

# Can Grounded Math and Education and Research Become Relevant to Learners

Allan Tarp

MATHeCADEMY.net

Allan.Tarp@gmail.com

TOPIC 03, presentation

## 1. Abstract

This presentation relates to the topic 3 question 3 about challenges to be overcome even if innovative teaching has been designed and initiated. The main question about mathematics education and its research is: 'If 50 years of research fails to solve the problems of math education, then what can?' The presentation allows the audience to give comments to the five section questions that are inspired by the Chomsky-Foucault debate on Human Nature.

Humans communicate in languages, a word-language and a number-language. We learn to speak the word-language in the family, and we are taught to read and write in institutionalized education, also mediating the number-language under the name mathematics, thus emphasizing the three r's: Reading, Writing and Arithmetic. Despite intensive research, international tests show that the learning of the number-language is deteriorating in many countries.

This raises two questions: May a change in mathematics, education and research make more learners reach the goal of math education? Is the goal of mathematics education to echo an inside university truth regime labelled mathematics, or to master the outside fact Many?

## 2. Education in general

On our planet, life takes the form of single black cells, or green or grey cells combined as plants or animals. Humans only need a few children in their lifetime, since transforming the forelegs to hands and fingers allows humans to grasp the food, and to share information through communication and education by developing a language when associating sounds to what they grasp. Where food must be split in portions, information can be shared through education.

Education takes place in the family and in the workplace; and in institutions with primary, secondary and tertiary education for children, for teenagers and for adults. English language does not have continental Europe's words for education using Plato's cave to picture learners as unformed and living below: Bildung, Unterricht, Erziehung, didactics, etc. Likewise, Europe still holds on to the multi-year line-organized office preparing education that was created by the German autocracy shortly after 1800 to mobilize the population against the French democracy, whereas the North American republics use self-chosen half-year block-organized talent developing education from secondary school. So, how well-defined is 'education'?

## 3. Mathematics and its education

The Pythagoreans used the word 'mathematics' as a common label for their knowledge about Many by itself and in space and time, arithmetic and geometry and music and astronomy. Without the two latter, mathematics later became a common label for arithmetic, algebra and geometry, which may be called pre-setcentric math, challenged by the present setcentric 'New Math' appearing in the 1960s, again challenged by a post-setcentric math seeing math as a natural science about its outside roots, Many, since setcentric mathematics never solved its self-reference problem that became visible when Russell showed that the self-referential liar paradox 'this sentence is false', being false if true and true if false, reappears in the set of sets not belonging to itself, where a set belongs only if it does not, and vice versa.

In any case, mathematics is a core subject in schools together with reading and writing. However, there is a difference. If we master the outside world by proper actions, it has meaning to learn how to read and how to write since these are action-words. But, we cannot math, we can reckon. Continental Europe taught reckoning, called 'Rechnung' in German, until the arrival of the New Math. When opened up, mathematics still contains reckoning in the form of fraction-reckoning, triangle-reckoning, differential-reckoning, probability-reckoning, etc.

Today, Europe only offers classes in mathematics, whereas the North American republics offer classes in algebra and geometry, both being action words meaning to reunite numbers and to measure earth in Arabic and Greek. So, how well-defined is mathematics and its education?

#### **4. The teacher and the learner**

It seems natural to say that the job of a teacher is to teach learners so that learning takes place, checked by written tests. However, continental Europe calls a teacher a 'Lehrer' thus using the same word as for learning. In addition, a Lehrer is supposed to facilitate Bildung, Unterricht and Erziehung and to foster competences. In teacher education, the subject didactics, meant to determine the content of Bildung, is unknown outside the continent. In the American high school, teachers have their own classroom to teach one subject; outside teachers must teach several subjects to students forced to stay in the same class for several years.

As to learners, the tradition sees learning taking place when learners follow external instructions from the teacher in class and from the textbook at home. Then constructivism came along suggesting that instead learning mostly takes place through internal construction when working with peers or with manipulatives. So how well-defined is a 'teacher' and a 'learner'?

#### **5. Research and conflicting theories**

Typically, research is seen as a search for laws predicating essence to an existent subject. But, is the subject the root or an example of its predication? Holding that existence precedes essence, Existentialism has no doubt, but what about other philosophical observations?

Using the word sophy for knowledge, the ancient Greek sophists warned against choice masked as nature whereas the philosophers saw choice as an illusion since the physical is but examples of metaphysical forms only visible to them when educated at the Plato academy as scholastic 'late opponents' defending their comments to an already defended comment against three opponents. Newton's natural science installed validation by unfalsified predictions instead, which inspired the 18th century Enlightenment period, which again created counter-enlightenment, so today research still uses Plato scholasticism outside the natural sciences.

Using classrooms to gather data, math education research could be a grounded natural science, but seems to prefer scholastics by researching, not math education itself, but theories on math education instead. But this raises questions about what to do with conflicting theories:

Within philosophy the Greek controversy between sophists and philosophers is revived today between structuralism on one side and French post-structuralism and American pragmatism on the other side. Within Psychology, Vygotsky sees education as building ladders from the present theory regime to the learner's learning zone, where Piaget replaces this top-down view with a bottom-up view inspired by American Grounded Theory allowing inside categories to grow from concrete outside experiences and observations. And Sociology fiercely discusses who constructs who in the relation between individual agency and social structure.

#### **6. References**

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