Design and Technology Education: An International Journal
25.2

Book Review: Reflections on Technology for Educational Practitioners

Dakers, J. R., Hallström, J., & de Vries, M. J. (Eds.). (2019). *Reflections on Technology for Educational Practitioners*. Leiden: Brill | Sense. https://doi.org/10.1163/9789004405516

ISBN [Paperback] 978-90-04-40549-3
ISBN [Hardback] 978-90-04-40550-9
eISBN [Ebook] 978-90-04-40551-6

Reviewed by Nicolaas Blom, University of Limerick, Ireland

Introduction

Reflections on Technology for Educational Practitioners is a valuable addition to the growing body of knowledge for technology education. This book takes an in-depth look at the philosophy of technology, and how this could contribute to understanding of the very nature of technology, particularly in support of curriculum writers, teachers and researchers in the technology education community. The underlying assumption of this book is that the philosophy of technology has value for technology education. Each chapter is written by a prominent technology education figure who discusses a specific philosopher of technology and how their ideas could be incorporated by practitioners.

The structure of the fourteen chapters is similar. The author introduces the philosopher and gives a biographical sketch of the person and their work. This is followed by an overview of the contribution they made to the philosophy of technology, in terms of specific frameworks, concepts or approaches. Finally, each chapter ends with a section in which the authors describe the relevance of the philosophers' contribution to the technology education community. These contributions vary; some focus on the value of educational research from specific frameworks, while others are more practical and suggest topics and activities for the technology classroom. Some authors chose to focus on specific teaching strategies such as questioning and critiquing or specific knowledge types to include in a technology curriculum. Most of the chapters provide practical examples showing the incorporation of these philosophical views into practice, while others ask questions to stimulate individual reflection and the development of future action plans to redefine how technology education should be enacted.

Chapter overviews

Chapter 1 – Introduction

John Dakers, Jonas Hallström, Marc de Vries

In the introduction, the editors, Dakers, Hallström and de Vries explain the usefulness of the philosophy of technology for the technology education community and provide an overview of the analytical and continental traditions of philosophy, including the differences between them. The editors also identify some of the major themes that are addressed in each chapter, using Mitcham's (1994) typology of technology. The introductory chapter ends with short

descriptions of each chapter, giving some biographical information on each of the philosophers as discussed in the chapters.

Chapter 2: Carl Mitcham: Descriptions of Technology

Johan Svenningson

In his description of the work of Carl Mitcham, Svenningson describes the nature of Mitcham's thinking by detailing the four ways in which technology is manifested as knowledge, volition, activities and objects, thus outlining a conceptual framework of the different conceptualisations of technology. In demonstrating the usefulness of Mitcham's typology of technology for research in technology education, Svenningson designed and implemented a pilot study that was conducted in Sweden with 13 to 14 year old students, to explore students' descriptions of technology. In doing so, Svenningson developed the Mitcham score to classify the broadness of students' descriptions of technology. Svenningson found that by using Mitcham's typology and the Mitcham score, researchers and teachers could gain an overview of a class's technological awareness which may ameliorate the design of technology lessons.

Chapter 3: Peter Kroes and Anthonie Meijers: The Dual Nature of Artefacts

Marc de Vries

In the first part of the chapter, de Vries discusses the development of analytical philosophy, a benefit of which is to reduce complex issues to their basics. In light of this, the dual nature of technical artefacts, viz the physical and functional nature, is introduced and discussed as a way to reduce the complexity of technological artefacts. De Vries also demonstrates how such a view of artefacts has implications for our understanding of technological knowledge, technological design and the ethical and moral underpinnings of technology. In demonstrating the usefulness and relevance of Kroes and Meier's dual nature of artefacts framework, de Vries reports on three applications of this framework for the purposes of curriculum development, investigating teachers' understanding of artefacts and developing students' understanding of technology. De Vries ends off the chapter by emphasising the value of using analytical philosophy frameworks as they help to conceptualise the nature of reality at basic levels.

