Calculus and Linearity in Grade One Dramatically Improve College Performance

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Extended Abstract

Statement of the Theoretical Problem

Children use bundle-numbers with units as 2 3s to communicate about Many before school. And they recount to change units to add 2 3s and 4 5s on-top, and they add areas when adding them next-to. So, why don't school allow children to use their numbers to learn more linearity and calculus in grade one? Is it so by nature, or could it be different? Difference research (Tarp, 2018) may give an answer.

An Account of the Theoretical Proposal Being Made

Uniting unit-numbers as 4$ and 5$, or per-numbers as 6$/kg and 7$/kg or 6% and 7%, we observe that addition and multiplication unite changing and constant unit-numbers into a total, and integration and power unite changing and constant per-numbers. Reversely, subtraction and division split a total into changing and constant unit-numbers, and integration and power split a total into changing and constant per-numbers.

Recounting 8 in 2s as 8 = (8/2)*2 creates a recount-formula *T = (T/B)*B*, saying ' *"T* contains *Bs T/B* times*."*; and used to change units when asking e.g. 2 6s = ? 3s, giving the prediction *T* = (2*6/3)*3 = 4*3 = 4 3s.

Recounting 8 in 2s also provides the solution *u* = 8/2 to the equations as *u*2 = 8 = (8/2)*2; thus solving most STEM-equations, since the recount-formula occurs all over. In proportionality, *y = c*x*; in coordinate geometry as line gradients, *Δy = Δy/Δx = c*Δx*; in calculus as the derivative, *dy = (dy/dx)*dx = y'*dx*. In science as meter = (meter/second)*second = speed*second, etc. In economics as price formulas: $ = ($/kg)*kg = price*kg, $ = ($/day)*day = price*day, etc.

With physical units, recounting gives per-numbers bridging the units. Thus 4$ per 5kg or 4/5 $/kg gives *T* = 15kg = (15/5)*5kg = (15/5)*4$ = 3$; and *T* = 16$ = (16/4)*4$ = (16/4)*5kg = 20kg. With like units, per-numbers become fractions. Both are not numbers, but operators needing a number to become a number.

Trigonometry occurs as per-numbers when mutually recounting sides in a rectangle halved by its diagonal, *a = (a/c)*c* = sin*A*c*, etc.

Once bundle-counted, stacks may be added next-to, called integration, or on-top after recounting has made the units like. Reversed addition is called differentiation.

Per-numbers also add as integral calculus since multiplying to unit-numbers before adding transforms them into areas. With mixtures as 2kg at 3$/kg + 4kg at 5$/kg, unit-numbers add directly, but per-numbers *P* add by the area *A* under the per-number graph, found by slicing it thinly so that the change may be written as d*A* = *P**d*x* in order to use that when differences add, all middle terms disappear leaving just the endpoint difference, thus motivating developing differential calculus to find the per-number *A*' = d*A*/d*x* = *P* (Tarp, 2018).

Review of the Relevant Literature

To study 2-dimensional bundle-numbers with units, the existing literature on 1-dimensional line-numbers without units has little relevance since adding numbers without units is 'mathematism' (Tarp, 2018) meaningless outside the 'no-unit-math greenhouse' (Tarp, 202x). Here 2+3 =5 meets counterexamples as 2weeks+3days is 17days; whereas 2x3 = 6 always since 2 3s recount as 6 1s.

Instead, theoretical guidance comes from seeing mathematics education as an institutionalized goal-directed guidance of human brains, thus being theorized by sociology, philosophy, and psychology.

Here however, internal controversies necessitate choices to be made. In sociology, the bundle-number approach favours agency over structure by using Bauman, Habermas and Foucault; in

philosophy it favours empiricism over rationalism by using existentialism; and in psychology it favours nature over culture by using Piaget instead of Vygotsky.

Clarifying the Novel Contribution of this Particular Project

The goal of mathematics education is to master outside Many later by first mastering inside university mathematics, seen as a self-supporting science theorizing one-dimensional number sets organised by different operations.

As an alternative Kuhnian paradigm, 'Bundle-number Math' sees mathematics as a natural science about the outside fact Many as shown by the names 'geometry' and 'algebra' meaning 'earth-measuring' and 'reuniting' in Greek and Arabic. Here, the goal of mathematics education is to master Many with children's already own two-dimensional bundle-numbers with units, to master university mathematics later.

Accepting and developing the bundle-numbers with units that children create when adapting to Many, Bundle-number Math teaches, not numbers without units, but numbering with units, using functions from grade one as number-language sentences that, as in the word-language, contains a subject, a verb, and a predicate.

By counting and recounting before adding, bundle-numbers with units let children meet the core of mathematics in grade one including equations, proportionality, trigonometry, and calculus. The following years are footnotes to what is already known: the 'Algebra-square' showing how operations unite and split totals into changing and constant unit-numbers end per-numbers (Tarp, 2018).

Empirical Research that Could Test the Validity of the Theoretical Proposal

Bundle-number Math may show its validity in its ability to 'bring back brains from special education' (Tarp, 202x). It may also be tested outside the main track: in preschool, home schooling, adult education, migrant or refugee education; or where students may choose between different half-year blocks instead of having multi-year compulsory lines forced upon them.

Implication of this Work for Further Theory Development

The MATHeCADEMY.net provides material for pre- and in-service teacher education using PYRAMIDeDUCATION allowing professional development to take place on the internet in self-guiding groups with eight participants validating predicates by asking the subject itself instead of an instructor (Tarp, 2021). This allows Mastering Many with Bundle-number Math to be tested and developed worldwide in small scale design studies ready to be enlarged in countries choosing experiental learning curricula as, e.g., in Vietnam.

Implications for Practice

Mastering equations, linearity, and calculus in grade one dramatically improves college performance.

References

Tarp, A. (2018). Mastering Many by counting, re-counting and double-counting before adding on-top and next-to. *Journal of Mathematics Education, 11*(1), 103-117.

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