Chapter 1
Ethics in Contemporary Science Education Research

Kathrin Otrel-Cass, Maria Andrée, and Minjung Ryu

1.1 Introduction

Is there really a need for another book that discusses research ethics? Is there in fact a need to write about research ethics specific to science education researchers? Are there ethics considerations that go beyond those of educational researcher in general?

We think there is. The science education research community has greatly contributed to the growing understanding on how subject specific learning and teaching can be improved or on what is taking place already in order to highlight and unpack good practices. We have gained significant and detailed insights into what makes science difficult to learn and why we should consider that science practices represent very specific cultural practices that are not necessarily open to all. What makes science education research also unique is that the subject itself is of political interest. Together with mathematics and engineering education, science is often described as one of the subjects that can ensure a nation's economic well-being and international competitiveness in the future. Beyond 2000 (Millar and Osborne 1998), or the Relevance of Science Education study (Schreiner and Sjøberg 2004), AAAS's (American Association for the Advancement of Science) Project 2061 (AAAS 1993), as well as Osborne and Dillon's critical reflections on science education in Europe (Osborne and Dillon 2008) are just a few examples that emphasize the importance of science education for the nation's prosperity and security.

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Not surprisingly, therefore, that research funding from a variety of funding bodies is available for science education research. While funding drives the proliferation of knowledge production through research to some degree, neoliberal realities that many universities face these days mean that securing funding becomes a necessity to pursue for most researchers (Leathwood and Read 2013). The neoliberal realities also mean that researchers are under pressure to produce knowledge at a fast pace, which may reduce the availability of time to reflect on the various nuances in their research practices. This research context inevitably has an impact on research ethics and requires careful ethical reflection and deliberation both at the individual level and at the community level.

What we hope to achieve with this book is to remind our fellow science education researchers of the ethical responsibilities to take care of the communities that we study and unmask traditional arguments and approaches. What warrants this conversation about research ethics, despite the plethora of existing resources for maintaining research ethics, is the changing condition of science education research that affects research practices in unique ways. Those changes may be of a technological nature, for instance through the possibilities to digitally capture data. New kinds of ethical questions that could arise here have to do with how we deal with and address the 'datafication' of our participants' lives. Changing conditions of science education also include new insights gained from different, but related, fields of study, for example neuroscience research. On one hand, the insights we have gained through years of research in these fields by themselves are changing conditions because such new insights require us to revisit our assumptions and approaches to teaching and learning science. On the other hand, we need to consider how those fields differ from science education research in the way in which researchers make sense of the information i.e. data and the potential benefits and risks such information presents to the knowledge production processes and arguments used in science education. We may also need to reconsider guidelines on ethical practices, when mobile technology that easily captures and distributes written and visual accounts of our research can also easily distribute participants' information without our knowledge (for example when our audiences take photos away from the presentations we give. A question we need to ask is how realistic it is when researchers claim (and most likely try) to ensure participants' anonymity and confidentiality of data or whether we fall foul of looking away. Even when we are withholding names, currently available technologies that allow for face or voice recognition are becoming smarter and are or will be equipped with cognitive powers that can self-operate without being prompted by human actors (Hayles 2017). In this technological context, the protection of anonymity and confidentiality faces new challenges. Pereira et al. (2014) pick up on what it means to think about 'the right to be forgotten' in the digital age (brought to the fore through a law introduced first by the European Commission in 2012). The authors emphasise that "the fragmentation of personal information dispersed across different web platforms creates vulnerabilities for our identity and other aspects of what constitutes our personality" (p.3). Data that is collected and utilised for science education research may have been digitally

harvested, refabricated and reorganized, to be presented in online publications where others may capture and take away digital snapshots of people's presented identities.

The intention of this book is to reflect on contemporary challenges in science education under these changing conditions to initiate a renewed conversation in what ways we should and can adjust and refine our research practices in order to ethically move science education research forward. In the following sections, we turn to some key issues that we believe need our attention and that have been picked up in individual chapters of this book in a variety of ways: the nature of regulatory frameworks that shape our research practices; the need to develop a community responsibility in order to advance our ethical practices further; new methodological frameworks that influence our research ethics, with a special focus on visual methodologies; and particular ethical challenges relevant to science education. Finally, we conclude with an overview of the contributions to this book.

