



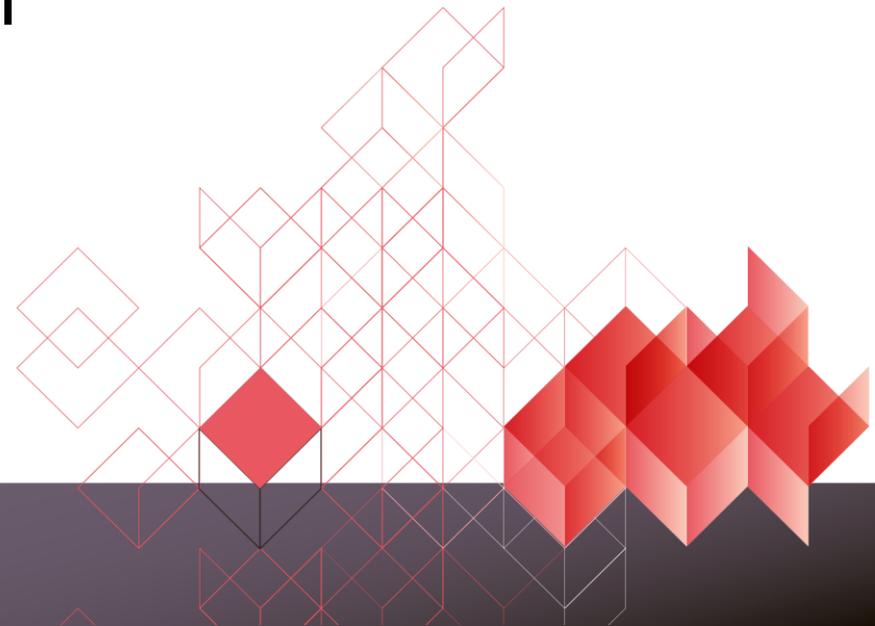
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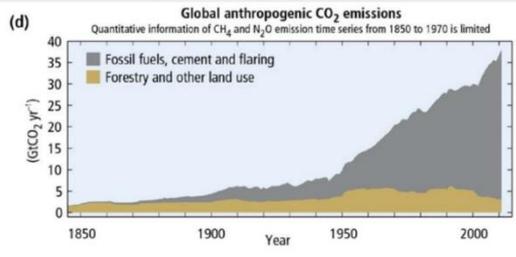
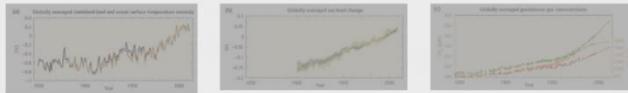
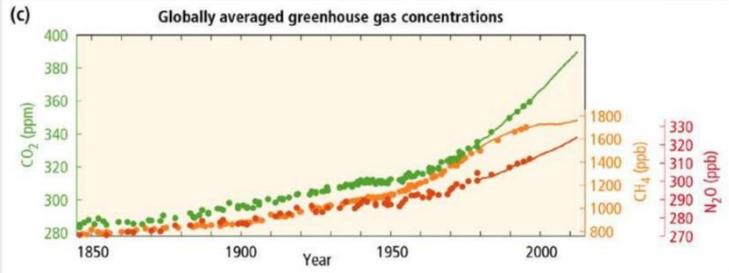
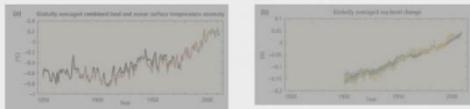
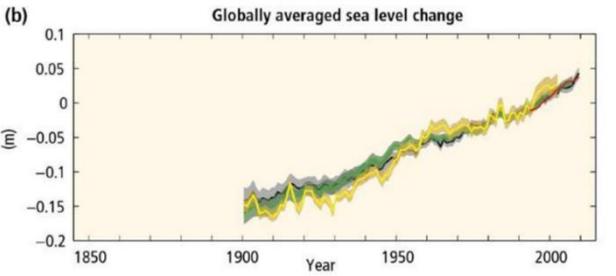
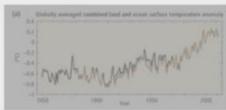
BERGEN UNIVERSITY COLLEGE

# Climate change and Mathematics Education

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Lisa Steffensen  
Ragnhild Hansen  
Kjellrun Hiis Hauge

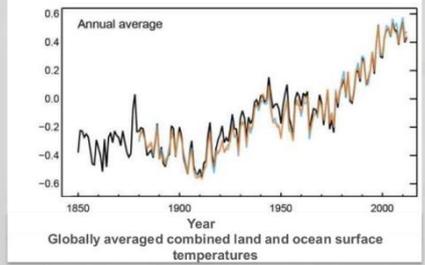




# Change 2014

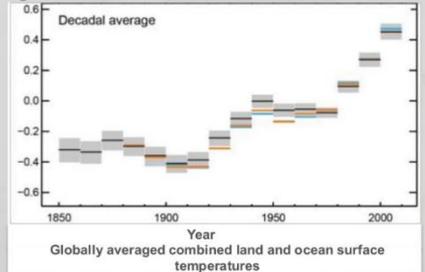
## Humans are changing the climate

It is extremely likely that we are the dominant cause of warming since the mid-20th century