Chapter 4: Günter Rophohl: Supporting Technological Literacy for Future Citizenship

Vicky Compton

Compton starts the chapter by introducing Ropohl as a German philosopher of technology who held a systems view of technology. This view characterises his contributions to the philosophy of technology, which subsequently informed the conceptualization and development of the New Zealand Technology Education curriculum. In discussing Ropohl's work, Compton highlights four specific contributions Ropohl made to the philosophy of technology, namely, his description of the features of technology that distinguish it from science, his classification of the different types of technological knowledge, an analysis of artefacts as socio-technical systems, and the formulation of ethics and responsibilities of engineers. In outlining each of these contributions, Compton provides valuable insights to support each of these contributions' relevance for technology education. In the final part of the chapter, Compton outlines the

relationships between Ropohl's ideas and the embedded curriculum strands and components in the New Zealand Technology curriculum, and finalizes the chapter by reporting on the benefits of this approach for student learning.

Chapter 5 – Pierre Rabardel: Instrumented Activity and Theory of Instrument

Marjolaine Chatoney and Patrice Laisney

Chatoney and Laisney discuss the focus of Rabardel's philosophy in terms of the relationships between humans, technological objects and technical systems. In particular, they elaborate on Rabardel's theory of instrumental genesis and how this influences the cognitive development of humans. This provides a range of tools and concepts to analyse the nature of human beings' goal-directed behavior as they engage with technologies in specific contexts. Chatoney and Laisney demonstrate the usefulness of Rabardel's theory of instrumented action in analysing the way in which students designed a protective cover for a smartphone using instruments including digital and analogue drawings and a 3D printer. They conclude that Rabardel's philosophy allowed them to reveal the different ways in which students' goal-directed activities evolved as they interacted with different artefacts. Important results are discussed pertaining to the role of drawings, CAD and 3D printing during solution conceptualization.

Chapter 6: Gilbert Simondon: On the Mode of Existence of Technical Objects in Technology Education

John Dakers

In this chapter, Dakers discusses Simondon's concept of 'individuation' which refers to the processes that explain the coming into being of everything: material, organic, social and technical. These processes are viewed as phase shifts by Simondon and imply that technical objects go through many evolutions or phase shifts and thus do not exist in isolation, i.e. each phase carries the implication of a preceding phase. In terms of technology education, Dakers refers to Simondon's idea of 'genetic pedagogy', which requires that account be taken of the general evolution of artefacts with their components and the socio-technical contexts in which they developed, resulting in the artefacts we are familiar with today. Dakers is of the opinion that such an approach to technology education could eliminate reductive subject/object, academic/vocational and thought/action dualities and enable new ways of understanding how new technical objects may emerge from existing realities.

Dakers also reports on Simondon's ideas about the nature of the relations and the major and minor rapport between humans and technical artefacts. A minor aspect is related to technical knowledge and that which is implicit and even habitual. The major aspect, by contrast, involves reflection and self-awareness. Simondon likens this to the difference in knowledge between the apprentice and the engineer. Dakers agrees with Simondon that current Technology Education curricula deals predominantly with minor technics, while the major technics are often kept for the more able child and adult. Simondon sees information theory as the resolution of this dichotomy. Ending this chapter, Dakers draws together the significant threads of Simondon's philosophical stance by presenting a strategy for introducing learners to technologies, forming the basis of individuation. Ultimately, it is hoped that the craftsman and the engineer can be reconciled through a milieu that emphasizes that which is human and democratic.

Chapter 7 Bernard Stiegler: On the Origin of the Relationship between Technology and Humans

John Dakers

In this chapter, Dakers explores Stiegler's ideas on the co-evolutionary processes that are involved between humans and technology. In contrast to philosophers such as Rousseau and Spengler, Stiegler did not believe that humans were born as 'complete' beings, but only in their interactions with technology did they develop the ability to walk upright, grasp objects and communicate, which led to the development of their psychomotor, intellectual and inventive capacities. In this way, as humans invent their technology, the technology invents the human. Dakers is of the opinion that the ideas of these co-evolutionary processes are lacking in current technology education curricula. Dakers argues that, instead of focusing on the development of technological literacy, technology education emphasises the craft-oriented aspects of technology. The chapter ends with Dakers advocating for education about technology, specifically understanding the human-technology relationship and the effect thereof on human life.