1.2 Ethical Regulations as a Minimum

Science education research involves by and large the study of people (often young and vulnerable people) and their practices in one way or another. Researchers working within this kind of humanities and social science research follow guidelines and frameworks that are often set by country specific ethics committees and shaped by research codes of conducts. Examples of regulatory frameworks across the world include the Canadian Tri-Council (https://research.ucalgary.ca/conduct-research/funding/apply-grants/external-grants/tri-council), the Australian Research Council (https://www.arc.gov.au/policies-strategies/policy/codes-and-guidelines), the European Commission (https://ec.europa.eu/research/swafs/index.cfm?pg=policy&lib=ethics), the Research Council of Norway and its National Committee for Research Ethics in the Social Sciences and Humanities (NESH 2016), the UK's NHS National Research Ethics Service (https://www.hra.nhs.uk/about-us/committees-and-services/res-and-recs/) and the Research Ethics Framework (2015) of the ESRC (Economic and Social Research Council) General Guidelines (https://esrc.ukri.org/files/funding/guidance-for-applicants/esrc-framework-for-research-ethics-2015/), the Forum for Ethical Review Committees in Asia and the Western Pacific (FERCAP, http://www.fercap-sidcer.org/index.php), or the United States' Protection of Human Subjects ("Common Rule." Title 45 Code of Federal Regulations Part 46, https://www.hhs.gov/ohrp/regulations-and-policy/regulations/common-rule/index.html). In the national contexts where the three editors work (Denmark/Austria, Sweden, and USA), there are varying requirements for the review of human subject research procedures prior to the onset of any research activity. Such regulations are commonly set by governmental bodies. These guidelines safeguard those who are studied while making researchers reflect on not only who can be researched and in what ways but also what is good, fair and right to be researched. In particular, these guidelines apply when conducting research to obtain

data through intervention or interaction with the individuals (e.g., use of a newly designed curriculum, teacher professional development) or collect identifiable private information (e.g., surveys).

Unsurprisingly, there are numerous books and chapters devoted to 'dealing with research ethics', because designing and conducting ethical research is crucial for a successful research study and, therefore, emerging researchers must learn about guidelines for research ethics and how to obtain an ethics review approval. However, such guidelines commonly constitute a regulated *minimum* of ethical consideration and may not necessarily consider the research methodologies used and the research topics dealt with in science education research. Regulations and ethical guidelines were traditionally developed from medical research ethics frameworks with the aim to mediate consideration of all risks to research subjects before the research is conducted (see the chapter prepared by Allison and Vogt 2020). This has had consequences in terms of the heavy emphasis on informed consent at the onset of data collection and participants' privacy in the pursuit of ethical consideration (Howe and Moses 1999). Science education research that is often qualitative and interpretive, and employs methodologies such as ethnography, case studies, interviews, or video based research that involve interactions with research participants are somewhat different from those methods used in medical research. The interactions with research participants in such methodologies range from talking with participants in a one-on-one interview setting to sustained interactions over longer periods of time aiming at the emancipation of teachers or students. The types of methodologies and types of interactions call for the development of a set of research ethical considerations that ensure researchers' responsibility and responsiveness within their research contexts and methodologies, which inevitably are different from those in medical research.

1.3 A Community Responsibility

Modern academic culture, which is shaped by a global neoliberal context, encourages (or even requires) many university-bound researchers to be productive in terms of publication rates (Luka et al. 2015). Productivity often equates with how fast and how many articles are published in peer-reviewed journals and how many research projects an individual has managed to secure external funding for. This academic culture appears to put individual researchers in a bubble that may obscure researchers' values of pursuing research with participants, various communities, and society at large in order to take collective responsibility as a research community. This means that we as a community of researchers should place more value on establishing and participating in joint conversations on how such conditions shape the ethical practices in science education research.