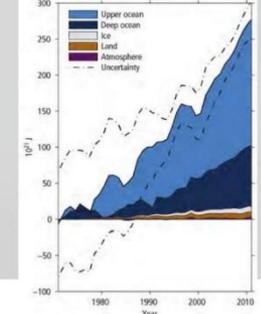
## Temperatures continue to rise

Each of the past 3 decades has been successively warmer than the preceding decades since 1850



## Oceans absorb most of the heat

Energy accumulation within the Earth's climate system



→ More than 90% of the energy accumulating in the climate system between 1971 and 2010 has accumulated in the ocean

→ Land temperatures remain at historic highs while ocean temperatures continue to climb

The system is clear  
 te, the more we  
 versible impacts  
 mte change and  
 able future



IPCC AR5 Synthesis Report

IPCC AR5 S





Lisa steffensen @LisaSteffensen · May 19

Underviser du om klima i matematikk eller andre fag? Diskuterer du i klasserom? Ta undersøkelsen, vinn en iPad?  
[response.questback.com/hgskoleniberge...](https://response.questback.com/hgskoleniberge...)



# Methodology

- Online questionnaire on social media
- Goal: To achieve insight in:
  - › Do teachers teach climate change in the mathematics classroom?
  - › How and what do they teach?
  - › Why do they teach climate change in the mathematics classroom?
  - › look for possible cooperation with teachers with respect to further research
- Prompt online:  
Do you teach climate change in mathematics or other subjects?



Matematikkdidaktikk  
Offentlig gruppe

Diskusjon Medlemmer Arrangementer Bilder Filer

klima

Lisa Steffensen  
25. august · Følelse

SPORREUNDERSØKELSE OM KLIMA I MATEMATIKKUNDERVISNING  
Vi ønsker å vite om du diskuterer klimaproblematikken i matematikktimene dine eller om du bruker klimarelaterte data eller grafer i andre fag.  
Alle som deltar er med i trekningen av en iPad!  
TREKKES 30 SEPTEMBER.  
Du finner mer informasjon på følgende lenke:

[www.QuestBack.com](https://www.QuestBack.com)  
RESPONSE.QUESTBACK.COM

5 liker/klakk 1 kommentar

Liker Kommenter Del

MEMLER 5662 medlemmer (83 nye)  
+ Legg til personer i gruppen

Inviter via e-post

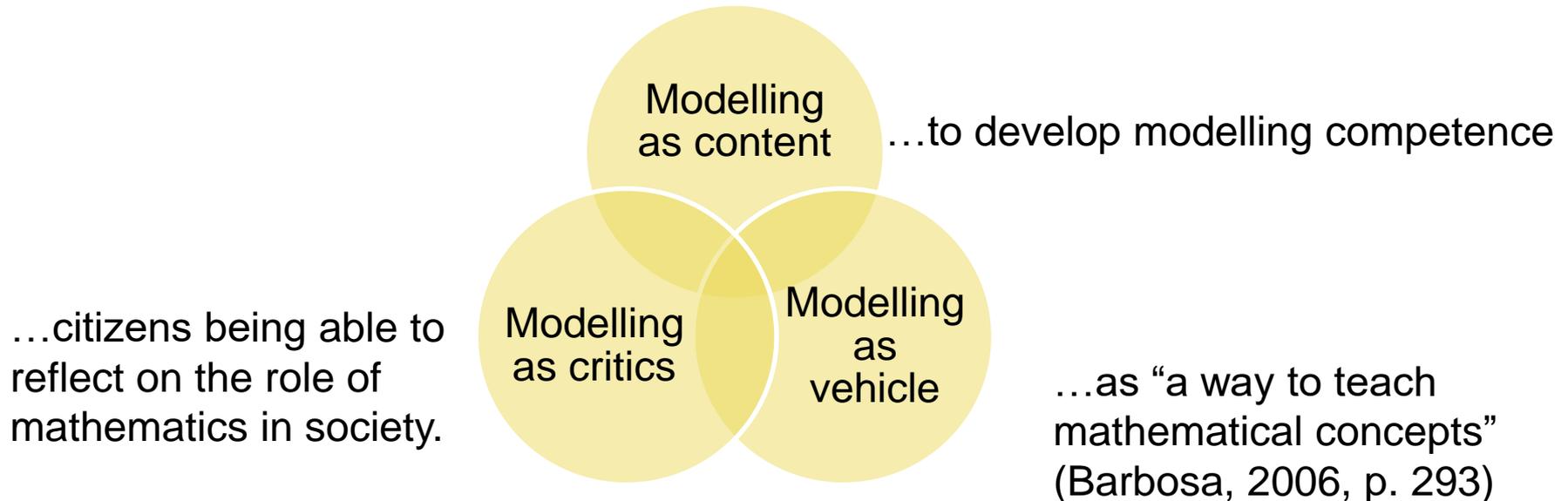
BESKRIVELSE  
Dette er en gruppe for personer som ser nytt...  
Se flere

