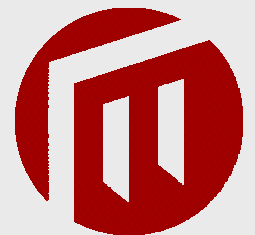


Vuxna lär matematik: Ett problemfält

Tine Wedege
Läroarutbildningen
Malmö Högskola

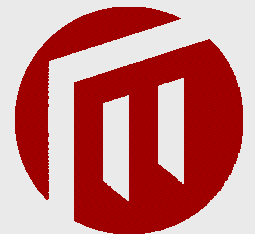


MALMÖ HÖGSKOLA

Problemets betydelse för forskningen

Le sens du problème est le moteur du progrès scientifique. (Bachelard, 1927)

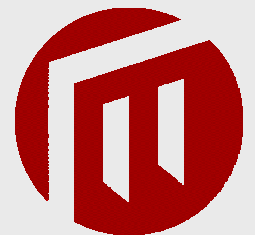
Sv: Förmågan att se – och att formulera – problem är det vetenskapliga framstegets drivkraft.



MALMÖ HÖGSKOLA

Utbildningskonsulentens problemställning i 1994

- Vuxna lär (inte) matematik i yrkesutbildning
 - Varför – Vad – Hur -



Tre dimensioner i läroprocessen: kognitiv, affektiv, social

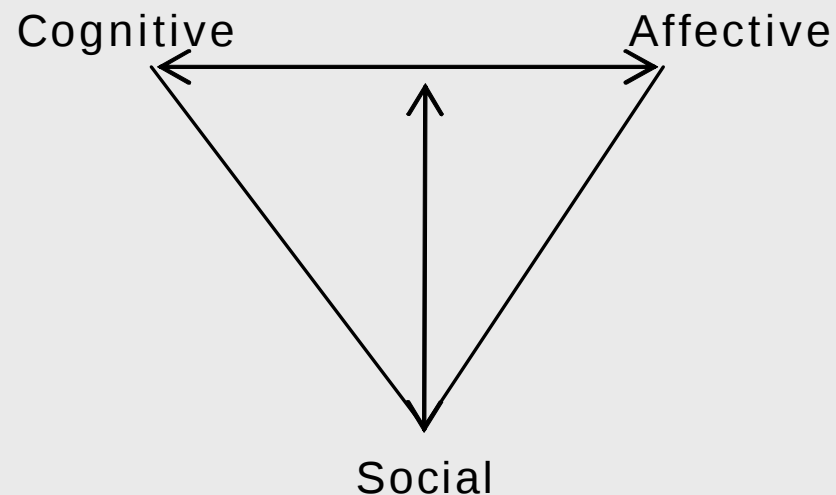


Figure 1. Three dimensions of the learning process.
Source: Illeris, (2003b: 400, Figure 2)

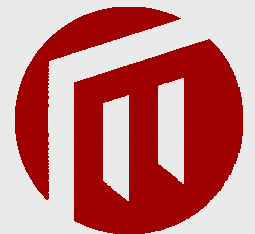
Forskning inom vuxenutbildning

Danmark

- Knud Illeris
- Henning Salling Olesen
- Bjarne Wahlgren

Sverige

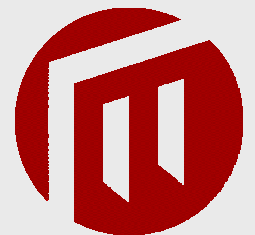
- Staffan Larsson
- Kjell Rubenson
- Per-Erik Ellström
- Bernt Gustavsson



Forskningsfältets etablering och utveckling

Inom vuxenutbildning och fortbildning kan två parallella och kompletterande processer urskiljas:

- En *institutionaliserings-process* som inrättar särskilda skolor för vuxna vid sidan om skolor för barn och ungdomar.
- En *deinstitutionaliserings-process* med fokus på vuxnas lärande utanför skolan.

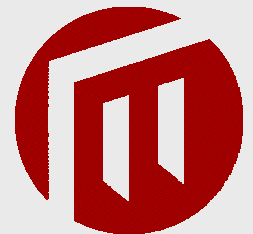


Forskning inom vuxenutbildning

- Staffan Larsson (2006). *Didaktik för vuxna*. Vetenskapsrådet

Professor i vuxenpedagogik, Linköping
Universitet

- **Men** - inget intresse för vuxnas matematiklärande



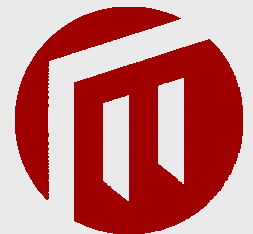
MALMÖ HÖGSKOLA

Matematikens didaktik som forskningsområde

Det överordnade syftet för matematikens didaktik kan formuleras kritisk-konstruktivt som:

- att *undersöka och försöka forma människors förhållande till matematik i vårt samhälle.*

(Inspiration: Fischer, 1993)



MALMÖ HÖGSKOLA

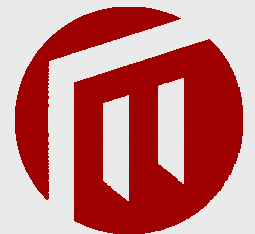
Matematikens didaktik som forskningsområde

Studieobjektet omfattar

”matematikundervisningens problemfält i hela
dess komplexitet”.