If we do not challenge our existing practices, we are likely to turn a collective blind eye on questionable practices. In a recent study the Norwegian ethical board (https://www.etikkom.no/en/news/news-archive/2019/40-percent-of-researchers-have-committed-a-qrp) published results from a survey showing that up to 40% of

Norwegian researchers have self-reported some forms of questionable research practices. Amongst issues reported by the researchers were that they have failed to inform stakeholders of their research projects about the limitations in the data analysis as well as having been influenced by the desires of funding bodies when designing their studies. In other words, there should be a critical need for science education researchers to engage in collective reflection on ethics and the challenges of acting with ethical responsibility and responsiveness.

As a community we need to think about modern day research realities that position us in a challenging context wherein, for instance, particular research topics or methods are preferred over others, and speed and number of publications are used as the sole measure of productivity. We need to consider how we can address such challenges and in what directions we should head. With this book we aim to engage in a conversation with the community of science education researchers so we can move from considering a mere compliance with governmental regulations as being ethical to collectively developing and sharing experiences and tools for reflection within the science education community. While the broad community of science education researchers may not all share the same ontological and epistemological assumptions, we believe that we, as a community, can and should focus on shared values and ethics and their implications for research practices despite such differences.

1.4 Methodological Reflections and the Need to Consider Ethical Implications

In science education research, theories and methodologies are continually evolving, which contributes to the emergence of new insights; this also creates tensions with respect to how research should be conducted. For example, in recent years there has been interest in theories such as new materialism (Milne and Scantlebury 2019) or actor-network theory and postphenomenology (Roehl 2012). The question is, whether theories that explore how students and teachers are affected (for example emotionally) by their interactions with materials require differentiated ways to research, especially since materials are seen here as actors that are put 'en par' with people. Another aspect is a push for collaborative relationships between researchers, science teachers, and students that seek to build relationships of trust. Participants in such kind or research are not seen as data sources and imply an entanglement of the hopes and wishes by both researchers and research participants. In this light it may be necessary to think about ontological questions concerning whether we should be referring to our participants as research *subjects* since even wording implies particular research assumptions and approaches.

Participatory methodologies and action research in science education can involve questions of authority and knowledge ownership and how we deal with relations between the involved actors. Since science education research often involves young people and their experiences, researchers, who are often positioned with authority

and considered as more knowledgeable than their young research participants, are faced with challenges of seeking ways to include young participants' perspectives throughout all stages of research, from the formulation of research to dissemination of findings (Harcourt and Sargeant 2011). Furthermore, while it is important to ensure participants' anonymity and confidentiality of data, we want to pose questions on how to ethically work with participants, such as young learners or teachers who could become co-researchers and co-creators of what can be witnessed in the research settings, especially in participatory research.

1.4.1 Visual Data as an Example of How New Tools Create New Ethical Challenges

With the increase of more sophisticated data collection tools and analysis methods, the conditions for conducting ethical research have changed and call researchers to review again their accountability towards research participants (Levinson 2010). For instance, the emergence of the internet and the abundance of information that is made available (for example through blogs, social media, photos and videos, etc.) raise questions on participant recruitment practices and informed consent models, including participant expectations how they or those they representing may be benefiting from the proposed research. A particular interest is also the rise in visual data that is being collected to produce research that goes beyond the study of talk, that considers how teachers and their students interact with materials, display their emotions, or experience their learning environments, that are all factors that shape teaching and learning (Ritchie et al. 2013). This kind of research requires that researchers capture and study teachers and students' interactions in detail during the moments of teaching and learning. Facial expressions that give insight into how someone reacted to a given situation are difficult to share and discuss in text-only, traditional publication format. Sharing video data or images, however, means that people's identities may be revealed even if their names are not made public (for instance through the use of Facebook's algorithm *DeepFace* that allows for facial recognition). The speed at which facial recognition software develops suggests that in the near future such software may identify the identity of individuals at the click of a mouse. In this context, we may ask whether existing guidelines that are provided for research are keeping up with the modern realities of the visual presence of individuals in digital spaces.