Chapter 8 Bruno Latour: Actor Network Theory

John Dakers

In this chapter, Dakers discusses Latour's Actor Network Theory (ANT) in order to present an alternative way of conceptualizing pedagogy and curriculum design in technology education. The first part of the chapter is dedicated to the exploration of such terms as 'actors', 'agency', and networks and how these concepts build on the previous work of Simondon and Stiegler. The second part of the chapter uses the concepts from ANT to look at current challenges in technology education, with the aim of reconceptualising teaching and learning in technology education. Although Dakers acknowledges that ANT does not provide guidelines for pedagogy or curriculum design, he does propose that the activity of curriculum design should be re-evaluated. Less emphasis should be placed on writing universal, prescriptive plans, allowing emergent learning to occur as actors in a technology classroom interact with each other. In this way, lesson planning should be seen as more open-ended, involving writing lesson guides as opposed to prescriptive lesson plans. Dakers also identifies an opportunity for researchers to use ANT as a framework to investigate new models for the delivery of technology education.

Chapter 9: Andrew Feenberg: Implications of Critical Theory for Technology Education

Piet Ankiewicz

In Chapter 9, Ankiewicz discusses Andrew Feenberg's critical theory of technology. In particular, he describes Feenberg's instrumentalization theory as an important contribution to the philosophy of technology. Instrumentalization theory allows philosophers to analyse artefacts on two levels. On one level, artefacts can be analysed in terms of their technical elements, devoid of any use context (primary instrumentalization), and on the other level, artefacts could be analyzed in terms of the secondary instrumentalization. Secondary instrumentalization refers to the causal interconnections between the technical components themselves and the artefact's links with the social and natural environment (systemization), as well as the various

social constraints under which technical artefacts may be integrated into society (mediations). In this way, society has some input into the design of technology. It is this input in which human beings may have some control over technological development. In discussing the implications of Feenberg's philosophy for technology education, Ankiewicz highlights the need for emphasizing values, based on Feenberg's notion of technical codes. Doing this could help develop students' ability to justify their design and manufacturing choices in terms of their personal and societal values.

Chapter 10 Langdon Winner: A Call for a Critical Philosophy of Technology

Cecilia Axell

This chapter by Axell continues to emphasise the importance of developing a critical philosophy of technology. In providing an overview of Winner's critical philosophy of technology, Axell highlights Winners' notion of technologies as forms of life and the fact that artefacts are value-laden and in most cases, embody political aspects. Axell highlights Winners' descriptions of the difference between democratic and authoritarian technics, with the view to advocate for decentralized and democratic politics of technology. In this way, power is distributed to not only expert designers and people in power, but also to non-designers who should be able to take part in decision making and have informed opinions about the social, cultural, political, natural and market contexts in which technologies develop. At the heart of democratic technics lies the idea that technologies should be more accessible, comprehensible and controllable. Axell establishes the relevance of Winners' contribution to the philosophy of technology by outlining the foundations of a critical pedagogy of technology education. In such a pedagogy, the importance of developing critical thinking beyond what happens in design and make activities is stressed. To this end, Winners' idea of forms of life should be used to facilitate learners' attention to the potential benefits and risks of past, present and future technologies with a specific focus on the winners and losers from multiple perspectives.

Chapter 11: Kevin Kelly: Technology Education for the Technium

David Barlex

In this chapter, Barlex explores Kevin Kelly's idea of technology as a conglomeration of individual technologies, linked together in an overall system called the 'technium'. How the technium develops is depended on three forces, namely pre-ordained development, the influence of technological history and society's free will. Barlex explores Kelly's view in noting that these forces actually restrict the influence that humans can have on technological developments. Specifically, Barlex identifies a limitation in Kelly's writings in that they do not account for the role of capitalism in technological developments and that humans only really have an influence at the beginning of technological developments. In relating Kelly's ideas of technology to technology education, Barlex emphasizes the need for developing students' technological perspectives and uses the 'tetrahedron approach' to demonstrate how teachers could incorporate Kelly's ideas into their technology lessons. In demonstrating such a lesson practically, Barlex use the 'wicked' problem of sustainable transport and the development of autonomous electrical vehicles as a context to develop both students' technological perspectives and their technological capability. Using Kelly's work, Barlex claims that a more

equitable balance between technological perspectives and technological capability in the technology curriculum could be restored.

