# AI literacy for teaching social sustainability may require specific societal awareness

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This presentation report on tentative research results indicating that mathematics teachers need specific kinds of societal awareness to facilitate a classroom discussion on ethical and critical perspectives related the mathematics in the 4th industrial revolution (Big Data, AI, Machine learning, etc.). This awareness relates to societal phenomena that may intersect with mathematical modelling, e.g. data may portray whiteness/sexism, risking mathematical analysis to reproduce them. To facilitate classroom discussions on the intersection, teachers must first be aware of how such phenomena operate in society. Teaching units in Sweden and USA are presented with examples of how mathematics teachers enable discussions through their societal awareness. An implication is that teacher education may require more societal content.

## Introduction and background

Society is undergoing rapid changes due to digital technologies (Big data analytics, AI, Machine learning) which enables new and fast solutions for various issues, e.g. making predictions and discerning patterns. At the hearth of this are new approaches in applied mathematics that are made possible by more processing power and larger data sets. Consequently, voices have been raised for data science to become new core content in mathematics education (Boaler & Levitt, 2019). However, there are also ramifications with the new technology since it can reinforce existing inequalities, enable exploitation, etc. (O’Neil, 2016). Drawing from both the need to educate for understanding data science in general, and the aims in education to support social sustainability and democratic values more specifically, three interconnected studies on ethical data science have been conducted from a perspective of (pre-service) teachers and teacher education.

## Data from three studies

One of the three studies is an interview study on mathematics pre-service teachers’ ethical reasoning on big data applications (Andersson & Register, 2023). The study addresses both how pre-service teachers reason mathematically and ethically in different ethical dilemmas, and also how they discuss what they could do as teachers to help students navigate in such contexts. Another is an ongoing case study, where two pre-service mathematics teachers designed and carried out a teaching unit during the practicum in the teachers program on critical thinking on AI and machine learning. They did this in collaboration with a researcher who acted as support so that the study mirrored elements of teacher education, e.g. having a seminar research literature, reflections meetings, etc. Data was produced in the form of lesson plans, logbooks, videos recordings in classrooms, and interviews. Finally, there is data from a summer course on ethical data science for high school students in the USA. The data consists of field notes from observing lessons and interacting with students, and interviews with two teachers who individually have taught two separate consecutive iterations of course.

## Tentative results

Tentative results indicate that AI-literacy for teachers may require specific knowledge that goes beyond mathematical ‘know how’ and a lay man’s view of society. Teachers who were able to synthesize societal and mathematical reasoning displayed more mature ethical and critical reasoning in data science contexts (Andersson & Register, 2023). Emerging from data, it also seems as any kind of societal awareness do not suffice, but rather awareness that encompasses an ability to discuss power relations on e.g. race and gender, and how related structures operate in society. Besides such awareness being a prerequisite for the above mentioned synthesis, it can also be utilized in teaching. For example, in data science it is a common task to determine which variables are most important for explaining a phenomenon. If it is a societal topic, there will typically be variables on the persons’ race, gender, age, income, home address, etc. Picking the most important variable is not as strait forward as from a mathematical point of view pick the one with highest pairwise correlation with the variable for the phenomenon. This is due to possible multicollinearity among the variables, i.e. variables may statistically explain one another, e.g. income may be predicted by a combination of the others. Teachers that seemingly had been drawing on their own societal awareness, reported that they strategically focus classroom discussions on such data science tasks to illuminate how data science decisions may intersect and reproduce problematic hegemonic perspectives on demographical data. Additional examples will be discussed at the conference.

The session ends with a discussion on how mathematics teacher education could encompass developing such societal awareness among pre-service teachers to enable them to synthesize societal and mathematical knowledge in their teaching. This would also help them in critically assess large language models as teaching and learning tools.

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## References

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