(Christiansen, i slutet av 1980-talet)

Men – inget intresse för vuxna



MALMÖ HÖGSKOLA

What do we need to know?

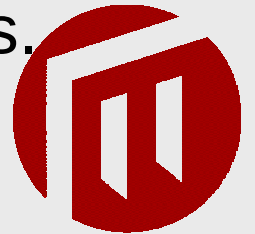
Diana Coben, 1992:

The main problem:

- No contact between adult numeracy teachers and researchers in adult and/or mathematics education.

Research issues:

- maths anxiety; gender and maths; maths implicit in traditional crafts of many cultures.



MALMÖ HÖGSKOLA

Challenges and issues

Iddo Gal, 1993:

Research is lacking in most areas related to numeracy provision.

Key problems:

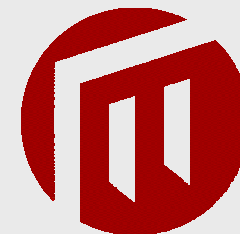
- transfer of numerical skills from the classroom to actual practice;
- how adults' everyday experiences and knowledge can be used to facilitate learning



Forskningsöversikter

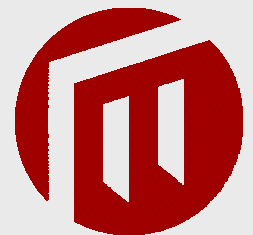
I *International Handbook of Mathematics Education* (Bishop et al. , eds.):

- FitzSimons, G. E., Jungwirth, H., Maasz, J. & Schlöglmann, W. (1996). *Adults and mathematics (adult numeracy)*.
- FitzSimons, G. E., O'Donoghue, J. & Coben, D. (2003). *Lifelong mathematics education*.



Forskningsöversikt mer omfattande

Coben, D. et al. (2003), *Adult Numeracy: A review of research and related literature*. London: National Research and Development Centre for Adult Literacy and Numeracy.

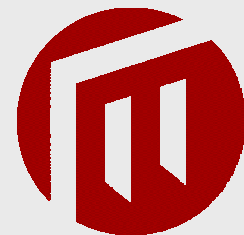


MALMÖ HÖGSKOLA

Forskningsöversikt: en lokal

Wedgege, Tine (In press). Adults learning mathematics: research and education in Denmark.

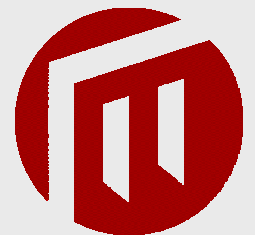
In B. Sriraman et al. (eds.), *The Sourcebook on Nordic Research in Mathematics Education*. Charlotte, NC: Information Age Publishing.



MALMÖ HÖGSKOLA

Vad studeras i ALM?

(Adults Learning Mathematics)



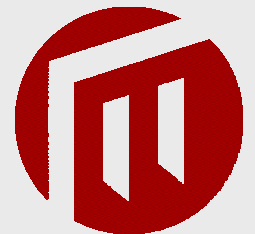
MALMÖ HÖGSKOLA

De vuxna som studeras I

Vuxna med kort utbildning

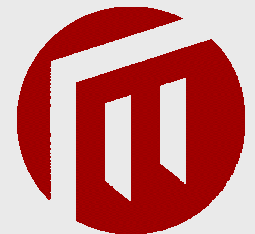
- who are engaged in a range of social practices, such as working (or seeking work), parenting and caring for other dependents, budgeting and organising consumption, voting, etc.

