

ALM11 Conference

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Plenary Lectures

1: Prof Bernt Gustavsson: **Folkbildning, bildning, utbildning.**

This lecture takes the point of departure in the nordic tradition of popular-democratic education.

It can be considered how a german concept of Bildung is transformed in a new context, in the popular movements in the phase of industrialism and democratisation of society.

The next step is to show how this tradition can be transformed into a new view in order to meet the strong reduction of education and knowledge, which has taken place from 1985, a reduction which can be analysed in economic terms, human capital, or technocratic terms. How can the democratic and humanistic dimensions of education and knowledge be reconsidered?

This step takes the point of departure in hermeneutic and pragmatic philosophy, and a concept of Bildung expressed in hegelian thoughts, and is followed by an analysis of knowledge in different forms connected to different activities and actions Man is involved in. Episteme is the scientific form where mathematics is considered to be the ideal activity, thechne is the productive or creative form, and practical wisdom connected to the human being as a social and ethical creature. This is an attempt to widen the understanding of education and knowledge with the intention to transcend it's instrumental development which has taken place in modernity.

2: Michaela Inglis: **“I said I taught the horse how to sing; I didn't say it learnt “: Issues underlying appropriate training for vocational uses of Mathematics.**

Due to the dominance of work in human existence (Straesser, 1996; Schrag, 1988), competence in a chosen vocation is of importance to the majority of the population. Such competence also extrapolates beyond that of the individual. It encompasses groups and therefore impacts on respective workforces. Cornford and Beven (1999) observed that a skilled workforce is the key to national wealth and economic ascendancy; an idea that has been seized upon by various governments around the world. One fundamental competency for effective participation in the workplace is the use of mathematical ideas and techniques (Mayer, 1992). This is particularly the case with regard to education and training, where the practical or functional application and use of mathematics has been identified in Australia as a key area (NCVER, 2001, p. 2).

Those around the world familiar with the pursuit of research into mathematics in the workplace would also argue that such a key area is of importance to workers of many other nationalities. This plenary will attempt to give some insight into the background of, and issues surrounding, mathematics education for, and within workplace environments.

3: Lars Gustafsson, Lars Mouwitz: **Adults and Mathematics – a vital subject**

The National Center for Mathematics Education (NCM) is a Swedish national resource center for mathematics education. In October 2001 NCM was assigned by the Swedish Government to carry out a survey and produce an analysis of the measures required to improve adult learning of mathematics. The results of this assignment were presented in the report *Vuxna och matematik – ett livsviktigt ämne (Adults*

and mathematics – a vital subject).

In the light of this report, and with reference to current ideological and scientific perspectives and background rationales, adults learning of mathematics is discussed. A special emphasis is put on the meaning of "mathematical proficiency for everyone" and this is contrasted with a more limited view of mathematics/numeracy as it often is expressed in national and international policy documents.

The report identifies five critical areas in which research and development work are a matter of particular urgency and which form the basis on which long-term development work will be based.

4: Lene Oestergaard Johansen: Bildung: a pseudo-justification or a hidden reason for adult mathematics?

The question "Why teach numeracy to adults with lack of basic mathematical skills?" has been the core question in my research for the last four years. I have used the new Danish adult education: Preparatory Adult Education (PAE) and the development of the New National Adult Numeracy Curriculum as a case of today trying to find answers to my question. From the beginning of my work I wondered 'can Bildung be an answer to the problem of justification?' knowing that the Concept of Bildung includes both ideals and ways of forming people to reach those ideals. I will present how Active Citizenship is a common ideal of human development in Denmark today shared by both politicians and researchers in adult numeracy education and that formal education also is a common argument as a way to reach this ideal, however how beautiful it seems and how much it looks like a united community of practise I will show and discuss the differences in the political and the researches discourse asking the question "Is Bildung the real reason for offering numeracy education to adults or is it a pseudo-justification?"

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Paper presentations, workshops, discussion groups

Ana Lúcia Braz Dias – Central Michigan University

This is a case study of mathematics teaching in an atypical school in Brasilia, Brazil. The City Park´s School is an open school, with flexible curriculum and diversified activities. It was created to attend the clientele of street children and adolescents or young adults in "assisted parole". Some of these students are homeless. Others have to reconcile school activities with work to supplement family income or as an only source of support to their families. The adolescents and young adults in this school can join the activities any time at their convenience, from 7:30 am to 6:00 pm. The school functions in an open space, a park in the center of the city close to the city´s major concentrations of formal and informal jobs. The school is also flexible in its reception of new students, accepting new members at any time of year. The program is individualized (although it comprises collaborative activities). Assessment is done on a daily basis and there is no grade retention. This study examines mathematics teaching in this setting, and aims at identifying the role that mathematics learning and the use of technology can play in the re-insertion of these homeless or convicted young adults into society.