OPPRETT NYE GRUPPER  
Grupper gjør det enklere enn noen gang å dele med venner, familie og lagkamerater.  
Opprett gruppe

NYLIGE GRUPPEBILDER Se alle

# Theoretical framework

Barbosa's (2006) educational perspectives on mathematical modelling, building on Julie (2002):

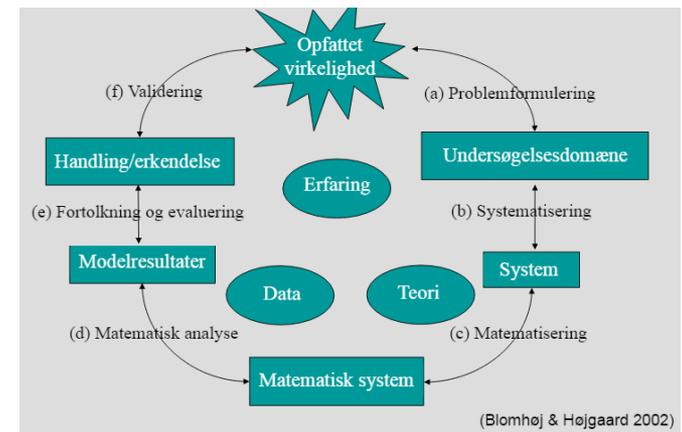


Visualization of overlaps between different educational perspectives on modelling, Hansen and Hana (2012).

# Theoretical framework

Blomhøj's (2003) educational perspectives on mathematical modelling:

- a) Problem formulation
- b) System bounding
- c) Mathematizing the systematized problem
- d) Analyzing the mathematized model
- e) Interpretation and evaluation of model results
- f) Evaluation of the validity of the model.

