From the archives

The following observations are excerpted from Under the Banyan Tree *by Dick Tahta, which appeared in 17(2).*

It is all too easy for bystanders to comment on what happens in other people's classrooms. In describing a township classroom I am well aware that I have been fortunate enough to work in more flexible and much more lavishly supported contexts. And I should add that I ended with considerable respect for the teachers whose lessons I observed. Sitting in their classrooms was an eye-opener and I now find it difficult to see educational issues except through this opening. So I need to embed the sort of questions I would like to raise about classroom style and content in the sort of situation that these teachers have to work in. On the other hand, I do not want to particularise the context too much. After all, behaviourist psychology, covert violence, and a meaningless curriculum are not unknown in schools in affluent suburbs. So this is where I invoke my mythical lesson under the banyan tree. My proposal is that in order to identify what basic activities you would want to see in *any* classroom, you try to imagine them being enacted without any of the usual resources, without even a roof overhead.

My own answers would invoke a principle of economy according to which teachers work, whenever they can, with whatever powers students already own. One such power (in all except very exceptional cases) is the ability to conjure up and recall images. This provides a particularly economic access to mathematics. This is clearest in the case of geometry which can hardly be studied without some form of visual imagery. But there are various images derived from other senses than sight that may also be called upon. For example, almost all children have a sense of rhythm and some aural imagery which enables them to chant the number words of a first language in the right order. This is the power that I would want to invoke over and over again under the banyan tree or wherever else. "Them as counts counts moren than them as dont count." [1] Thus I would expect *any* group to be able to chant communally through various arithmetic progressions: for example, the even numbers, the multiples of nine and so on ... "Starting at 1,089 let's count backwards saying every 7th number." What, I would want to know, would be the point of doing any other number work with students who couldn't do *that*?

I have of course already begged a question by referring to such chants as counting. This is ordinal counting, namely counting in the intransitive sense—saying certain number-names in order. Current educational practice prefers to emphasise cardinal counting, namely counting transitively—counting a set of objects and finding the number-name for the set. It is relatively easy to count in the ordinal sense, but cardinal counting is another matter involving some quite sophisticated mathematical ideas. It can take a lot of time and attention for children to learn that the number of objects in a (finite) collection is independent of their nature, their position, or the order in which you count them. But by "just counting" you get what Caleb Gattegno used to call a "lot for a little". Thus the cyclic structure of the number system to base ten enables you to count up to a million knowing just the names of the first nine numbers and the powers *-ty, hundred, thousand.* This assumes you say things like "one-ty three" for 13; to use the correct English expressions requires you to know a few special anomalous forms like *thirteen*. You certainly get a lot from as little as twenty or so number-names.

The customary cardinal emphasis leads you to read 3 plus 2 = 5 as a statement about the cardinal number of a union of disjoint sets. But you could read it as "counting on" two places from the name "three" in an ordinal chant. You get a lot for a little by milking this second reading for all it is worth: in fact you get the four rules of arithmetic, as Philip Ballard pointed out seventy years ago.

The four fundamental processes in arithmetic are merely four different ways of counting. Adding is counting forwards, and subtracting counts backwards. In multiplying or dividing we count forward or backward by leaps of uniform length. [2]

Counting forward or backwards in uniform leaps might be seen as a natural and early example of linearity. Who would not be happy to work with a class which had mastered that, even if nothing else?

"Starting at 1,089 let's count backwards saying every seventh number." What, I would want to know, would be the point of doing any other number work with students who couldn't do that?

[1] In the words (and spelling) of the eponymous spokesman of Russell Hoban's novel, *Riddley Walker.*

[2] P Ballard, *Teaching the essentials of Arithmetic,* University of London Press, 1928, p 59.

For the Learning of Mathematics **37**, 1 (March, 2017)
FLM Publishing Association, Fredericton, New Brunswick, Canada