Recounting Before Adding Makes Teachers Course Leaders and Facilitators

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TOPIC 01, Research-based poster

1. Abstract

This PowerPoint presents innovative perspectives in educating math educators from the child's perspective, relating to the topic 1 question 2 about successful programs and essential contents, and to question 6 how primary teachers can become learning community facilitators.

Recounting in bundle-numbers allows teachers to secure that no students are left behind.

The three learning levels at the MATHeCADEMY.net allows a teacher to become both a facilitator for a professional learning community and a course leader initiating pyramid-organized professional development locally or globally on the internet. The open source inquiry-based material is organized as individual inspiration, group reflection and school development, thus creating self-sustaining learning communities that ensures sustainability. The learning levels are research based; and by seeing mathematics as a natural science about the physical fact Many, they develop the quantitative competence children bring to school, thus including all students despite diversity as to gender or ethnicity or social or cultural background.

2. Peter, stuck in division, until learning about recounting in flexible bundle-numbers

Being a mathematics teacher in an ordinary class and in an adult class, both showing severe dislike towards division and fractions, Peter is about to give up teaching when he hears about a one-day workshop on curing math dislike by recounting totals in flexible bundle-numbers.

Here 5 sticks are recounted in 2s in three different ways, overload and standard and underload, occurring as outside blocks, and inside bundle-formulas: T = 5 = I I I I I = II I I I = 1B3 2s = II II I = 2B1 2s = II II I₊ = 3B-1 2s. Likewise, if using ten-bundling: T = 57 = 5B7 tens = 4B17 tens = 6B-3 tens; or T = 567 = 56B7 = 50B67 = 60B-33 = 5BB6B7 tens.

Operations are eased by recounting in over- or underloads:

When dividing 336/7, 336 is bundle-written as 33B6. This is recounted as 28B56 that divided by 7 gives 4B8 or 48; or as 35B-14 that divided by 7 gives 5B-2 or 4B8 or 48.

Likewise, with subtraction: T = 65 – 48 = 6B5 – 4B8 = 2B-3 = 1B7 = 17; or T = 65 – 48 = 6B5 – 4B8 = 5B15 – 4B8 = 1B7 = 17.

Likewise, with multiplication: T = 7 x 48 = 7 x 4B8 = 28B56 = 33B6 = 336.

Likewise, with addition: T = 17 + 48 = 1B7 + 4B8 = 5B15 = 6B5 = 65.

A chatroom recommends watching the video 'CupCount and ReCount before you Add' (https://goo.gl/eBRFTy), and to download a 'CupCount & ReCount Booklet' for self-testing. Realizing its innovative potentials, he gives a copy to his colleagues, and they ask the school to arrange a free 1day Skype seminar in curing math dislike by recounting in bundle-numbers.

In the morning they watch the PowerPoint presentation 'Curing Math Dislike' confronting the three forms of mathematics, a pre- and a present and a post-setcentric version.

Present setcentric mathematics is called 'MetaMatism' as a mixture of 'MatheMatism', true inside a classroom but rarely outside where '2+3 = 5' is contradicted by e.g. 2weeks+3days = 17days, and 'MetaMatics', presenting a concept top-down as an example of an abstraction instead of bottom-up as an abstraction from many examples: 'A function IS an example of a set-product', instead of 'a function is a name for a formula with some unspecified numbers.'

The post-setcentric version is called 'ManyMath' by seeing mathematics as a natural science about the physical fact Many, to be counted and recounted in bundle-units before being added (or split) next-to or on-top. Here digits are icons with as many sticks as they represent. Likewise, operations iconize bundle-counting: a division broom pushes away bundles, to be stacked by a multiplication lift, to be pulled away by a subtraction rope, to look for unbundled singles, to be placed in a separate stack as decimals, or on-top counted as a fraction of a bundle. A 'recount-formula', $T = (T/B) \times B$, allowing a calculator predict that 'from T, T/B times, B can be taken away', occurs as proportionality all over mathematics and science.

The recounting seminar includes two Skype sessions with an external course leader.

Observing ManyMath curing math dislike, the school asks Peter to take in 1year e-learning course at the MATHeCADEMY.net, teaching teachers to teach MatheMatics as ManyMath. Peter here experiences PYRAMIDeDUCATION where 8 are organised in 2 teams of 4 teachers choosing 3 pairs and 2 instructors by turn. An external coach assists the instructors instructing the rest of their team. Each pair works together to solve count&add problems and routine problems; and to carry out an educational task to be reported in an essay rich on observations of examples of cognition, both re-cognition and new cognition, i.e. both assimilation and accommodation. In a pair, each teacher corrects the other's routine-assignment. Each pair is the opponent on the essay of another pair. Each teacher pays by coaching a new group of 8 teachers.

The four e-learning courses for primary and for secondary school are called CATS, inspired by the fact that, to deal with Many, we Count & Add in Time & Space.

Primary school mathematics is learned through educational sentence-free meetings with the sentence subject, thus developing tacit competences and individual sentences coming from abstractions and validations in the laboratory, i.e. through automatic 'grasp-to-grasp' learning. Thus, learning means asking, not the instructor but the subject talked about. Using full number-language sentences with a subject and a verb and a predicate as in the word-language allows modelling from the beginning by recounting both bundles, distances, time periods, money etc.

Secondary school mathematics is learned through educational sentence-loaded tales abstracted from and validated in the laboratory, i.e. through automatic 'gossip-learning': Thank you for telling me something new about something I already knew.

The material is inquiry-based with guiding questions. In primary school, the four sets of questions are as follows. COUNT: How to count Many? How to recount 8 in 3s? How to recount 6kg in $ with 2$ per 4kg? How to count in standard bundles? ADD: How to add stacks concretely? How to add stacks abstractly? TIME: How can counting & adding be reversed? How many 3s plus 2 gives 14? Can all operations be reversed? SPACE: How to count plane and spatial properties of stacks and boxes and round objects?

In secondary school, the four sets of questions are as follows. COUNT: How to count possibilities? How to predict unpredictable numbers? ADD: What is a prime number? What is a per-number? How to add per-numbers? TIME: How to predict the terminal number when the change is constant? How to predict the terminal number when the change is variable, but predictable? SPACE: How to predict the position of points and lines? How to use the new calculation technology? QUANTITATIVE LITERATURE, what is that? Does it also have the 3 different genres: fact, fiction and fiddle?

The three MATHeCADEMY.net learning level thus allows Peter to become a facilitator for a local learning community and a course leader initiating pyramid-organized professional development locally or globally on the internet. After coaching a learning pyramid at the school to allow eight other teachers to be trained as facilitators and course leaders, the school may ask Peter to take the secondary school course also so the school can become as a local centre for curing math dislike, thus allowing students to excel in both primary and secondary mathematics.

3. References

Tarp, A, 2018, "Mastering Many". Journal of Mathematics Education, vol 11(1), pp. 103-117.