

## *Epilogues*





# From the Present towards Hope for the Future

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## Abstract

In this epilogue we elaborate on and synthesise what we have learnt from reading this book. We start by considering what the word “apply” in *Applying Critical Mathematics Education* might mean. Apply connotes to put into action, but it is also related to the following ideas: to work hard at, to pay close attention to, to have relevance for and to request something. In the context of our readings we think of being relational and dedicated as a matter of enhancing situated critical awareness, addressing relevant issues as a matter of highlighting complex global and local challenges and making demands as a matter of agency and power. To us, these themes together synthesise the insights on critical mathematics education in action that the authors of this book offer; namely, propositions on how to illuminate and execute social justice and heterogenous subjectification by critically entangling local and global knowledges in contextually situated educational enactments that hold the potential to address complex challenges. We close by sharing our ideas on how the contribution of this book gives us hope for the future in these times of crises and complex challenges.

## Keywords

critical mathematics education – hope – complex challenges – critical awareness – subjectification



The title of this volume is *Applying Critical Mathematics Education*. Initially, we thought of applying as “putting into action.” We considered the notion of action and its connectedness to hope for the future. If there is no future, there is no notion of action: we act because we have hopes for tomorrow. The relationship between hope and action raises questions about what kinds of acts and, perhaps, hopes the word “apply” connotes. As emergent writers and speakers of academic English, we sometimes turn to thesauri to grasp embedded meanings in English words. We looked up the word “apply” and learned that apart

from “putting into action,” it is also related to the following ideas: to work hard at, to pay close attention to, to have relevance for and to request something (Cambridge Dictionary Online, n.d.). Hence, applying critical mathematics education may imply acting by being relational and dedicated, by addressing relevant issues and by making demands. Drawing on our understanding of the meaning of “apply,” therefore, we think of being relational and dedicated as a matter of enhancing *situated critical awareness*. We think of addressing relevant issues as a matter of highlighting *complex global and local challenges*. We think of making demands as a matter of *agency and power*. Hence, we have organised our text in three main parts according to this logic. In doing so, we connect the ideas and concepts brought forward in the book to unpack the lessons we learned from our reading and the hopes that our reading gave us. In the last part of this epilogue, we direct our gaze at future concerns for critical mathematics education in the context of issues that we, Ulrika and Lisa, have at heart. We follow Andersson and Wagner (this volume) who suggested synthesising critical mathematics education and ethnomathematics. Hence, when we write critical mathematics education, we refer to their synthesised meaning.

## 1 Situated Critical Awareness

A culturally situated critical mathematics education rejects the myth of mathematics as culture-free and neutral and contributes to fostering active participation in societal and political life. Situated critical awareness emphasises students’ local contexts, power relations in the classroom, and mathematics as social and cultural activities that may serve as tools for or objects of critique (Andersson & Wagner, this volume). In other words, situated critical awareness enmeshes the critical use of mathematics with critique of mathematics, while simultaneously recognising that the two activities are contextual.

### 1.1 *To Apply: Acting by Being Dedicated to the Critical Means to Care about Justice*

To understand what it means to use mathematics critically in different situations students must learn how to “walk the walk and talk the talk.” But they must also learn how to be critical of how the walk operates: what mathematics does or does not influence and in what way it is influential. And they must learn to be critical of what the talk lets you know or not know or experience in different situations. This can mean giving underprivileged groups of students access to successful participation in dominant mathematics and mathematics education practices. Access to dominant mathematics is a prerequisite

for understanding how mathematics is used in the argumentation of dominant societal structures. Hence, access to dominant mathematics is needed to develop critical awareness (Barwell & Hauge, this volume).

However, mere access to dominant mathematics does not necessarily foster critical awareness (Ryan, Andersson & Chronaki, this volume; Steffensen, Herheim & Rangnes, this volume). It is, therefore, urgent to act by facilitating opportunities for students to challenge how dominant mathematics operates in their lives, in their communities and in society in general. Such challenges are not only about the facts of, for example, the unjust distribution of resources or of climate change, but also involve critically recognising and problematising personal affective and embodied experiences with mathematics (Lunney Borden, this volume; le Roux & Rughubar-Reddy, this volume).