Chapter 12 Don Ihde: Praxis Philosophies and Design and Technology Education

Steve Keirl

Before discussing Idhe's contributions to the philosophy of technology, Keirl gives an overview of the philosophical landscape underpinning Idhe's contributions. Concepts such as post-phenomenology, pragmatism, hermeneutics, intentionality and life world are explained in detail, which provides a bridge for the reader to understand Idhe's writings. Keirl then outlines some of Idhe's areas of foci, including technology-science relations, technology and the life world, technology relations and 'Our life world', cultural hermeneutics, the designer fallacy, bodies in technology and the notion of posthumanity. All of these foci reveal insight and different perspectives of human-technology-society-environment interactions, which could augment and enrich how we approach the development of technological literacy in education. Before relating Idhe's work to technology education, Keirl reflects on the current challenges faced by the education system in general, specifically the current 'western-style' of education where knowledge is seen as identifiable, quantifiable, teachable and assessable and the purpose of education is related to capitalist values. In order to envisage the realisation of Idhe's technological world in classrooms, Keirl foregrounds the concept of technological literacy and proposes three ways in which this could happen as well as some of the immediate advantages for curriculum and pedagogy. Keirl finishes the chapter by challenging the technology education community to find ways in which we could educate students about technology's roles in our lifeworlds by using Idhe's work.

Chapter 13: Albert Borgmann: The Device Paradigm

John Dakers and Marc de Vries

Dakers and de Vries start the chapter by providing a brief overview of dystopian philosophers of technology, in particular Borgmann, who expresses concern about the interrelationship between humans, technology and the natural environment. Dakers and de Vries believe that reflecting on these views is valuable for technology education as it could afford a balanced approach toward the development of technological literacy. Dakers and de Vries report on two of Borgmann's contributions, namely his notion of the device paradigm, and his theory of focal things and practices. Essentially, the device paradigm refers to the way technologies commodify activities, causing disembodied and disengaged human beings, while focal things and practices refer to activities that lead to deeper and meaningful engagements with society and the environment. Relating Borgmann's contribution to technology education, Dakers and de Vries recommend that Borgmann's theory of focal things and practices be used as a structure to guide explorations, debates and discussions on how technologies can better enhance contemporary life by designing a more meaningful future, while critiquing the activities that make society disconnected.

Chapter 14: Clive Staples Lewis: Social, Environmental and Biomedical Implications of Technology

Jonas Hallström

In the final chapter, Hallström explores the implications of The Abolition of Man, by C.S Lewis, for the philosophy of technology. Hallström identifies three themes in Lewis' work, namely his views on social, environmental and biomedical effects of technology. Importantly, he notes that Lewis' work goes beyond the usual critiques of technology, by including reflections on human and moral dimensions underpinning the effects of technology. Hallström points out that the implications of Lewis' work for technology are two-fold: teachers should focus on the connections and interactions between social and environmental issues when talking about the implications of technology, and teachers should engage students in ethical questioning and critiquing of future scenarios.

Strengths and weaknesses

The authors frequently allude to the interconnectedness between the concepts and ideas of the different philosophers in their respective chapters. While some of the chapters are written with density that does not make for easy reading, as a general rule the book is lucid and accessible. Although some authors refer to the usefulness of the philosophies that are discussed in this book, this book would particularly appeal to the academic.

While I appreciate the emphasis on the relationship between technology, society and the natural environment in Chapters 5 to 14, I do however miss a nod in the direction of philosophies related to graphicacy, the nature of modelling and design methodology. This might be the subject of future volumes. It might also be interesting to explore Eastern and African philosophies of technology in future volumes.

Despite infrequent technical errors, this book demonstrates an erudition and deep insight into philosophies that are pivotal for enriching technology education practices. I look forward with anticipation to future volumes that will continue in the standard of excellence established in this book.

Overall conclusion

In conclusion, the book contains a wealth of insights from the philosophy of technology that could augment and enrich practitioners' views of technology education. *Reflections on Technology for Educational Practitioners* is a valuable resource for those interested in exploring the theoretical underpinnings of technology education, and can offer new ways for practitioners to think about how they teach, write or conduct research into technology and technology education. This book provides useful and timely questions, guidelines and reflections on the philosophy of technology and its role in enhancing technology education practices.