TSG6 ICME10: **de-institutionalisering**



MALMÖ HÖGSKOLA

Kvalitetskontroll



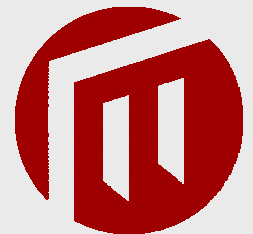
MALMÖ HÖGSKOLA

De vuxna som studeras II

Vuxna med kort utbildning

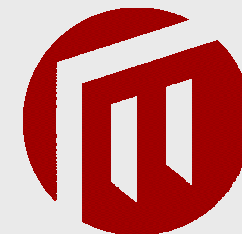
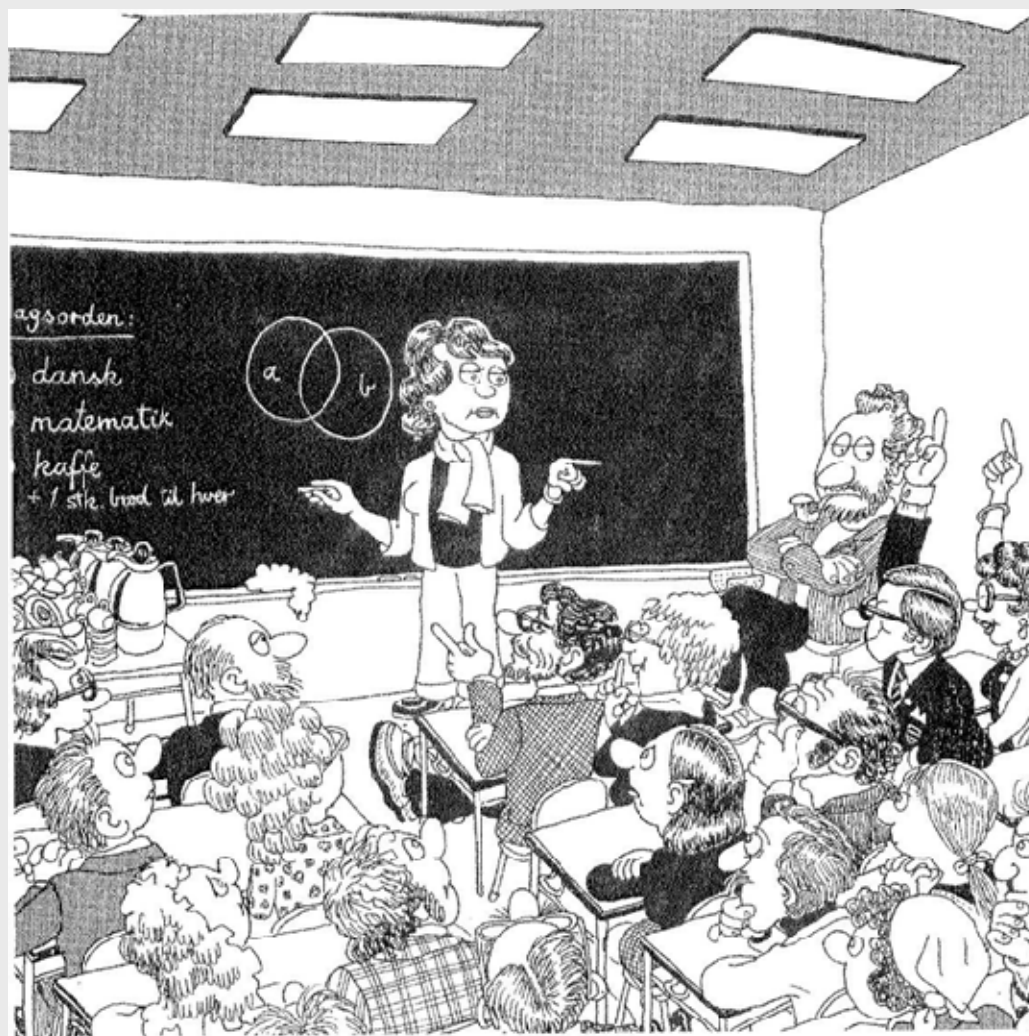
- who start, resume or continue their education in formal, informal or non-formal settings, beyond the normal age of schooling in their societies.

TSG8 ICME11: **institutionalisering**



MALMÖ HÖGSKOLA

"Tillbaka på skolbänken"

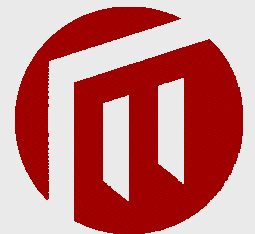


MALMÖ HÖGSKOLA

Matematiken som studeras

Med *matematik* menar vi många olika aktiviteter och kunskaper, inkl. akademisk matematik, yrkesmatematik, etnomatematik, folkmatematik och vuxnas numeracy.

TSG6 ICME10



MALMÖ HÖGSKOLA

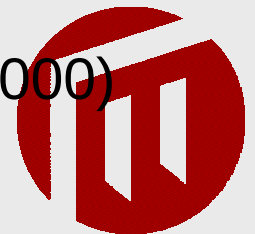
Lärande som studeras

Informal education means the lifelong process whereby adults are learning mathematics in everyday life (e.g., work, family, leisure, society).

Formal education refers to the adult educational system from adult basic education and vocational training through further and higher education.

Non-formal education is defined as any educational activity organized outside the established formal system that is intended to serve identifiable learning objectives.

