



HAL
open science

Mathematics, ethics and climate change - ethical awareness in mathematical education

Magnus Ödmo

► **To cite this version:**

Magnus Ödmo. Mathematics, ethics and climate change - ethical awareness in mathematical education. Twelfth Congress of the European Society for Research in Mathematics Education (CERME12), Feb 2022, Bozen-Bolzano, Italy. ⟨hal-03748558⟩

HAL Id: hal-03748558

<https://hal.science/hal-03748558v1>

Submitted on 9 Aug 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

Mathematics, ethics and climate change- ethical awareness in mathematical education.

Magnus Ödmo

Malmö University, Sweden; magnus.odmo@mau.se

Keywords: Mathematics, Ethics, Climate change, Critical math.

Background

The overall goal of the research project presented here is to investigate and produce knowledge about how students and teachers are learning mathematics when presented with mathematics in the context of climate change. Climate change offers a timely and to many people relevant problem, and this problem consists of amongst other things ethical considerations. There are no easy technical solutions to the problem of climate change and the norms and values to address the problem differs around the world (Block, 2019). These norms and values are based on ethical standpoints. It is these that will be discussed and exemplified in mathematical examples in a series of lessons in school-based research.

School-based research

For my coming school-based research, a series of lessons will be created to exemplify how ethics and mathematics are intertwined and, in the classroom, there will be discussions about ethical considerations concerning climate change. Different ethical standpoints and perspectives will be presented to the students, illustrating the complexity of the problem of climate change. Articles dealing with the ethical implications concerning climate change are multiple in the research community. Gardiner (2011) argues that climate change plays a fundamental role due to decision making, which affect animal and future generations. Gardiner (2011) also point out some reasons why it is hard to be ethically sound. Local emissions have a global effect. A decision in one place may have implications in a totally different place in the world. Raymond (2004) argues for an ethics of commons. The atmosphere is a global common good and he proposes that the emissions should be allocated between nations. It could be done by using the principle of equal burden. Meaning that nations should reduce their emissions based on the burden of this reduction. Another approach based on equal human rights would be to allow an emission level per capita. Shue (1999) concludes that “whatever needs to be done by wealthy industrialized states or by poor non-industrialized states about global environmental problems, the costs should initially be borne by the wealthy industrialized states” (p.111). He then describes the reasoning behind this conclusion and how proportional and progressive burden can be explained. All these suggestions mentioned above are based on different ethical assumptions, and are examples of what can be presented and discussed in a mathematics classroom regarding ethics and climate change. They also deal with mathematical concepts, for instance proportionality and progression, that can be used as examples. The mathematical examples the teacher make to illustrate climate change, through graphs, diagrams and tables influences how the discourse is formed and has implications on the finding of possible

solutions to climate change. These choices and implications are something both the students and the teachers must be made aware of.

Methodology and analysis

In the upcoming project, data will be collected through interviews with the students and the teachers. The analysis of the data will be performed using *actor-network-theory* (ANT). It is a methodological approach to study social phenomena where everything exists in a continuously changing network of relationships (Latour, 2005). As Latour (2005) describes, everything that happens in a social situation takes place on the same level. So, for instance, humans as well as objects have agency, and both play a role in creating a social situation. In ANT there are two central concepts, *mediators* and *intermediaries*. *Mediators* “transform, translate, distort, and modify the meaning or the elements they are supposed to carry”. (Latour, 2005, p.39). *Intermediaries* on the other hand, is what transports meaning without transformation: “defining its inputs is enough to define its outputs” (p.39). But how do we distinguish between mediators and intermediaries? Latour mentions that to learn ANT is nothing more than to “become sensitive to the differences in the literary, scientific, moral, political, and empirical dimensions of the two types of accounts” (p.109). I will look at the student as an actor and mathematics as an actor and how the two-trough translation is changed into a mathematician - an actor-network - a new entity with new agency. What are the necessary interactions for this translation to be successful?

Discussion questions

- What are suitable mathematical examples based on ethical standpoints that can be useful when teaching and learning mathematics in a climate change context?
- What should be the main focus when using ANT as methodology in this research, is it the students, teachers as actors or maybe Climate Change as a token, and how these are changed by the interaction in the classroom?

Acknowledgement

I would like to express my special thanks of gratitude to Anna Chronaki and Lisa Björklund Boistrup, for their support in writing this poster.

References

- Block T., Van Poeck, K., & Östman, L. (2019). Tackling wicked problems in teaching and learning: Sustainability issues as knowledge, ethical and political challenges. In K. Van Poeck, L. Östman, & J. Öhman (eds.), *Sustainable development teaching: Ethical and political challenges* (pp. SIDNUMMER). Routledge.
- Gardiner, S. M. (2011). *A perfect moral storm: The ethical tragedy of climate change*. Oxford University Press.
- Karrow, D., Khan, S., & Fleener, J. (2017). Mathematics education’s ethical relation with and response to climate change. *Philosophy of Mathematics Education Journal*, 32, SIDNUMMER.
- Latour, B. (2005) *Re-assembling the social: An introduction to Actor-Network Theory*. Oxford University Press.

Raymond, L. (2004). Cutting the “Gordian knot” in climate change policy. *Energy Policy*, 34(6), 655-658.

Shue, H. (1999). Global Environment and International Inequality. *International Affairs*, 75(3), 531-545. <http://www.jstor.org/stable/2623635>