### 1.2 *To Apply: Acting by Being Dedicated to the Relational Means for Dealing with Dominant Eurocentric Mathematics Values*

A culturally situated mathematics education has the potential to decolonise education and transform researchers' approaches. For instance, learning about and with community knowledge can result in displacements in pedagogical approaches from Eurocentric values and beliefs towards more culturally situated approaches (Lunney Borden, this volume). Furthermore, a decolonising stand is not a matter of either/or knowledge and values, but encompasses both/and views that shape conceptual interconnections (Ryan & Parra, 2019). Adopting such educational approaches involves "a complex interplay of the categories inside/outside (of Indigenous social, cultural and political spaces), that are not conceived of as mutually excluding but as nested and in implicated in a continuous, mutual reshaping" (Parra & Valero, this volume). Decolonising pedagogical stances need not be a matter of replacing one hegemony with another. Instead, by adopting educational approaches that strengthen cultural identity and authority over education, and that value both community and dominant mathematics, universalised de-rooted subjectification may be escaped. Adopting such an approach addresses concerns that go beyond Indigenous contexts, as, for example, Le Roux and Rughubar-Reddy (this volume) have demonstrated.

## 2 Complex Global and Local Challenges

Climate change and obesity as a global pandemic are complex or "wicked" problems. They are characterised by the urgent need for action, a vague problem-formulation, a lack of well-described solutions involving uncertainty and disagreements, and with no central authorities (Rittel & Webber, 1973). Both

challenges already exist in society and students face them in and out of school. There are many other global and local complex challenges such as, for example, the global Covid-19 pandemic.

### 2.1 *To Apply: Acting by Addressing Relevant Issues Means Emotional Labour*

Climate change, as well as obesity, can create feelings in students and teachers, such as confusion, resignation, or motivation to act (see Abtahi, Götze, Steffensen, Hauge, & Barwell, 2017; Steffensen & Hansen, 2019). In terms of climate change, Thunberg (2018) articulated her feelings in her speech at the World Economic Forum in Davos. She used words like “hope,” “panic,” “fear,” “act,” and “crisis” to push for urgent action on a broad personal and societal scale, rather than for us to put our hope in experts or technological solutions. She clearly stated that she does not want hope, but rather wishes for people to panic and experience fear, as shown by her statement “I want you to act.” That is, she is not calling for a retreat from the problem or for passive despair. In the same vein, obesity is a complex problem that often includes despair, retreat and an attempt to assign blame (Finegood, Merth, & Rutter, 2010). Thus, we identify similar feelings of fear in issues concerning obesity to those expressed by Thunberg.

Discourses on climate change and obesity are highly mathematical. Mathematics is involved in describing, predicting and communicating climate change, and references to statistical findings, measures and trends are also connected to obesity (Barwell & Hauge, this volume; Steffensen et al., this volume; Hall and Barwell, this volume). The highly mathematical discourses that are used to articulate these problems mean that mathematics education needs to be involved. Introducing such challenges in the classroom can lead teachers to question whether such topics are too complex, too controversial, or cause negative feelings such as fear and despair (Abtahi et al., 2017; Steffensen & Hansen, 2019). However, complex problems need not be an all-or-nothing matter. In empirical research by Steffensen (e.g., 2021; Steffensen, Herheim, & Rangnes, 2018; Steffensen & Rangnes, 2019), two teachers emphasised that they wanted to communicate to students that even small changes mattered, which we interpreted as meaning that teachers provide hope for students’ actions. We argue that although complex problems can involve controversies or cause emotional labour, citizens and society need to address them, and mathematics education has a responsibility to enable students to deal with such problems.

