case biology): in biology intentions play no role (there are no designers or users that have intentions from which desired function emanate), and therefore a distinction between proper and accidental function as made in technology is problematic.

The nature of technological knowledge

Technological knowledge is problematic in traditional epistemology. This is because traditional epistemology is mainly based on scientific knowledge. Here again we see an important difference between technology and science, which justifies a distinct place for technology in the school curriculum. In traditional epistemology knowledge is defined as justified true belief. In order for us to say that we 'know' that the moon turns around the earth, we will in the first place have to believe this (otherwise it makes no sense at all to say that we 'know' it), we must have found some sort of justification for that belief (we accept the fact that so many others believe it too and that 'experts' say and write it), and furthermore it has to be true (if at two o'clock we believe it is one o'clock and we found justification by taking a look at our watch that runs an hour behind, other will not accept when we say that we 'know' that it is one o'clock since it is not true). Objections have been made against this definition by making clear that the justification and truth of our beliefs may coincide only by accident. If we take a look at our – idle – watch and read two o'clock at two o'clock, it would not be appropriate to say that we 'know' that it is two o'clock even though we have 'justified and true' belief here.

But reflection on technological knowledge creates even more problems for the 'standard' definition of knowledge. Is truth always the decisive criterion for technological knowledge? Or could it rather be effectiveness. Civil engineers when designing a bridge realise that classical mechanics is not entirely appropriate for their bridge, but for practical reasons they prefer to use this rather than quantum mechanics. Evidently effectiveness prevails over truth. Furthermore, there is a normative component in technological knowledge that is not found in scientific knowledge nor in the 'standard' definition of knowledge. Technological knowledge comprises knowledge of functions and the relationship between physical aspects of an artefact (its physical nature) and the functions it should fulfil (the functional nature). Both result in propositions such as: 'I know that this is a good . . .'. In science such propositions cannot be made. Electrons are not good or bad, or in other words suitable or unsuitable. They are as they are, and that is it. Knowledge of technical norms and standards, knowledge of good technical practice all have this normative component that can not be assessed in terms of being true or nor true (norms can be effective or ineffective, but not true or untrue). So here we see that at least part of what we call technological knowledge is fundamentally different from scientific knowledge. Again this justifies a place for teaching about design in the curriculum, that is distinct from science.

Finally we can make a difference between knowing-that and knowing-how. According to Ryle, the key point that distinguishes these two is that knowing-that can and knowing-how cannot be expressed in terms of propositions. I cannot express in propositions how I ride my bike, even though I am quite experienced in doing it. This, no doubt, has consequences for teaching. Knowing-how cannot be expressed in propositions and therefore can not always be taught in the same way as knowing-that, in the teaching of which we often use the possibility to express this knowledge in terms of propositions. Knowing-how probably needs to be learnt be experience, by watching and doing.

Actors and their values

Design is done for purposes. There can be quite varied purposes for designing, depending who are involved in the designing, making and using the artefact. Various actors and actor groups can be identified each with their own interests. Designers will have to take into account a whole spectrum of such actors and actor groups that can have an influence during different phases of the artefact's lifecycle. This has led to the term 'lifecycle-orientated design'. When teaching about design, this should be taken into account. Pupils need to get some grasp of the complexity of design that is caused by the variety of actors and actor groups that need to be taken into account. In that respect education should follow industry. In the opening presentation of a conference on design methodology, Stephano Marzano, at that time the head of the Philips Design department, made a significant statement: 'we do not just sell products, we sell values'. Apparently values are highly valued in industry. But what values are valued? That and similar questions belong to the ethics of technology and of design. Educationalists often shy back from taking up ethical issues in their teaching, because they are afraid of possibly influencing the pupils. Yet, the fact that technological knowledge intrinsically has to do with norms (see the previous section) shows that teaching about technology cannot properly be done without paying attention to norms and values. Taking that seriously does not at all force us to influence. There are good opportunities to show to pupils the various options for tackling ethical problems and dilemma's, such as a utilitarian approach, in which cost/benefit thinking about the consequences of decisions are used, a virtue approach in which personal qualities such as responsibility towards employers and the environment are used, and a deontic approach in which rules and norms are used (such as in professional ethical codes for engineers). Besides that the importance of proper reasoning and logic for the consideration of ethical problems and dilemmas can be taught and learnt.

Design methodology

Reflection on design practice in terms of the 'how to do it' is already a fairly well established discipline for which the name design methodology is commonly used. One of the important outcomes of design methodological studies is that well defined methods only play a limited part in design practice. And when they are used, it should be kept well in mind that all those methods have in-built assumptions. In a situation in which these assumptions are not met, the use of the method may well be problematic, although at first sight the method seems to yield an outcome. Naïve use of that outcome has often led to frustrations, because it appeared to be wrong, and the method was then blamed although the user of the method was the main cause of the problems because (s)he did not realise that the method was used improperly. Such naïve use of methods most certainly is a serious danger in educational practice. Too easily cookbook descriptions of methods are taught as if they work regardless of what is designed and in what context it is designed. Here too philosophy of design/technology has important lessons for education.

Integration and co-operation in Technology Education

We have now seen the four main areas in the philosophy of technology. These areas can be used as inputs for building up a conceptual basis and an identity for Technology Education. But philosophers will not be able to do that on their own. We are dealing here with a school subject, for which there is more that matters than philosophy of design. The practice of teaching design in the context of a school subject should also be used as an input, as well as the issues around shaping the conditions for this teaching. That means that building up a conceptual basis and identity for our school subject, a close co-operation between teachers, researchers and other parties such as policy makers, teacher educators, industries, and of course parents and pupils, is needed. Researchers, both in philosophy and in education, need to present their outcomes in such a way that is becomes

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available for the other parties involved. Academic journals, such as the International Journal of Technology and Design Education, at the cradle of which John Eggleston stood, play a part in that. Such a journal also offers this opportunity in an international mode. A survey of seven volumes of this journal has indicated that conceptual issues, both theoretically and from in the perception of pupils and teachers, still have a modest place in the journal, but there is certainly something to be learnt from. Furthermore it has become evident that teachers are often not well served by this medium because of the jargon that is often found in research-based articles. Clearly there is ample opportunity for improvement here. At the same time it can be stated that other journals, such as DATA's Journal of Design and Technology Education. Modus, and Designing with their emphasis on school practice, are more appropriate media to address teachers' concerns, because researchers will need a journal such as the *International Journal of Technology and Design Education* anyway as an academic medium. Clearly there is place for both types of journals, each with their own audience. But in the end it must all come together somehow.

Finally I want to quote John Eggleston, to whose honour and memory this lecture was presented (from his last book '*Teaching and Learning Design and Technology*, 2000, page xxviii):

> 'Good teaching and good researching go hand in hand. The consequences are beneficial to all concerned – specially the students'. And were they not the ones that should be our ultimate concern?

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