





# **How to encourage citizenship for democracy through mathematics ?**

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# Democracy – what is it?

## Out of school? In school?

	Formal, representative system	Informal, participatory democracy
Out of school		
In school		

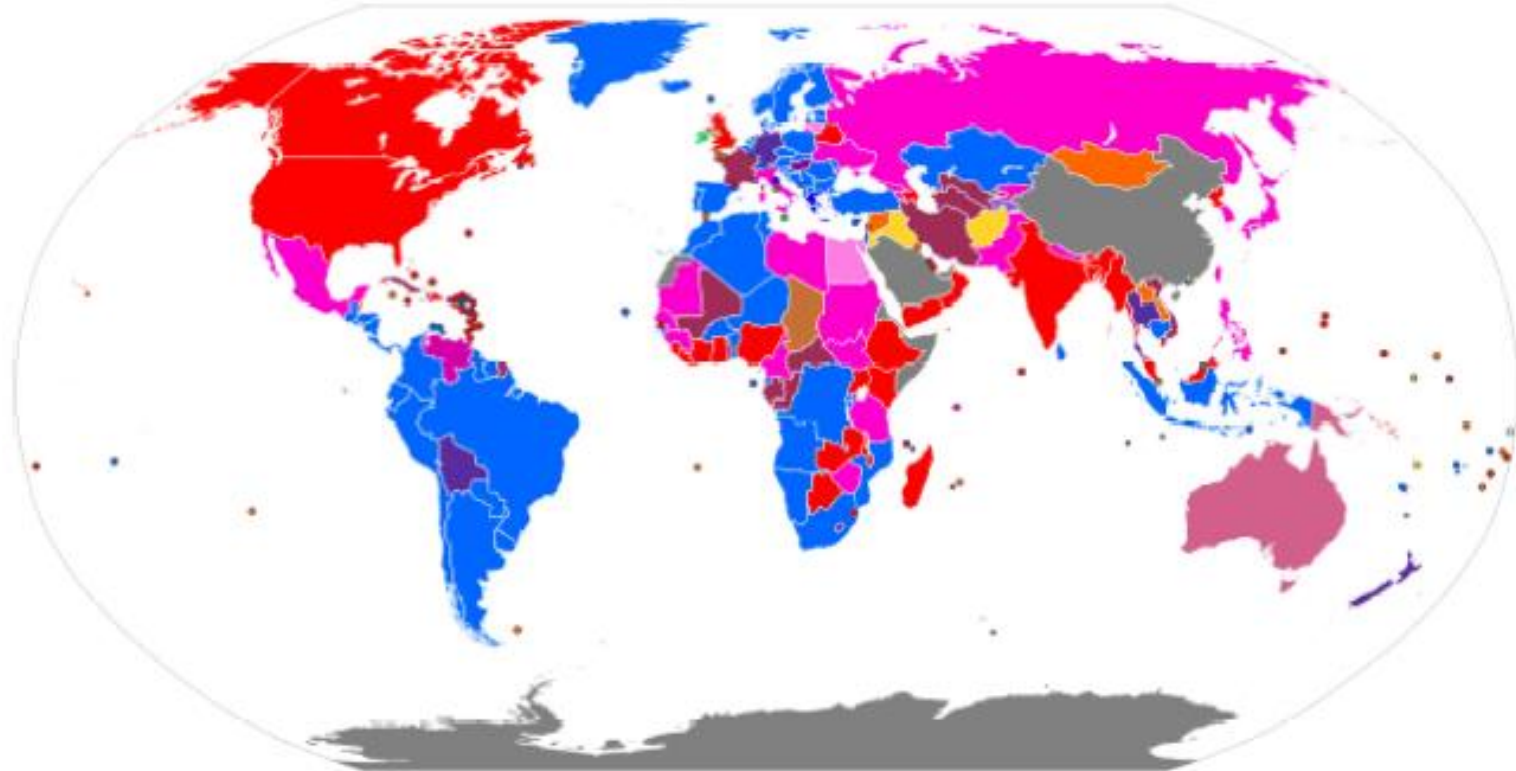
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# Many different voting systems

[File:BlankMap-World.svg](#): [Canuckguy](#)