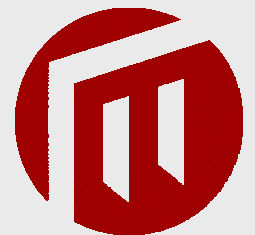
UNESCO (2000)



MALMÖ HÖGSKOLA

En central problemställning

=> Numeracy



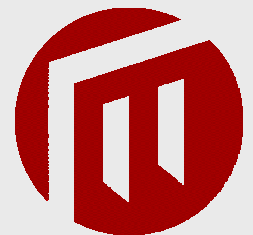
MALMÖ HÖGSKOLA

”Transfer” mellan skola och vardag och vice versa

En central problemställning:

- The so-called “transfer” of mathematics between school and everyday – and vice versa – is not a straightforward affair
(Evans, 2000).

Transfer (Sv: överföring) används ofta som metafor

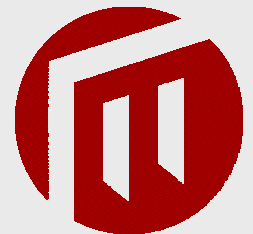


Numeracy bygger broar

Nyckelbegreppet är *numeracy* och problemfältet är relaterat til vuxna, matematik och livslångt lärande i en samhällsmässig kontext.

Men begreppet numeracy är omdiskuterat

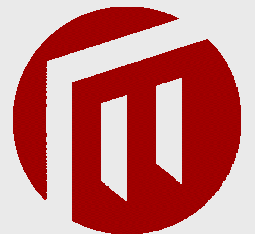
- Se David Kaye “Defining numeracy” – a selection of definitions (in ALM 14)



Numeracy bygger broar

Frustrated with a mathematics whose history kept it within strong disciplinary boundaries (...) We colonized numeracy, permitting, indeed requiring, it to be a bridge between mathematics and society

(Johnston & Yasaka, 2001, p. 291)

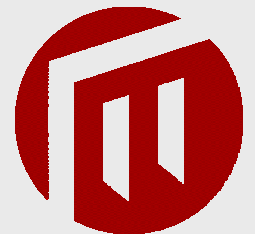


MALMÖ HÖGSKOLA

Numeracy bygger broar

Our basic premise is that numeracy is the bridge that links mathematical knowledge, whether acquired via formal or informal learning, with functional and information-processing demands encountered in the real world.

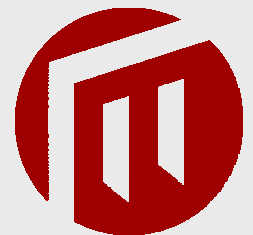
(Manly, Tout, van Groenestijn & Clermont,
2001, p.79)



MALMÖ HÖGSKOLA

Numeracy bygger broar

To be numerate means to be competent, confident, and comfortable with one's judgements on **whether** to use mathematics in a particular situation and if so, **what** mathematics to use, **how** to do it, what **degree of accuracy** is appropriate, and what the answer means in relation to the context. (Coben, 2003, p. 10)



Numeracy – Nyckelbegreppet

Två karakteristiska drag – funktionalitet och kontextualitet:

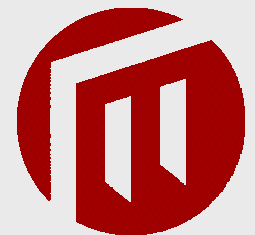
- *Numeracy* consists of functional mathematical skills and understanding that in principle all people need to have.
- Numeracy changes in time and space along with social change and technological development.

(Lindenskov & Wedege, 2001, p. 5)



Forskningen i ALM

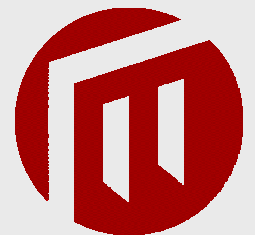
Tre exempel



MALMÖ HÖGSKOLA

Vuxna lär matematik - ett problemfält

En aktuell bild av internationell forskning om vuxna och matematik med fokus på – och exempel från – samspelet mellan forskning och utbildning.



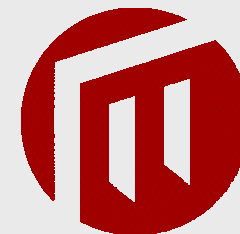
MALMÖ HÖGSKOLA

Vuxna lär matematik – ett problemfält

Det överordnade syftet för matematikens didaktik kan formuleras kritisk-konstruktivt som:

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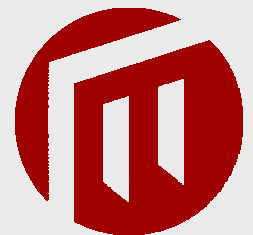
(Inspiration: Fischer, 1993)



MALMÖ HÖGSKOLA

Tre fält relateret til vuxna som är engagerade i specifika sociala praktiker:

- Adults as parents (Civil)
- Adults as landless peasants (Knijnik)
- Adults as nurses (Coben)

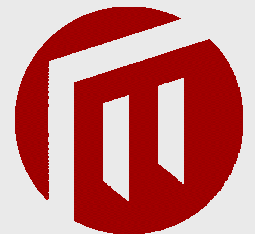


(1) Working with parents

- Why do adults return to study mathematics?