### 2.2 *To Apply: Acting by Addressing Relevant Issues Means Dealing with Uncertainty and the Formatting Power of Mathematics*

To deal with complex problems in the classroom is not a straightforward task. Teachers might need to reconsider how they look at problems when including

climate change in the mathematics class. Normally when society encounters scientific problems, groups of experts are relied upon to solve the problem. They are expected to suggest the best solution so that decision-makers can take satisfactory measures. However, in complex problems, the experts may arrive from a range of scientific fields, and the decision-makers from multiple countries representing a variety of standpoints on what actions should be taken. Climate change also involves uncertainty, risks, values, and conflicts. At the same time, the urgency of the problem calls for action. When dealing with complex problems, one could involve students in decision-making where dialogue is an essential keyword. An applied critical mathematics education can emphasise teaching about these uncertainties and values (Hauge & Barwell, 2017). For instance, in this book, Steffensen et al. reflected on an example where the teachers had facilitated students to reflect on uncertainty: their own measurement differences and the uncertainties involved in calculating the global average temperature of the Earth. Mathematics can also format society, in connection, for instance, to obesity. Hall and Barwell (this volume) critically scrutinised the Body Mass Index (BMI) as an example of a mathematically based model that becomes a part of categorising and defining people as “normal” or “obese.” Mathematics is used for more than just describing the problem; it becomes prescriptive of (un)desired bodies.

### 3 Agency and Power

Collaboration between researchers and teachers who are willing to learn to cooperate in respectful ways and minority communities may provide opportunities for agency to address complex challenges such as educational decolonisation (e.g., Lunney Borden, this volume; Parra & Valero, this volume). Such collaboration requires that dominant societies, ideologies and institutions treat minoritised groups in respectful ways and acknowledge their ways of knowing, being, speaking and feeling (Hand et al., this volume; Ryan, 2019a) and that the privileged make way for the underprivileged.

#### 3.1 *To Apply: Empowering by Enhancing Political and Mathematical Understanding and Knowledge ...*

Enabling students to have agency and power to act on socio-political issues requires an environment of reflective knowing and critique (Barwell & Hauge, this volume; Steffensen et al., this volume), through, for example, fostering an understanding of the formatting power of mathematics. However, Steffensen et al. (this volume) showed that dealing with the formatting power of mathematics in classroom contexts is a multifaceted matter. On the one hand,

education can support students to engage in critical scrutiny of mathematical models. On the other hand, from such scrutiny, the uncertainty captured in the models becomes apparent, a disclosure that may jeopardise students' trust in science. Mathematics education must, therefore, necessarily include dealing with different levels of uncertainty.

Sustaining institutional structures in the light of resisting colonisation can be shaped both mathematically and politically. Mathematics education has the potential to provide interfaces where local community ways of knowing mathematics encounter Western academic mathematics in a mutually beneficial way (Andersson & Wagner; le Roux & Rughubar-Reddy; Lunney Borden; Parra, & Valero, this volume). To advance such interfaces means to interpret and situate mathematics education in each specific context. Such actions allow for moves that articulate local responses to homogenisation and globalisation, since it is a mathematics education from and for the people. Le Roux and Rughubar-Reddy (this volume) demonstrates how mathematics education scholars can act agentially in an intermediate space that need not dichotomise, for example, Western and non-Western approaches. Instead, by entangling theories and locality, concepts may be reworked and subsequently enrich the complexity of mathematics and mathematics education.

### 3.2 ... *Is Not Always an Easy Matter*

Good intentions to sustain actions and structures that allow the underprivileged to speak sometimes fall short, as some of the chapters show (e.g., Hand et al., this volume; Ryan et al., this volume). That does not, of course, mean that we should not continue to struggle, but that we must humbly accept and remind our (privileged) selves of our own ignorance. To educate privileged ignorance can mean to get to know the knowledge and experiences of the Other in respectful ways that do not put an extra burden on the underprivileged. An extra burden may be put on the underprivileged when more privileged groups demand that the underprivileged explains or shares their experiences. To avoid this, Hand et al. (this volume) followed Patel (2015) when they suggested pausing in such situations. Pausing means to stop and make space to seek together to critically understand injustice in social and institutional relations and its origins, in order to find ways to undertake joint work under respectful and just circumstances.