([Light blue](#)) Party-list proportional representation (party-list PR)

([Red](#)) First past the post (FPTP)

([Dark pink](#)) Parallel voting (party-list PR and FPTP)

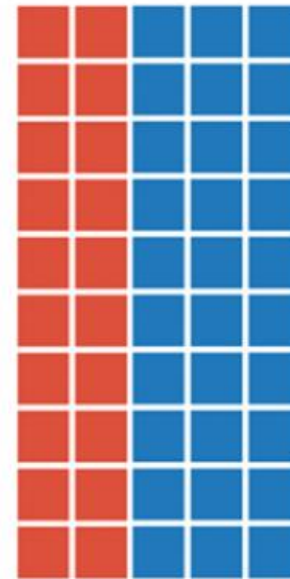
([Maroon](#)) Two-round system (TRS)

([Dark grey](#)) No direct elections

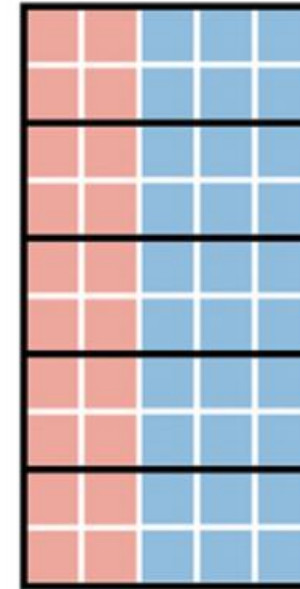
# How to count?

Source: [New poll: Everybody hates gerrymandering – FairVote](#) Sept 12, 2017

- Proportional: Every vote counts equal
  - 2 RED 3 BLUE
- First past the post: The majority in each county gets a seat
  - 0 RED 5 BLUE
- First past the post: The majority in each county gets a seat
  - 3 RED 2 BLUE