One of the main reasons is that they want to help their children with the homework.

(Swain et al., 2005)

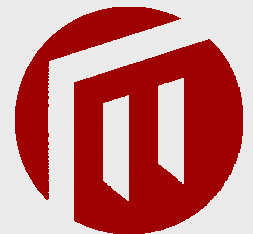


Working with parents

The problem

- There is a connection between students' performance in mathematics and parental engagement and family involvement.
- There is evidence that low-income families usually have fewer opportunities to engage in their children' education than middle or upper class families.

(ALM and International Journal, 2008, 3(2a &b))



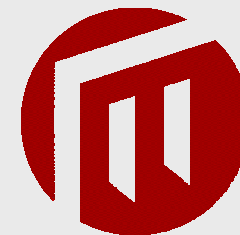
MALMÖ HÖGSKOLA

Working with parents

“To study and to form”:

The issue studied and discussed in this subfield is how parents - in minority and working-class communities - become helpers of their children in doing mathematics.

A key issue: The need to transform parents' own perceptions about themselves as learners and doers of mathematics.

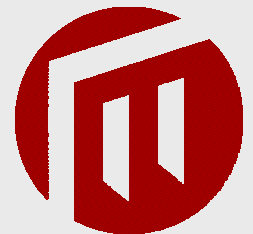


Working with parents

Expressed by Civil:

“Our goal is to develop teaching innovations in mathematics that capitalize on students’ (and their families’) knowledge and experiences from everyday life”

(1999, p. 216)

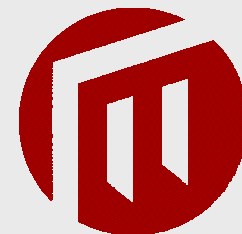


MALMÖ HÖGSKOLA

Working with parents

At ICME11, in 2008 Javier Díez-Palomar et al from the new generation of researchers was “Drawing from a parents perspective”.

- Guest editor at the ALM Journal special issue on “Parents’ involvement in mathematics education: looking for connections between family and school”.

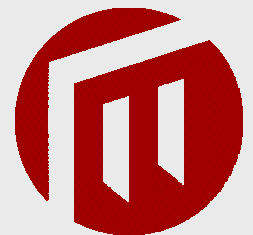


Working with parents

Ethnomathematics /Adult education

Civil (2004) refers to Knijnik's description of her concept of an *ethnomathematical approach*:

- research into the conceptions, traditions, and mathematical practices of a specific subordinated social group and *pedagogical work* involved in making the group members realize that:



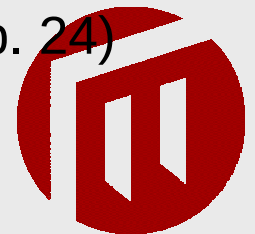
Working with parents

Ethnomathematics /Adult education

.... making the group members realize that:

1. they do have knowledge;
2. they can codify and interpret their knowledge;
3. they are capable of acquiring academic knowledge;
4. they are capable of establishing comparisons between these two different types of knowledge in order to choose the more suitable one when they have real problems to solve.

(Knijnik, 1993 p. 24)

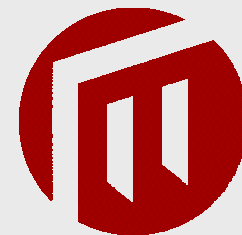


MALMÖ HÖGSKOLA

(2) Ethnomathematics

I have argued that conceptions like ethnomathematics and folk mathematics have expanded the problem field of mathematics education and paved the way for studies of adults' mathematics in everyday, working and societal life.

(Wedege, 2003)



MALMÖ HÖGSKOLA

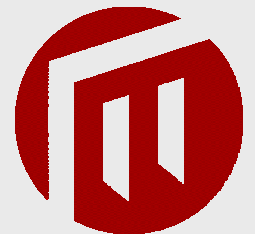
Ethnomathematics

from a socio-political perspective

The problem

- “A given social group, in this case the rural workers, practises a different mathematics from that produced by academe, and therefore not socially legitimate. How does one deal pedagogically with this cultural diversity, in the case mathematical diversity?”