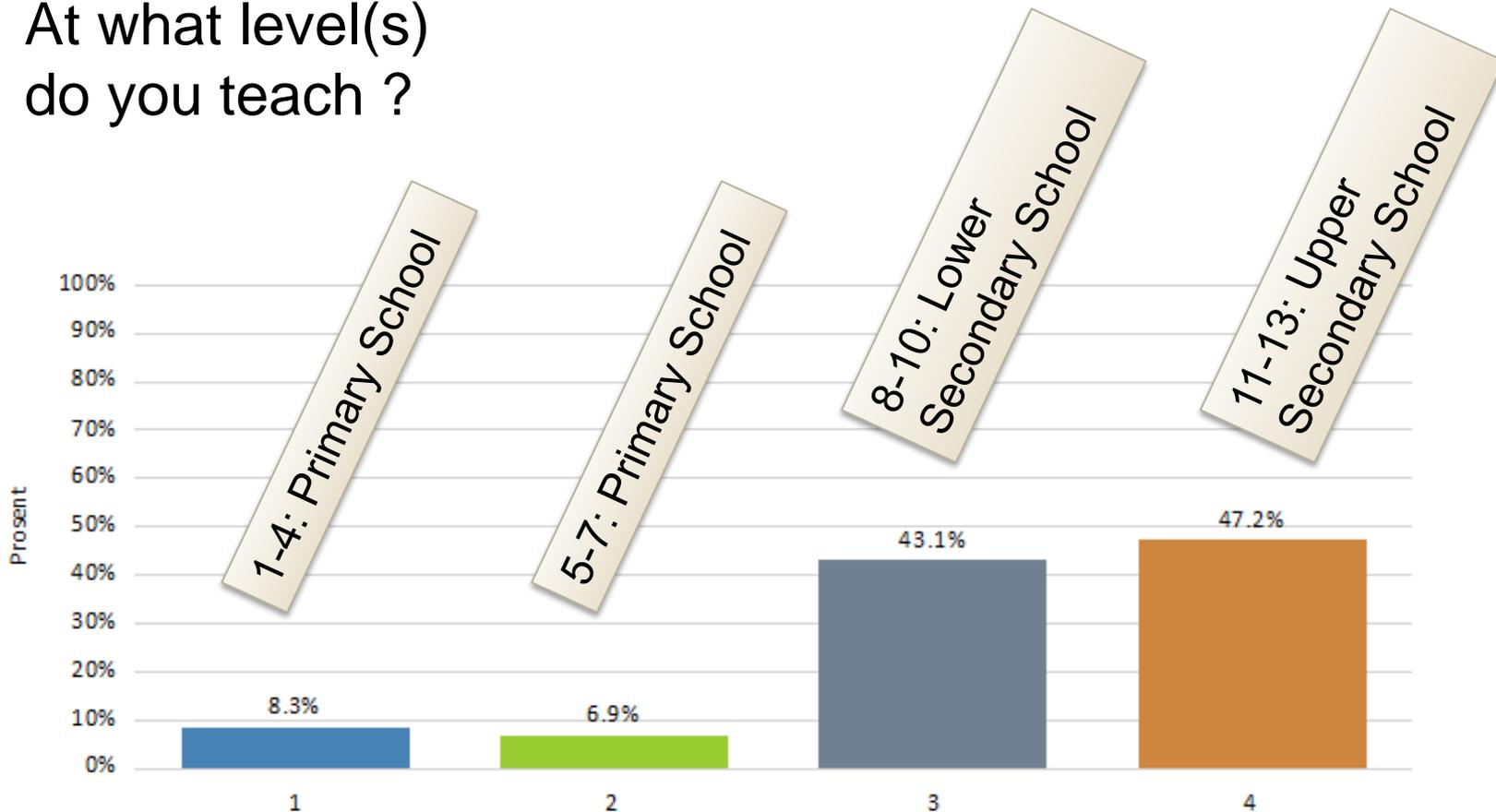


With these stages in mind, we found it possible to discuss the teachers' approaches to climate in the light of modelling.

# Results and analysis

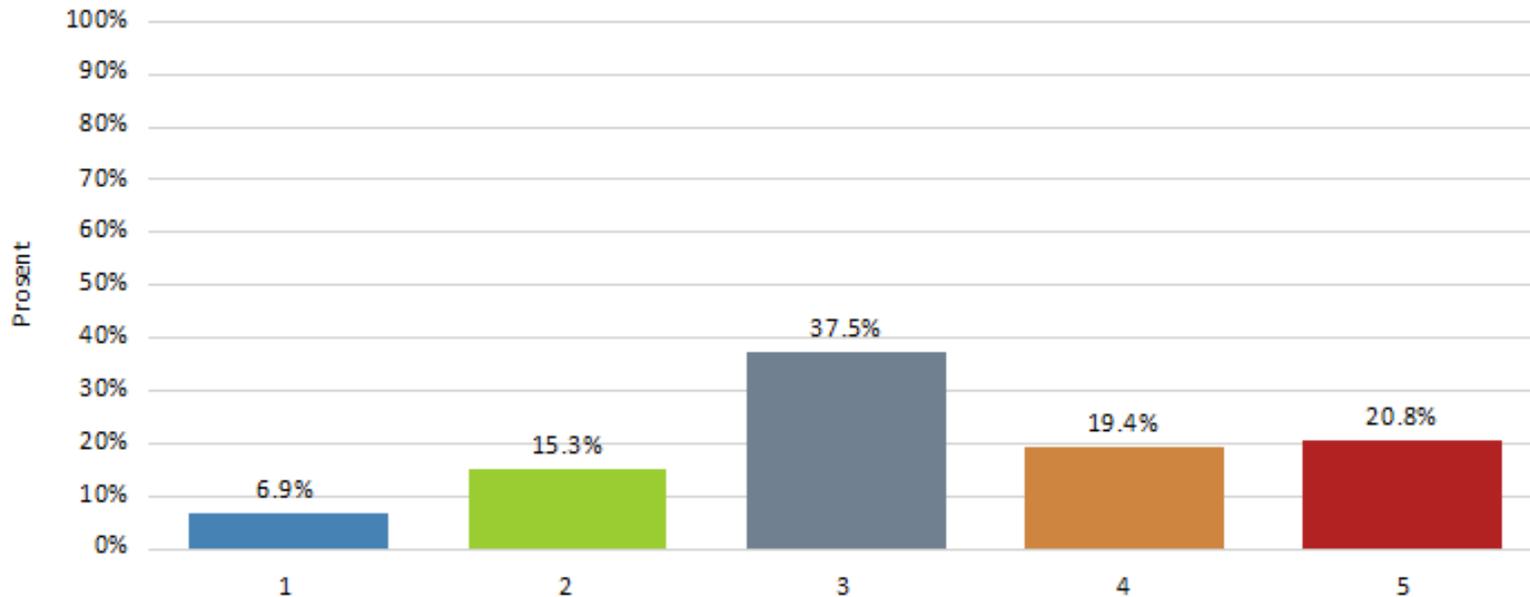
In general, the survey respondents gave quite informative feedback  
Totally, we received 72 responds.

At what level(s) do you teach ?