1.5 The Particular Ethical Research Challenges for Science Education

All human endeavors involve values and the production and reproduction of values, and so does science education. The organized traditions of researching science teaching and learning have contributed to, and have been influenced by, particular

methods, traditions and rituals. The philosophy and culture of science is shaped by 'logos' (Greek for the search for objectivity, facts and reason), and this is traditionally in conflict with the contentious nature of many areas and cultures of social science studies, including the cultures of science education research. A prominent example is the continuing discussion surrounding the conflict between science and religion. Contemporary issues that arise in discussions of climate change have much to do with the practices and the insights gained through science and our understanding about it. School science education has the possibility to contribute to dealing with potential conflicts i.e. by learning how to engage in informed discussions that may have the potential to identify conflict resolutions that are critical to the survival of our societies (Muralidhar 2019).

Science education has to deal with questions of epistemology and values since epistemological assumptions are a matter of ethical responsibility that afford and/or constrain our responsiveness to science issues. However, there is no 'correct' or 'absolute' way to look at the epistemological foundations of science education in reality and how this may shape our subjectivities. Subjectivities on that matter are important since they help us to ask whether science education as well as the research on its practices have to do with politics, neo-liberalism, sexuality or other categories that constitute our social order (Bazzul 2016).

We believe that attention needs to be paid to the kind of discourses and practices that produce certain ways of 'being', that does not exclude science education practices or the research around it. Limitations and affordances around our research practices that are delineated by discourses and the repetition of practices shape our perspectives of the phenomena we take an interest in. So, it seems important to spend more time on developing how researchers are constituted in and through their ethical research practices since this is still not discussed in-depth.

1.6 Outline of the Book

This book is organized into two parts: Part one is entitled *Challenging existing norms and practices* and part two *Epistemological considerations for ethical science education research*. Each part includes a number of contributions to the thematic focus and is rounded of by a reflection chapter where the authors departed from the points made in the previous chapters to present their own insights.

In *Challenging existing norms and practices* the discussions of the contributing authors are focusing on questions like: What are the conditions of knowledge that shape ethical decision making? Where is this kind of knowledge coming from? How is this knowledge structured, and where are the limitations? How can we justify our beliefs concerning our ethical research actions? As well as the issues that have to do with the creation and dissemination of knowledge through research approaches in science education. In reflecting upon methodological considerations fundamentally philosophical questions of the relevance of research ethics are raised by Antje Gimmler in chapter 2 (Gimmler 2020). Questions are also raised concerning the

range and varieties of methodological practices of research in science education from historically oriented science education research in chapter 3 by Allison and Vogt (2020), to ethnographies of education in chapter 4 by Minjung Ryu (2020) and in particular the values and knowledge at stake in researching educational practices in chapter 5 by Johansen and Anker (2020), how these values and norms are entangled with the science content and how this becomes visible when dealing with contentious contents such as in sexuality education in chapter 6 by Orlander and Lundegård (2020). The first part of the book concludes with the commentary chapter 7 by Jaume Ametller (2020), who, prompted by the previous chapters, reflects on how to engage with the political and onto-epistemological ideas related to the ethical challenges we face in science education research.

In *Epistomological considerations for ethical science education research* the discussions of the contributing authors are centered around the norms and practices of conducting science education research in regard to methods, validity and scope. In chapter 8, Andrée et al. (2020) examine the symmetry of relations in science education research contrasting ontological with epistemological and methodological values to reflect on research practices. Adams and Siry (2020) examine in chapter 9 the Athenticity Criteria first described by Guba and Lincoln (1989) and reflect on how this supporting their science education research to be transformative and authentic. Scantlebury and Milne (2020) explain in chapter 10 what the ethical consequences the adoption of a post-humanist approach after Karen Barad mean. The chapter describes that this theoretical approach identifies human action as being emergent to allow researchers to identify material-discursive practices. In chapter 11 Jaakko Hilppö and Stevens (2020) zoom in on science education research that utilises video recording to allow for the capture of students' voices to make them agents of their own practices. Focusing on material ethics Kathrin Otrel-Cass (2020) argues that the practice of conducting research ethically is an ongoing practice that is difficult to imagine in its full spectrum a priori, but requires ongoing reflections and communications between researchers and their participants. The second commentary chapter that concludes the book is written by Martin Riopel (2020) and acknowledges a shift of focus in the chapters from macro-level considerations to micro-level considerations. In this closing chapter, Riopel argues that this can be interpreted primarily as a sign of maturity in the field but also as an alignment with some of the challenges of the current society.

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