(Knijnik, 1997 p. 89)

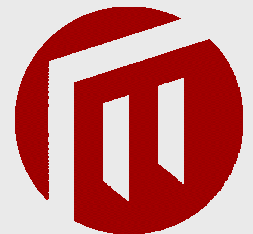


MALMÖ HÖGSKOLA

Ethnomathematics from a socio-political perspective

Knijnik (2007) problematizes the dichotomy between "high" and "low" culture in mathematics education on the basis of empirical data from field work with peasants from the Brazilian Landless Movement:

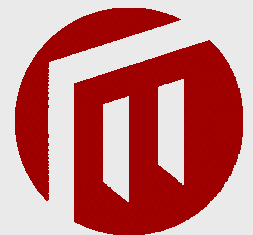
- Peasant oral mathematics vs School written mathematics



(3) Numeracy for nursing: The problem

That poor numeracy can be life-threatening for the patient was stressed by Meriel Hutton at ALM4:

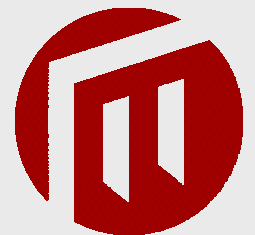
- “That nurses need to be competent in the mathematics involved in calculating fluid balance, drug dosages and intravenous drip rates is generally accepted. **However**, nursing students have been shown to perform poorly in written tests of the relevant mathematics.” (1998, p. 192)



Numeracy for nursing: The problem

10 years later this problem is reformulated by Coben and her colleagues, 2008 ICME11:

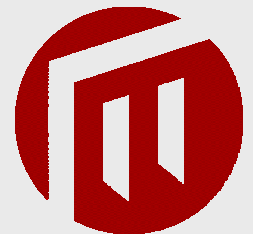
“Numeracy is recognized as a key skill for professional practice in nursing, yet successive studies present a picture of lack of proficiency within both the student population and amongst registered nurses.”



Numeracy for nursing: The problem

But Coben and her colleagues do not stop there they point to **another problem**:

There is no recognized standard for numeracy for nursing. In absence of a benchmark – or diagnostic assessment – it is difficult to determine which skills require development, or to ascertain when competence has been achieved.

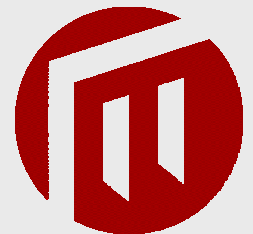


Numeracy for nursing: creating a benchmark

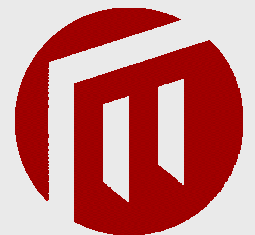
And this is the problem that they intend to solve in two big research and developmental projects:

- creating a benchmark for numeracy for nursing.

Challenge: combine the ALM principles with requirements for standards and assessment.



Vuxnas vardagskunskaper ?

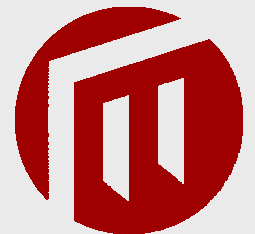


MALMÖ HÖGSKOLA

Vardagskunskaper

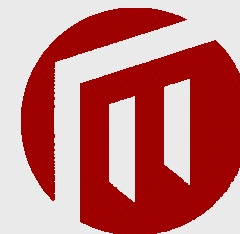
I. Kunskaper **vunna** i vardagen, dvs. kunskaper som en individ har förvärvat och som sas tillhör dennes kognitiva repertoar.

- Wistedt, 1990, *Vardagskunskaper och skolmatematik*



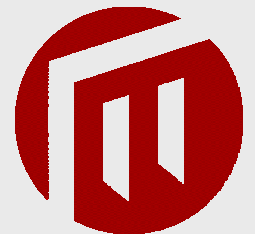
Vardagskunskaper

- I. Kunskaper **vunna** i vardagen, dvs. kunskaper som en individ har förvärvat och som sas tillhör dennes kognitiva repertoar.
 - II. Kunskaper **önskvärda** i vardagen, dvs. kompetenser och färdigheter som människor inte behöver ha förvärvat men som de kan antas ha nytta av i vardagslivet, för att bl.a. kunna tillvarata sina rättigheter och fullgöra sina skyldigheter som samhällsmedborgare.
- Wistedt, 1990, *Vardagskunskaper och skolmatematik*



Vardagskunskaper – en utbildningsvetenskaplig problemställning

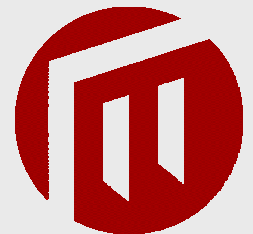
- Skolkunskaper kontra vardagskunskaper är en grundläggande problemställning i all matematikutbildning – och i utbildningsvetenskap.