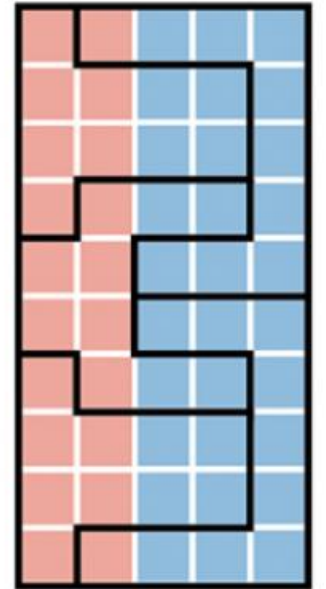


40 % stemmer rødt  
60 % stemmer blå



5 til blå  
0 til rød

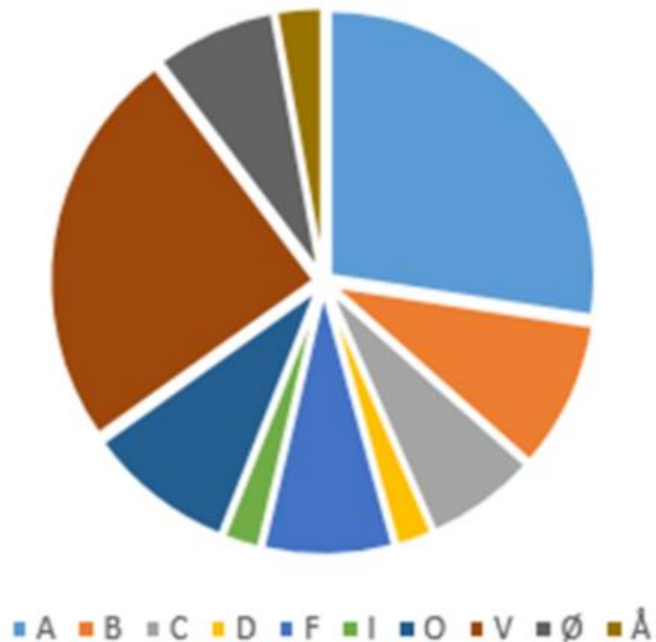
**BLÅ VINDER**



2 til blå  
3 til rød

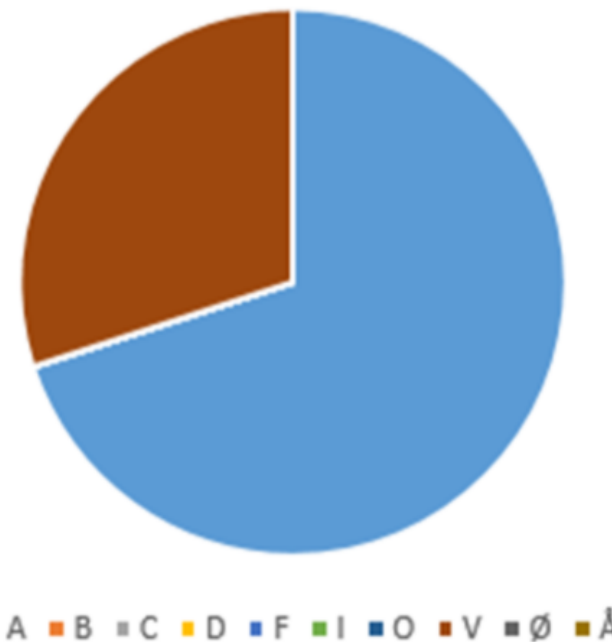
**RØD VINDER**

Folketing 2019 - nuværende algoritme



Figur 1: Partiernes mandatfordeling i Folketinget 2019 © Børne- og Undervisningsministeriet

Folketing 2019 - ny algoritme




Figur 2: Partiernes mandatfordeling ved brug af algoritmen 'flertalgsvalg' i de ti danske storkredse © Børne- og Undervisningsministeriet

The Danish Parliament at present and if votes were counted as first past the post

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# Mathematics as a democratic right?

Is mathematics education a democratic right for adults ?

How many adults are given access ?

Are the offers appropriate ?

What has changed during the years ?


Do you know why?

Which mathematical competencies, are relevant for the ordinary citizen to be able to participate in the representative and lived democracy ?



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Out of school		 A graphic for breaking news featuring a globe, the word 'NEWS' repeated in a circular pattern, and a red banner with the text 'BREAKING NEWS' and a yellow 'LIVE' tag.
In school		

# Informal, participatory democracy

## The lived democracy



# Mathematics in the media - fake news (1)

Here is data on hospitalised corona patients in Denmark 07.12.2021

146	no vaccination
14	vaccination started – one time
299	fully vaccinated

- This may mean *Vaccinated people are hit most hard by Corona?*
- [Spørg Os: Hvor mange af de indlagte med covid-19 er vaccineret? | TV 2 Lorry](#)

# Mathematics in the media - fake news (2)


Here is data on hospitalised corona patients in Denmark 07.12.2021

2.3 per 100.000	no vaccination
8 per 100.000	vaccination started – one time
6.7 per 100.000	fully vaccinated

- This may mean *Un-vaccinated people are hit most hard by Corona?*
- [Spørg Os: Hvor mange af de indlagte med covid-19 er vaccineret? | TV 2 Lorry](#)

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# Teaching approaches for obedience or democracy?

- Lived democracy takes place to a greater or lesser degree in the teaching of mathematics itself.
- When the book or teacher asks questions and decides if the adults' questions and answers are relevant and right, is an authoritarian teaching.
- It socializes into obedience and submissiveness
- It may damage the adults' preconditions for participating in the lived democracy outside the school.
- Conversely, mathematics teaching with democratic learning processes may strengthen these preconditions BUT HOW??????





