Using Epistemic Network Analysis to understand core topics as planned learning objectives

Allsopp, Benjamin Brink; Dreyøe, Jonas; Misfeldt, Morten

Using Epistemic Network Analysis to understand competencies as planned learning objectives

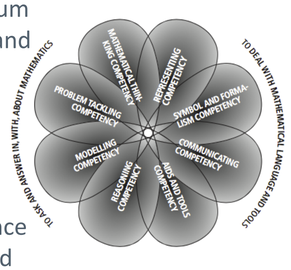
Benjamin Brink Allsopp, Jonas Meldgaard Dreyøe, Morten Misfeldt

WHAT IS ENA?

Epistemic Network Analysis is a tool developed by the epistemic games group at the University of Wisconsin Madison for tracking the relations between concepts in students discourse (Shaffer 2017).

THE DANISH MATHEMATICS CURRICULUM

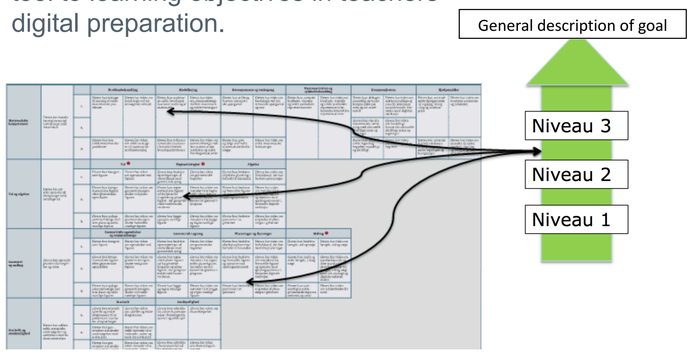
The Danish mathematics curriculum is organized in six competencies and three topics. In the recently implemented learning platforms teacher choose which of the mathematical competencies that serves as objective for a specific lesson or teaching sequence. Hence learning objectives for lessons and teaching sequences are defining a network of competencies, where two competencies are closely related of they often are part of the same learning objective or teaching sequence.



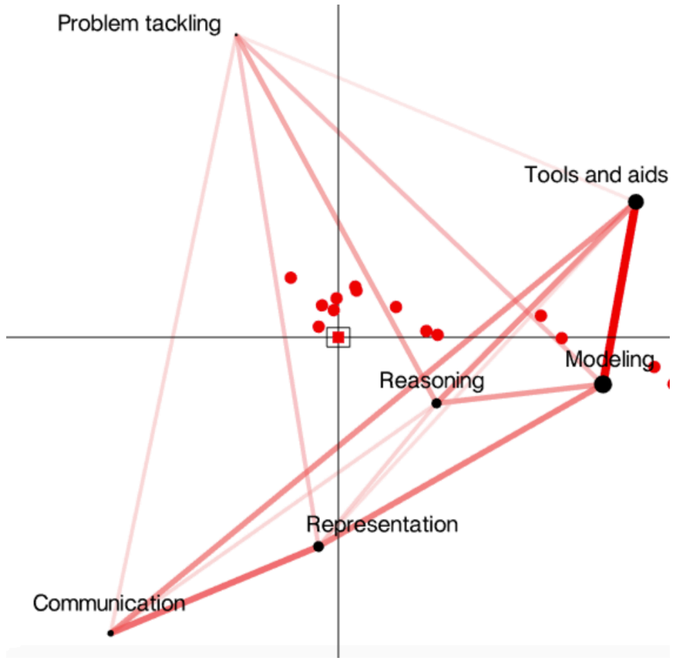
Competency/ Subject area	Math. thinking comp.	Problem tackling comp.	Model-ling comp.	...	Aids and tools comp.
subject area 1					
subject area 2					
...					
subject area n					

GOAL ARROW DATA

In our current work we are applying this tool to learning objectives in teachers digital preparation.



A COMPLETE VIEW



ANALYSIS OF THE 2D SPACE

Y AXIS

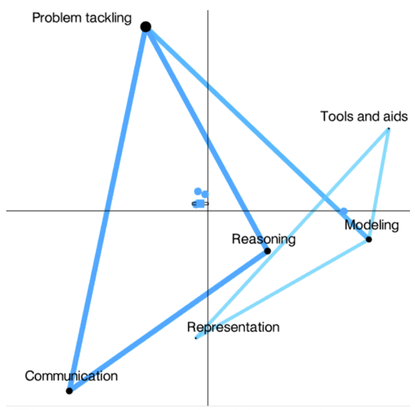
First, we looked at the opposites on the y axis, problem tackling versus communication. It is tempting to tentatively recognize the y axis as being about "talking the talk" versus "doing actual mathematics". Then we grouped the competencies along the y axis into three groups of two. This promoted the understanding that the y axis represents a continuum from talking about, drawing, describing and explaining mathematics over modeling to actually doing mathematical moves, actions and solutions with tools and aids. A continuum from describing and explaining to doing mathematics.

X AXIS

By looking at the placement of competencies along the x axis in three groups, we understand the x axis as representing a perceived continuum from working in the abstract to working more directly in the world. We have summarized this as the in-the-mind/in-the-world continuum.

These discussions allow us to identify the dimension of greatest variance (x) as a continuum between "in the mind" and "in the world", and the greatest orthogonal variance on x (y) as a continuum between "talking about" and "doing mathematics". Pending considerations of significance, the above analysis has allowed us to identify a conceptual space in which mathematics teaching can be mapped.

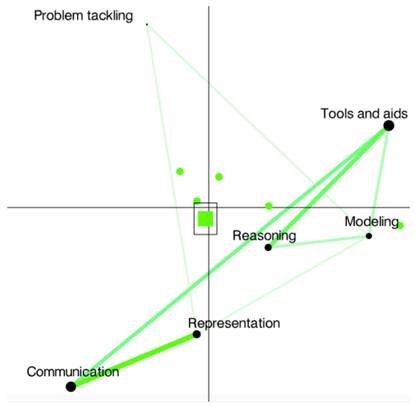
GRADESTEP 1 TO 3



The two camps in this gradestep's visualization fits the general view of gradestep 1 to 3. With *calculation-narratives** and working with dynamic geometry (Geogebra).

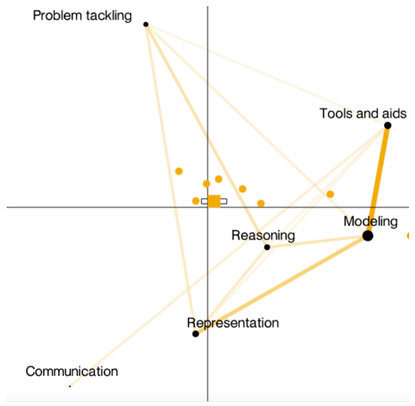
*A didactical attempt to address the relation between calculations or equations on one side and narratives that could lead to such on the other

GRADESTEP 4 TO 6



This visualization, where problem tackling is almost out of the picture suggests mathematics as a game. With a very formalistic view of mathematics, where you have to say the "right" things.

GRADESTEP 7 TO 9



The visualization produced for gradestep 7 to 9, suggests a teaching that is heavily affected by the modelling competency. Therefore it seems as the teaching revolves around mathematizing the world around us.

PROGRESSION ANALYSIS

The progression in the visualizations from 1st to 9th grade shows a significantly different role for problem tackling in gradestep 4 to 6, than in the other to two gradesteps. The visualizations for the three gradesteps do not look the same, which means that the teaching it self is probable to be different, as described in the analyses above. There is only a slight change for the centre of mass, which might suggest otherwise.

AALBORG UNIVERSITET