Gail E. FitzSimons – Monash University

During the last 18 months I have had the privilege of visiting several workplaces under the auspices of two research grants. Building on a burgeoning corpus of research into how mathematics/numeracy is used in workplaces around the world, and using activity theory as a research methodology, my goal in the first was to gain further insights in the Australian context. This is in preparation for the next phase of my major research project which is to design an evaluative framework for new learning technologies in adult numeracy. A second, smaller project has involved investigating how mathematics/numeracy is learned on the job in the case of chemical spraying and handling. Activity theory will again play a useful part in the analysis.

Linda Galligan – University of Southern Queensland

Today more adults than ever before are studying at university. Preparation and support of these students for the mathematical rigours of university study requires that program designers have knowledge of teaching staff expectations within university courses and a clear picture of the numeracy demands of a variety of courses. Although the numeracy demands of traditional mathematically based courses are considered to be well understood, the demands of courses which are often considered to be non-mathematically based (eg in many arts, nursing, psychology, and business programs) are less well understood by students and teaching staff. Further, changes in curriculum in both universities and schools has created a blurred picture of these demands and the expectations of students and staff appear to have drifted apart. To clarify this picture a numeracy audit of some key non-mathematically based 1st year courses was undertaken along with a survey of all staff teaching first year courses. The results indicate that there was a mismatch between expectation and actuality, and that teaching staff were concerned about the mathematical abilities of entering students, generally in the areas of critical thinking and problem solving, and specifically in areas particular to their courses. The audit of courses and survey of staff identified many academic numeracy concerns not previously considered. The paper details how these concerns have been utilized in the development of preparatory and support programs within an Australian regional multi-mode university.

Eigil Peter Hansen – VUC Syd

Flexible Learning

Since 2001 I have been working on a model for flexible learning. In my class room you will meet adults learning Math hoping to finish at the G or E level. To meet the syllabus they have to work with different themes from everyday life and in the themes they will work with the appropriate mathematics. New pupils may start on Tuesdays (continuous enrolment), which means they will quickly have to learn to evaluate their own level, seek means to fill gaps and progress from there. Any pupil can at any given time find additional material either at a lower or a higher level within the various subjects. Because I want an abundance of and great variety in material and because my VUC lack money, much teaching is based on digital material, which they may print according to individual needs.

Among other things the possibility for the individual

- To spend adequate time on the different subjects
- To acquire the necessary skills
- To fill knowledge gaps
- To work at her / his own pace
- To work with the material which suits her / him the best e.g. books, pc, video, internet, theory, exercises

In my presentation I will share my ideas and experiences with you. My plan is to show you how all this can be coordinated into a teaching programme the pupils and other teachers can fathom.

Torkel Haugan Hansen - Vox

The main objective in my ph.d.-project is (1) to establish and visualize mathematics as a general competence in the modern labour market in Norway and (2) to analyze and characterize the mathematical competences of adults with significant work experience, in order to better adapt adult education to this group.

The paper discusses a qualitative study which has been made as a pilot-study for this research. The study involves one single worker that has been observed at work and interviewed in order to localize the mathematical competences in its job-function.

A vital assumption based on earlier empirical studies is that some of their mathematical competence is in form of tacit knowledge. An indication is that "No" is a common answer among workers when they are asked whether they use mathematics in their job. The study design is based on theories on tacit knowledge, and

made in order to identify and externalize this into explicit knowledge.

The subject of the pilot-study works at a cafeteria in connection with a nursing home. The job consists of buttering buns and sandwiches, making waffles and coffee, receiving payment and giving out change, warming and serving dinner, keeping the premises tidy and washing dishes.

The findings show that mathematics/calculations were used in a number of situations in this job-function. Technological appliances were available to help the worker with the majority of these tasks, but not always used. This seems to depend more on the time pressure and the demand for accuracy, than on the difficulty of the mathematical problem. When something had to be done fast and accurate, the technological appliance was used. In situations where these factors of stress were not that present, they were disregarded as "superfluous and bothersome". This finding will be studied further as a result of this pilot, to investigate whether time pressure and accuracy demand (and possibly other stress factors) are variables that more generally affects how workers use appliances to solve mathematical problems.