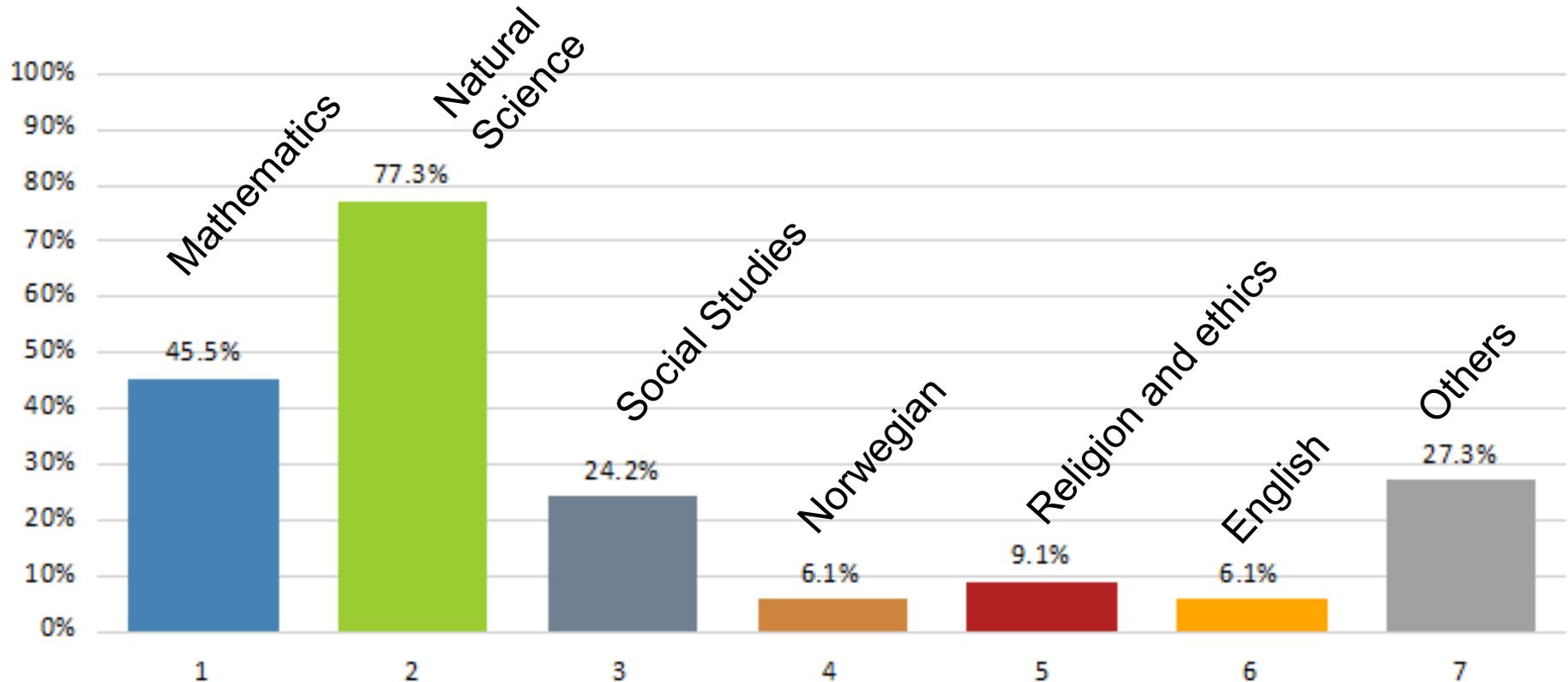


# How many hours do you spend on climate change in a class per year ?



	Navn
1	0
2	≤ 2 timer
3	3-5 timer
4	6-9 timer
5	≥10 timer

# In which subjects do you teach climate change?

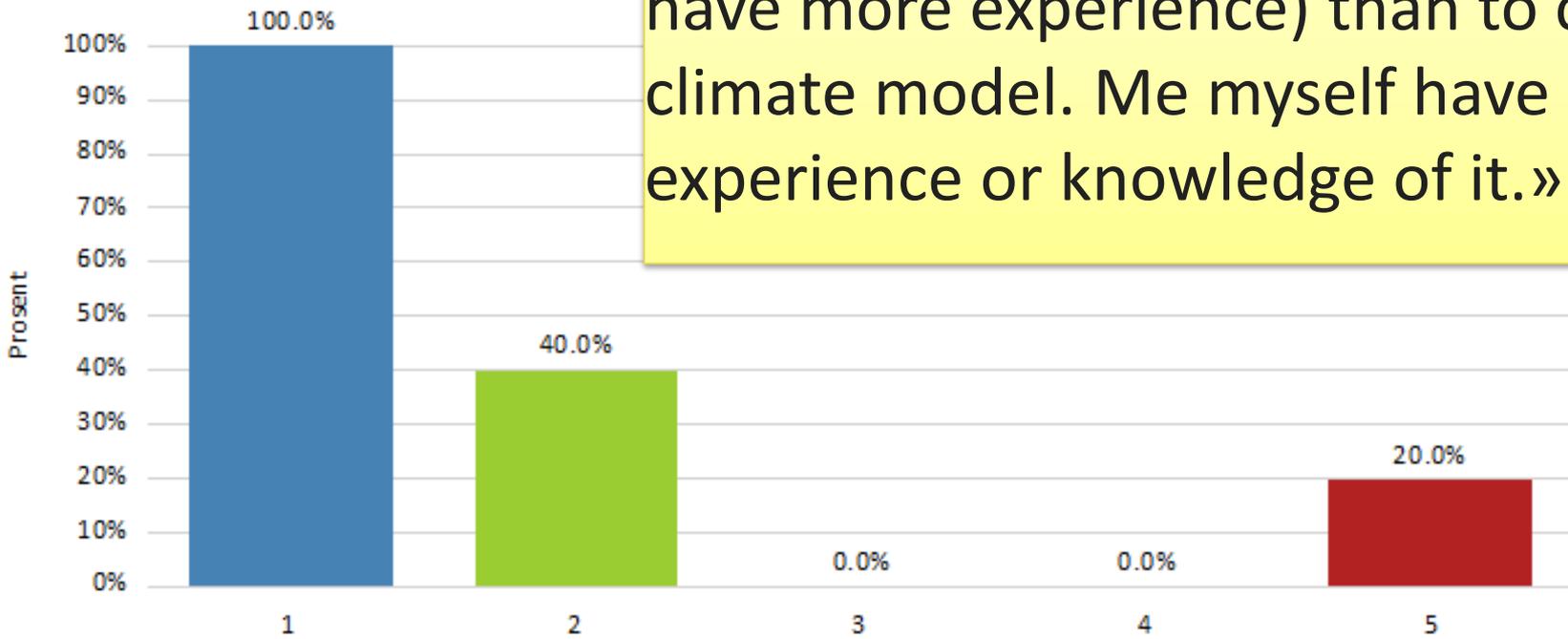


N = 66

Examples of others (7): physics, biology, chemistry, geosciences, elective (research in practice, technology and design, technology and theory of research), tourism and language, and in a project context.

For those who answered:  
**What is the reason for not teaching about climate change?**

«Mathematical modeling is curriculum, but I believe there are more pedagogic examples (easier and where students have more experience) than to create a climate model. Me myself have no experience or knowledge of it.»