## 4 Actions and Hopes for the Future

So far in this epilogue, we have tried to capture what actions we found embedded in the chapters of this book with respect to the concept "applying." We found three overarching interconnected themes (situated critical awareness,

complex global and local challenges, and agency and power). These themes together synthesise what the contributors to this book hope to bring about by applying critical mathematics education: namely, to promote social justice and heterogenous subjectification by critically entangling local and global knowledges in contextually situated educational enactments that hold the potential to address complex challenges. We share this hope in these times of crises and complex challenges.

Some complex challenges are highly visible in our (Ulrika's and Lisa's often privileged) Scandinavian contexts, while some are less visible to us. We want to highlight that the underprivileged may suffer daily from the consequences of complex challenges that may be ignored or "forgotten" by hegemonic societies (Swanson, 2017). We want to contribute to illuminating the "forgotten." Grasping "forgotten" complex challenges may be overwhelming and impose a sense of despair upon us (Steffensen et al., this volume). hooks (2003) has highlighted that "despair is the greatest threat. When despair prevails, we cannot create life-sustaining communities of resistance" (p. 12). As teachers, we might feel conflicted about introducing challenges that could cause despair among our students. However, the word "apply" suggests acting. Relatedly, Swanson (2017) has written:

Perhaps it is time for us to remember what the intentions of mathematics education should be, to live well with mathematics education in order to live well with others; to live and research well with mathematics education in order to make possible futures of radical hope. (Swanson, 2017, p. 13)

To have radical hope is to hope for future goodness that is not yet imagined. A future for which we lack the appropriate concepts to conceptualise it (Lear, 2006). In this book, the contributors grapple with providing concepts and ideas that may allow us to live well, or at least better with mathematics education and research and with each other, which we conceive of as hope for the future.

To conclude, we turn to future concerns that we, Lisa and Ulrika, will engage with, from the point of view we synthesised in the sentence above – because that will give us hope.

From the perspective of neoliberal consumerism, Lisa regards a socially just production and distribution of resources such as food, energy, clean air and water as needing to be addressed. The privileged, knowledgeable student needs to be positioned not only as a consumer or a problem solver, but also as a part of the problem. Engaging in complex problems, with the intention to live well with each other cannot merely be a matter of solving problems; it is also an affective matter of performing solidarity. Challenges such as climate change

or the recent coronavirus pandemic affect people differently. However, those who suffer the most should not be “forgotten”; and consequently, mathematics education should remember its role and empower students with hope and give them the agency to act.

From the perspective of heterogeneous subjectivity, Ulrika struggles to have radical hope (Lear, 2006) in the context of the rapidly increasing digitalised and globalised world. In some sense digitalisation and globalisation bring people closer. At the same time, it makes way for global homogenisation and thereby jeopardises heterogeneous subjectification and recognition of and respect for the Other. Critical mathematics education has the potential to provide power and agency to address and resist homogenisation by enacting and fostering situated critical awareness. In a migrating world, this is a matter of solidarity that becomes actualised in mathematics classroom talk, in which language is not merely a matter of communication. Language is also an epistemological matter of what counts as (mathematical) knowledge and who counts as mathematically knowledgeable (Ryan, 2019a, 2019b; Ryan & Parra, 2019; Ryan, Andersson, & Chronaki, this volume). By excluding some ways of talking about and knowing mathematics, some subjectivities will become excluded and heterogeneity thereby jeopardised. Those subjectivities must not be “forgotten”; to live well with mathematics, we mathematics educators and researchers must remember our role as safeguarders of heterogeneous ways of experiencing, knowing and doing mathematics.

We are inspired by the aspects of action and hope that the contributors to this book express. We look forward to applying critical mathematics education in our future research, embarking on familiar and unfamiliar areas and, at the same time, bringing action and hope for the future. As early career female Scandinavian researchers, we hope we will honour the meaning of apply. That is, we will try to enact situated critical awareness, to address complex challenges and to highlight issues of agency and power. Although this is our ambition, at times we will fail. But we will keep on trying. And bring with us our hopes for the future.

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