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Jens Langaap – Universität Hamburg

In the centre of my work are adults who acquired only rudimentary mathematical knowledge, which is not always adequate to manage simple everyday problems. Their innumeracy is described as a consequence of developmental dyscalculia. At the moment I'm teaching ten female students (26 to 51 years old) with little mathematical knowledge, to whom I'm giving single lessons. The aim is an individual access to mathematics and the development of fundamental mathematical competence. In cooperation with the students I create individual instruction sequences, where we start with everyday life situations and subjects of the students life and interest. In the course of the process the students express the meaning of their innumeracy for their own lives. They talk about how they manage their everyday life referring to mathematical demands, about their psychological and mental burden and their attitudes to mathematics. In this report I'd like to draw a first picture of these statements and to introduce to my concept.

Terry Maguire and John O Donoghue – University of Limerick

A national survey of tutors in Ireland clearly demonstrated that tutors who teach adult numeracy in Ireland are not a homogenous group. Tutors differ both in terms of their conceptualisation of what constitutes numeracy and their beliefs about mathematics. They are working in a wide range of education and training environments and are driven by a diverse array of organisational imperatives. Three categories of numeracy tutor were identified based on the type of mathematics/numeracy that they delivered.

Category 1: Non-accredited customised numeracy programme

Category 2: Vocational Numeracy (mathematics related programmes)

Category 3: Formal Mathematics (nationally accredited adult mathematics programmes)

This paper discusses the different profile of tutors and the range of training needs that were identified within each category.

Further the paper discusses the use of both "traditional" and "reform" models of professional development (Richardson, 1998) and explores how effective professional development opportunities can be designed to meet the range of training needs identified for each category of tutor whilst taking cognisance of individual tutor motivation and learning style.

The paper concludes by considering the potential of "learning communities" which can provide opportunities for continuous learning and reflection, in supporting the professional development of adult numeracy tutors.

Marja-Liisa Malmivuori

Essential qualities and differences in students' mathematical self-system structures.

The study to be presented relates to the idea of self-systems and self-system processes as the broader theoretical framework for describing the essential structures and dynamical qualities of students' personal

mathematics learning processes and experiences. Self-systems point here to important habitual and structural personal metacognitive, cognitive and affective sets or systems and behavioural patterns constructed through past mathematical experiences. Accordingly, in this study we will construct connections between the kind of students' mathematical beliefs, affective responses and mathematics learning behaviours that have also in previous math education research turned out to play a significant role in math learning and problem solving for school students as well as for adult students. Moreover, research results of the variations in these self-system structures along with students' gender and math achievement level will shed light on the development of individual differences in personal mathematics learning. Special attention is paid to the differences in the qualities and connections of students' self-perceptions, anxiety responses and self-regulatory behavioural patterns. Quantitative data from the measurement of Finnish secondary school students' self-system structures are applied to illustrate the essential qualities and divergences in these personal structures.

Kay Owens – Charles Sturt University

Although the majority of our primary school teacher education students enter with a positive attitude to mathematics, their understanding of mathematics is challenged in a problem solving and investigative subject. The subject involves the use of computers. It is a challenge to keep them positive about ICTs and mathematics while challenging their beliefs. The students who are not so positive and have difficulties with either the mathematics or the technology need support. This paper looks at the support that is provided and the outcomes of the subject. One successful focus has been on the links between their understanding of mathematics, its application in a community project and their role as a future primary school teacher. Another has been the nature of the computer laboratory classroom learning experiences.

Katherine Safford-Ramus – Saint Peter's College

Over the course of the past two years I have read approximately sixty doctoral dissertations about adult mathematics education research in North America. Several of these dissertations reported research on intervention programs that attempted to enhance the learning experience of the students. In this session I will present descriptions of the intervention strategies that were implemented and report the findings of each researcher on the level of success that their program achieved.

Geoff Wake – University of Manchester

Mathematics educators often turn to the world of work in an attempt to understand how mathematics in workplace practice might:

- inform design of future curricula;
- provide contexts for realistic mathematical activities to support learning.

Some studies aimed at informing the former of these have attempted to identify appropriate mathematical content by recognising its use or required understanding across a range of different workplaces and activities, and have, perhaps by necessity, used frameworks that rely on what might be considered "academic" mathematics to organise findings. Other particularly more recent, studies have used theoretical frameworks such as Cultural Historical Activity Theory to attempt to come to an understanding of how the mathematical activity of workers might be better understood by taking account of how the worker's activity is culturally and historically situated. Focussing on a particular mathematical activity within such studies often results in researchers pointing to how idiosyncratic tools and artefacts often mediate the activities of workers.