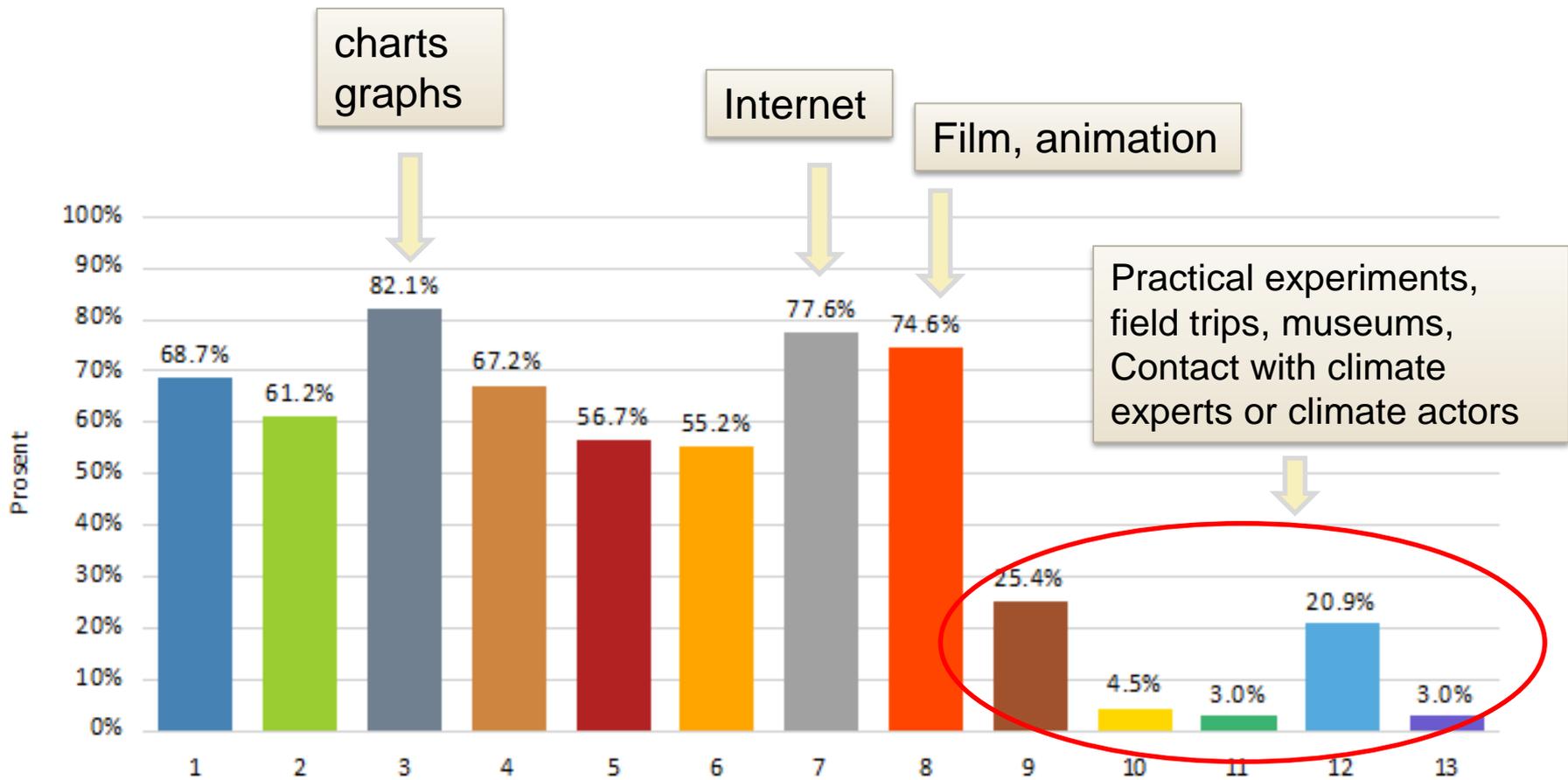


N = 5

1. Not curriculum in the subject I am teaching now
2. Not relevant in subject teaching now
3. Too complicated for my students
4. Take too much time
5. Others

# What resources did you apply when teaching about climate change:

1	Tallmateriale fra ulike kilder
2	Tabeller