Vardagskunskaper – en utbildningsvetenskaplig problemställning

För lärande i matematik gäller:

- Att kunna "ren" matematik medför icke automatisk att man kan tillämpa matematiken. (Skovsmose, 1994)



Vardagskunskaper – en utbildningsvetenskaplig problemställning

För lärande i matematik gäller:

- Att kunna "ren" matematik medför icke automatisk att man kan tillämpa matematiken. (Skovsmose, 1994)

Och tvärtom:

- Att vara matematisk kompetent i vardagen medför icke automatisk att man kan klara skolmatematiken.

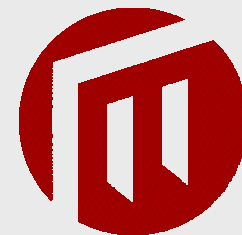
(D'Ambrosio, 1985; Mellin-Olsen, 1987; Lave, 1988; Wedege; 1999; Wedege & Evans, 2007)



Vardagskompetenser i matematik

- *Mathematical literacy* is an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen.

PISA, Theoretical framework 2003/2006



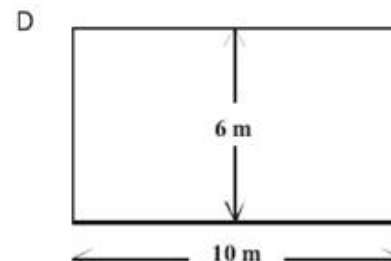
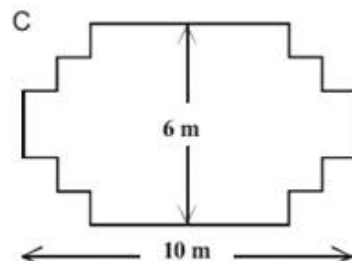
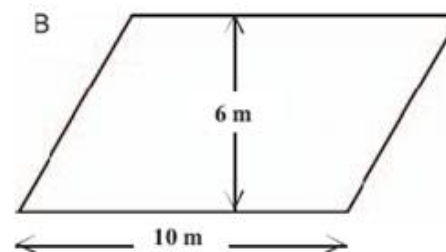
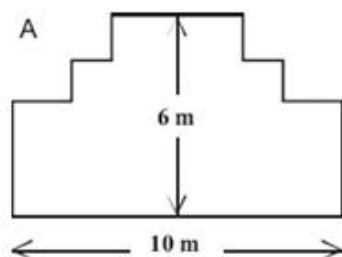
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PISA 2003 (15-årige)

SNICKARE

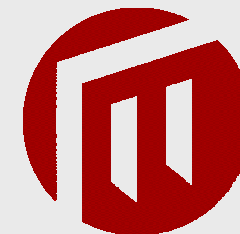
Fråga 1: SNICKARE

En snickare har 32 meter virke och vill bygga en kant runt en blomsterrabatt. Han funderar över följande designar på rabatten.



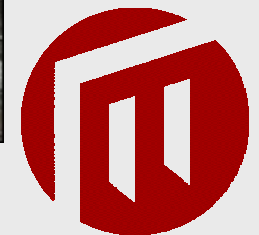
Ringa in antingen "Ja" eller "Nej" för varje design för att visa om kanten kan byggas med 32 meter timmer eller inte.

Design på rabatten	Med denna design, kan kanten byggas med 32 meter virke?
Design A	Ja / Nej
Design B	Ja / Nej
Design C	Ja / Nej
Design D	Ja / Nej



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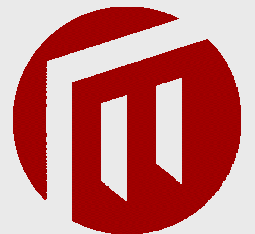
Fra Anlægsfirmaet *Junckerhaven*



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Vardagskompetenser i matematik

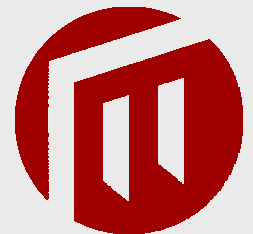
- *Numeracy* is the knowledge and skills required to effectively managing the mathematical demands of diverse situations.
- ALL – Adult Literacy and Lifeskills survey



Typisk testuppgift från IALS, All, ... Adult literacy surveys

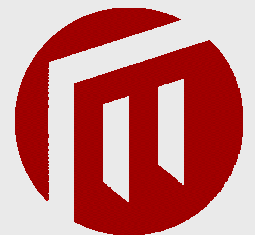
- For an evening's home entertainment, six friends hire two video tapes at £2.50 each and order a take-away pizza that costs £19.66.
- 'What is the total cost?
- How much does each person have to pay?'

(ALM-8, Dhamma Colwell)



- Det finns inga kompetenser – endast kompetenta människor!

(Wedege, 2000; 2002; 2003; ...)