This paper will describe one case study based around the work of railway signalling engineers and the attempts of students on a pre-vocational engineering course to make sense of this. The different episodes of activity are analysed using these different frameworks and the resulting findings synthesised in an attempt to draw lessons for future curriculum development. Finally, reflecting on this research from the viewpoint of a curriculum developer, I consider how we might, in future, better inform curriculum design and development from workplace studies.

Topic Groups

Topic Group A

Juergen Maasz and Kathy Ramus Safford

One strength of our organization Adults Learning Mathematics (ALM) is the international character of the membership.

In each member country, prominent learning theorists shape the research agenda of the national adult education community.

This year participants in topic group A (Day 1) will be invited to articulate the theories that dominate their national dialogue.

At the second session, contributors will be invited to discuss the application of the various theories to our work in numeracy and their role in the future of our organization, ALM.

Topic Group B: Mathematics Education for the Workplace

Lisbeth Lindberg, Michaela Inglis

In keeping with the theme of ALM 11, the focus for the topic group this year will be on *Teaching and Learning for Mathematics Education in the Workplace*. In order to begin the dialogue, there will be a brief look at the content of the Topic Group from previous ALM Conferences, and then to discuss any research that is currently underway in the area of Mathematics Education for the Workplace.

At ALM 10, much conversation took place regarding different aspects of learning and knowledge. Specifically, debate centred around the lack of knowledge of any real research 'out there' regarding the *teaching and learning* of mathematics for the workplace. To investigate this dilemma, there will be the following focus questions:

1. What is mathematical knowledge in workplace contexts?
2. How is such knowledge acquired?
3. How can this process of accrual be identified?
4. What mechanisms/theories may assist in the teaching and learning of mathematics for the workplace?
5. What are the main issues/hurdles related to the teaching and learning of mathematics for the workplace?

The History

ALM 7: Topic Group started – Beginning conceptions

- There were vocational programs in upper-secondary schools with some people working in numeracy programs in workplaces.
- The group acknowledged that more work needed to be done in the area.

ALM 8: Focus on vocational aspects with many papers about collecting data in the field.

- Skills versus philosophy.
- Pure mathematics versus applied as found in the workplace.
- Literacy versus numeracy
- Direct uses of mathematics versus life-long learning.

ALM 9: What is happening in different countries?

- What basic skills are required?
- Is it possible to deal with numeracy in schools? Workplaces? Both? Neither?
- Collaboration between workplaces and schools:
 - o For the workplace?
 - o More mathematics
 - o Less Mathematics?
 - o Something else?

ALM 10: Began to look for "black holes" in research areas.

- Work being done in the packaging industry, and hospitals and nurses. These workplaces asked for help with their mathematics.
- Another project consisted of some wonderful tasks using mathematics, but the workers were not interested in looking at the mathematics involved. A question arose asking whether there are workplaces where the workers are hiding their lack of mathematics?
- One project involving lorry drivers and an oil union asked for a literacy program to supplement the numeracy program.
- An interest to focus more on competent workers than incompetent workers, to see how the competent workers are managing.
- Some discussion regarding useful methodologies to examine workplace mathematics.
- Many vocational teachers use a "rule of thumb" rather than to explain the underlying concepts.
- Mathematics teachers need to learn to communicate the "big ideas."
- Focus on learning and knowledge. Questions arose:
 - o How are we defining learning?
 - o How do we acquire mathematical knowledge?
 - o How do we know what learning experiences are important to go to the next level of

understanding?

o Differences to acknowledge and investigate:

<i>School Mathematics Learning</i>	<i>Workplace Mathematics Learning</i>
Person-centred	Task-centred
Purposefully learnt	Incidental
Individual errors	Team errors
Constant knowledge	Changing knowledge

There is a need for new projects on learning mathematics in schools, at work, and through life.

Topic Group C: Affective Factors in Adult Mathematics Learning

Convenor: Wolfgang Schloeglmann, University of Linz, Austria

This Topic Group continued its discussions at a well-attended meeting at ALM-10. At this meeting, there was substantial support for a continuation of this workshop at future ALM conferences. Topics of interest that were discussed:

- Categories of affect and research methods
- Meta-affect
- Affect and its influence on cognitive processes
- Affective and attitude results from the international surveys

This year, the convenor propose for discussion in the Topic Group

- Survey of the research in this area (e.g. McLeod, 1992; Evans, 2000; Evans/Hannula/Philippou/Zan, 2004);
- meta-affect and mathematics learning without understanding

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