3	Diagrammer/grafiske framstillinger
4	Bilder
5	Lærebøker
6	Tekst fra ulike medier
7	Internett
8	Film/animasjoner
9	Praktiske forsøk
10	Feltturer
11	Museumsbesøk
12	Kontakt med ekstern eksperter eller andre aktører
13	Andre





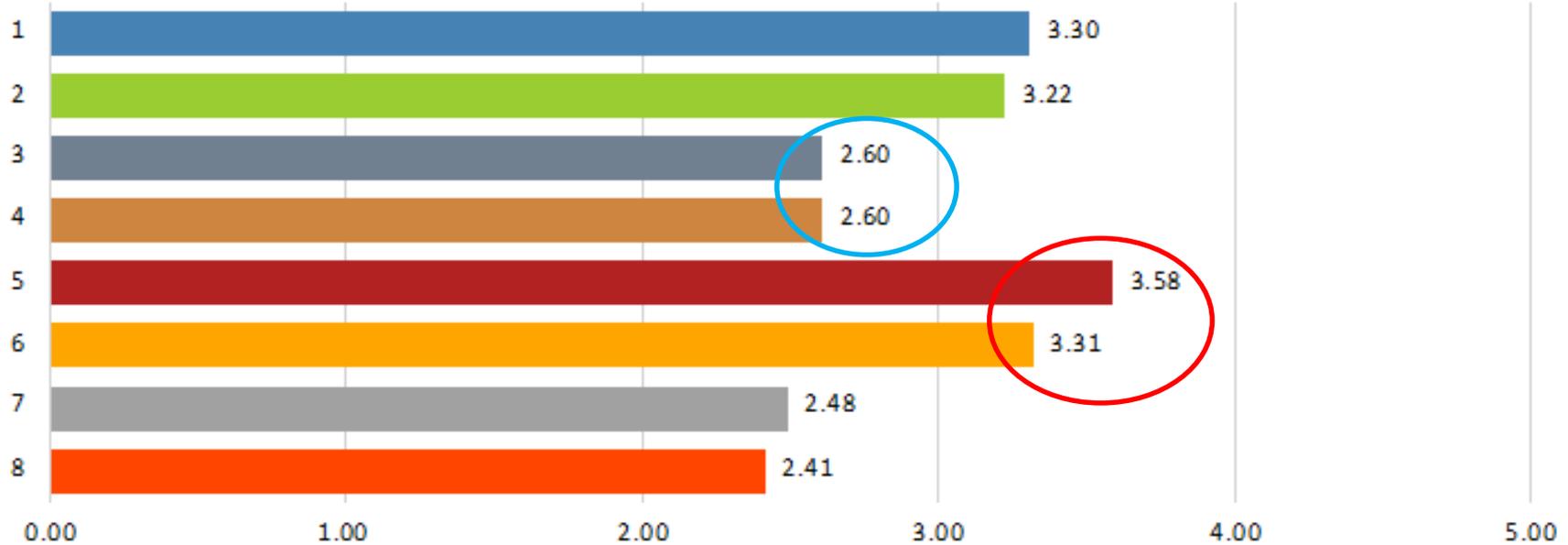
# If you used data, tables or charts in teaching climate, how did you use it?