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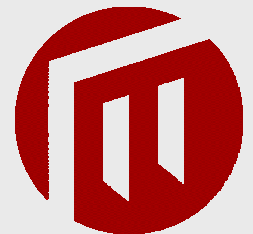
Utmaningen

Alla som sysslar med utbildning vet att det är ett spänningsfält mellan

- Samhällets – och skolämnenas – generella krav

OCH

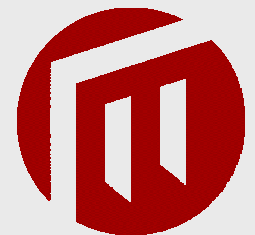
- Individens kompetenser och subjektiva behov.



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Utmaningen

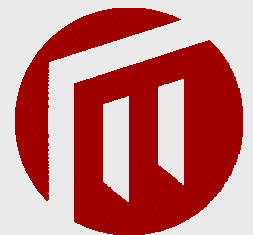
- Inom utbildningsvetenskaplig forskning är utmaningen att kombinera samhällets generella krav av kvalifikationer med individens kompetenser och subjektiva behov.



Utmaningen

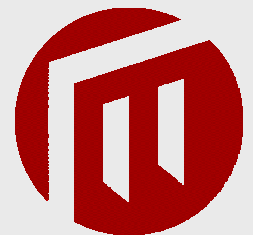
Två komplementära tillgångar i forskningen:
generell vs subjektiv.

- Den generella och den subjektive tillgången – krav och behov – ska kombineras i forskningen. (Wedege, 2000, 2004, 2009)



Vad räknas?

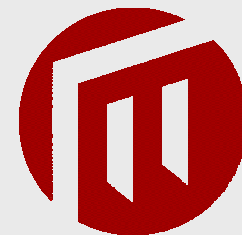
- *Mathematics counts*, Cockcroft 1982 (krav)
- *Adults count too*, Benn 1997 (behov)
- *What counts as mathematics?* FitzSimons 2002 (krav och behov)
- *Adults' Mathematics Count*, Wedege 2009 (behov och krav)



Vuxnas matematik: I arbetet och för skolan

- Skolkunskaper kontra vardagskunskaper är en grundläggande problemställning i all matematikutbildning för vuxna
- Vanligtvis riktas intresset mot människors kompetens att använda matematik ifrån skolan i vardagen, men i detta forskningsprojekt går intresset i den andra riktningen.

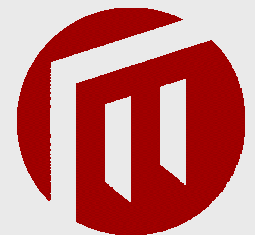
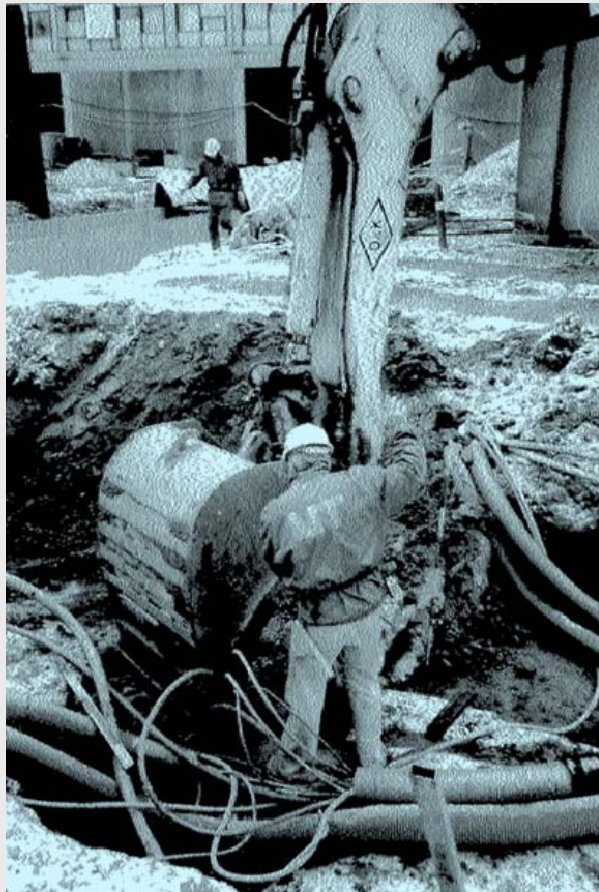
(Internationalt forskningsprojekt 2010-2013)



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"Dikesgrävning" i verkligheten

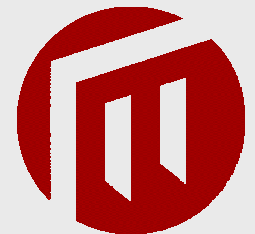
(Wedege, 1998)



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