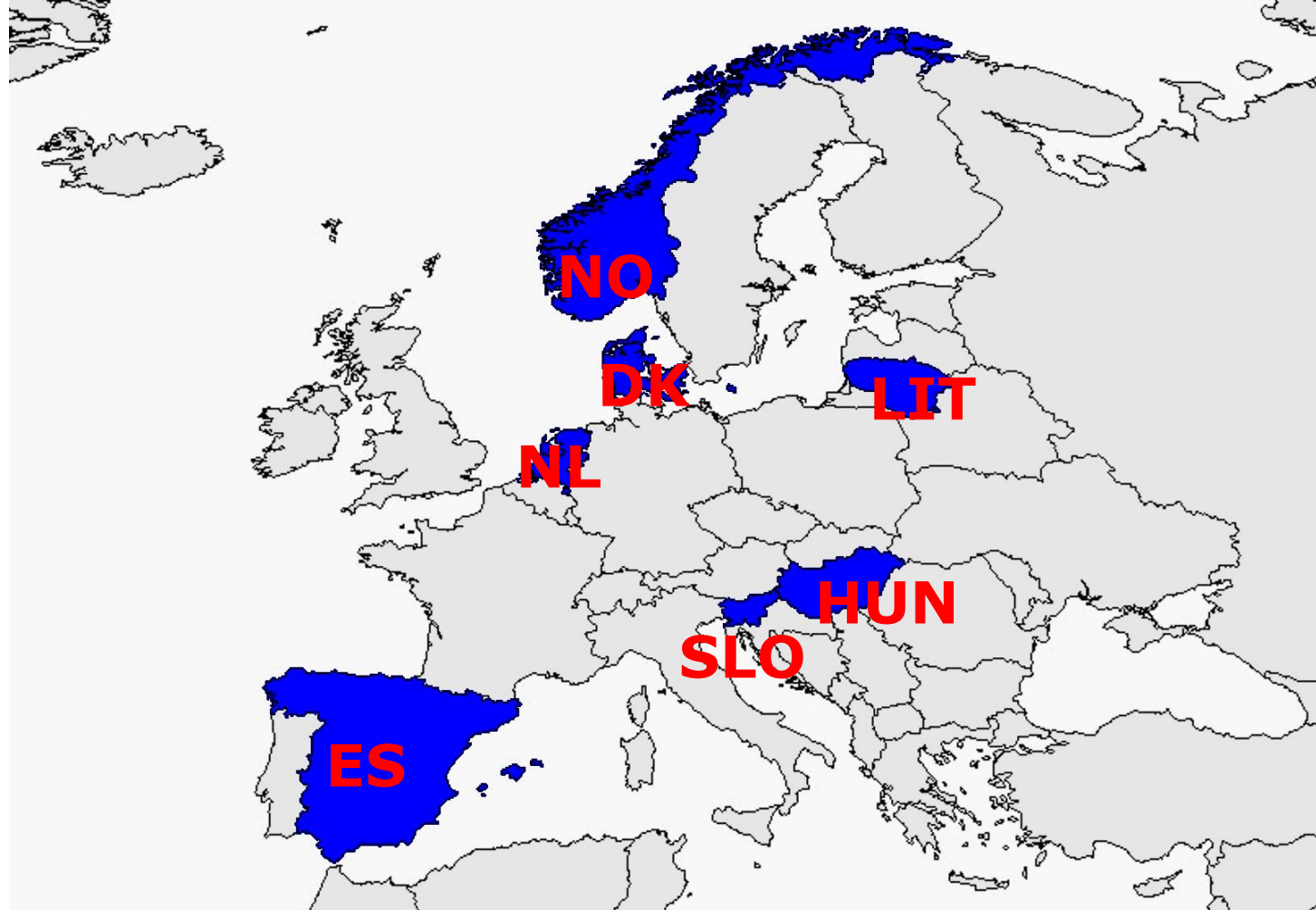
## Democratic learning processes, DMP

Teaching approaches must include collaboration



# Mathematics in Action

EU-project 2004 - 2007





# Mathematics in Action



1. Bring the learner in a potential mathematical situation
2. Identify problems in the situation
3. Plan the problem-solving procedures
4. Solve
5. Check
6. Review

# Student actions: Self- checking as control

## Citation from adult numeracy class in the Netherland

How do you check?

Lien:  $300 + 300 = 600$                        $150 + 150 = 300$

Soraya has made a mistake: 25% is with her €175

Soraya checks:  $175+175 = 350$ , not 300

Conclusion: A mistake is not a problem as long as you check your results.

**When you check you can be 100% sure.**

**Student says 'You do not have to ask the teacher all the time. You are in control.'**







# Assessment issues are important for democratic learning processes

- When students are given the right to see mathematics as meaningful, assessment methods should be supplemented with reflections on:
  - Did you find the mathematics in the course relevant – meaningful?
  - Did you find the collaboration in the course relevant – meaningful?
  - Which part will you remember?
  - Did you raise your voice?
  - Was your voice heard?

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Thank you  
and now group work