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## Excerpts from teachers:

- Students **collect** data, **create** tables and graphs.
- **Explains** graphs, **illustrate** points
- As tasks where students must **interpret** tables and graphs
- **Discusses** graphs with respect to the data and sources, prognoses + **compare** graphs from different sources .
- **Interpret**, and **anticipate** developments
- Teach students to **read** tables and graphs . How can these be **manipulated** to look the way you want the result to be
- Linking it to statistics, teaches students to **read** mathematics

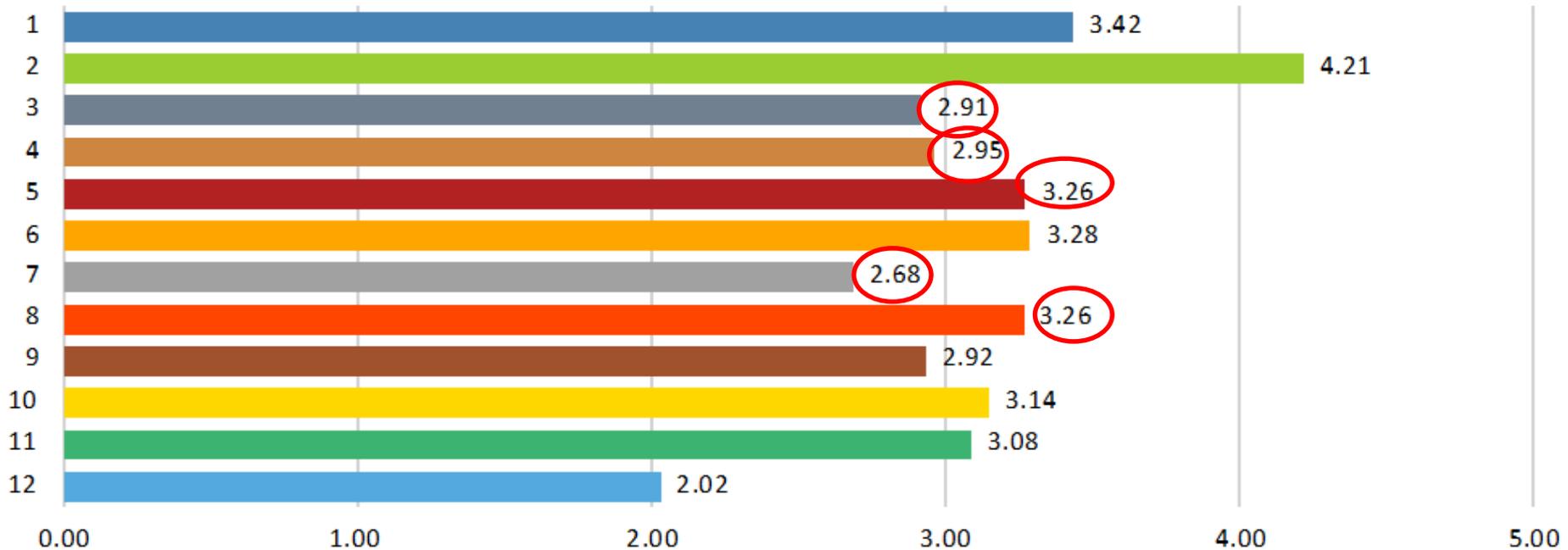
# If you used data, tables or charts, what was your emphasis in teaching ?



1. Interpretation and presentation of data
2. Interpretation of graphs or charts
3. Collecting data
4. Learning about mathematical concepts (ex. axis, average, correlation)
5. Discussion on climate change
6. Reflection on information
7. Learning ICT
8. Learning goals in other subjects

1. Not at all
2. Very little
3. Some
4. Much
5. Very much

# Rate your reasons for teaching climate change as a topic



1. It's a competence aim
2. To learn about climate change
3. To learn mathematical concepts
4. To learn mathematical modelling
5. To learn about uncertainty
6. To learn scientific method

7. Its a political topic
8. To get insight in the disagreement
9. It's in the media
10. To enhance interdisciplinary learning
11. To learn about sources
12. Other reasons

# Thanks for listening!

## Conclusion - summary

- Teachers **do use** climate change as a theme in the mathematics classroom
- Teachers use **various methods** and have **various aims** in teaching climate change

**Key concepts:** critical mathematics education/perspective, mathemacy, reflective knowing, formatting power of mathematics, modelling, climate change, values, conflicts, uncertainty, post-normal science, critical citizenship, social response-ability, extended peer community, reflective educational practice



PhD project (jan 16 – dec 19)

Action research with :

- 4 teachers (research partnership)
- 125 students age 15-16 years old

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