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July 2022

Box 12, Folder 11 - "The Sum of the Quantities Represented by the Number Rods..." (E.M.S.)

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Recommended Citation

Standing, Edwin Mortimer, "Box 12, Folder 11 - "The Sum of the Quantities Represented by the Number Rods..." (E.M.S.)" (2022). *Other Authors and Uncredited Manuscript Fragments, n.d.*. 6. <https://scholarworks.seattleu.edu/standing-fragments-other/6>

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Diagram

The sum of the quantities represented by the number rods above (i.e. the sum of the rods) is equal to the long 10 rod , plus the four pairs of rods - each pair making 10- plus the 5 rod . Now this is the same this as 10 multiplied by 5 , plus 5. Thus we can write :-

$$1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10 \quad 10 \times 5 \quad 5$$

Or , changing it round a little :-

$$5 \times 10 \quad 5 \quad 5 \times 10 \quad 5 \times 1 \quad 5(10 \quad 1) \quad 55$$

Now let us look at the number rods once more . That 5 rod by itself , looking a little lonely without a companion ... If we had another we could make 10 , so as to remind us that we are adding numbers up to 10 . Meditating thus we suddenly realize that 5 is half of 10 , so to remind us that we are adding numbers up to 10 we can write :-

$$5(10 \quad 1) \quad \frac{10}{2} (10 \quad 1) \quad \text{or more neatly} \quad \frac{10(10 \quad 1)}{2}$$

which is the same thing as $\frac{10 \quad 10}{2}$

Trying the same thing with the number rods up to 9 only , we find that we have four pairs of rods(each

making 9) and the 9 rod itself . Th is time our total comes to

$$1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \quad 9 \times 5 \quad \frac{9(9-1)}{2} \quad 45.$$

This we know must be the right answer as it must be the same as the sum of the ten number rods taken together (55) less 10 , that is the ten rod which we have just taken away .

Whatever number we tried in the same way - even if we had number rods up to 1000, the principle would be the same . We have , in effect , proved that given any number - say n - the sum of all the numbers

$$1 \ 2 \ 3 \ 4 \ 5 \ \dots \ n \quad \frac{n(n-1)}{2} \quad \text{or} \quad \frac{n}{2} \frac{n}{2}$$

and all this discovery we have made merely with the aid of a few pieces of painted wood , placed side by side in a certain pattern .

materials for a considerable time like the children themselves. "For we , too , if we repeat things we know , can also make discoveries .Something comes to out spirit , some unexpected phenomenon , something hidden and waiting to come to light " In this Montessori speaks from long personal experience . All her life she was constantly inventing fresh materials for new subjects , or making improvements on her previous ones , or finding new uses for them . We have already described (pp) how one day , working with the ten number rods - which she had known for thirty years - she suddenly discovered how they could be used to demonstrate the formula

1 2 3 4 5n

Yet in the ordinary way these same rods are used to teach the four year olds their first ^{sure} steps along the road of Number . During the Montessori Training Courses many a Montessori student , working with the materials , has made similar discoveries , thus verifying Montessori's statement that , "in this way we can do a work which brings us beyond the things we know " "Anyhow " she she continued - still addressing her students - " whether you do or not , that is how the children proceed , and you can observe it for yourselves . It is a kind of work which , all of a sudden gives us an intuition which makes us go beyond what we have seen , even beyond what we see . This is the way the child acts , and we are impressed by this phenomenon . We see the child , in this phenomenon of activity , driven on towards an unknown world to discover it . This is not a theory , a manner of speaking - but a v sober fact ."

After working for some time with the graded materials the children will often come up to the directress with some such question as these : "Are there any colours lighter than the lightest ? or darker than the darkest ? Are there any cubes smaller than the smallest in the Pink Tower ? If so how small could they be ? " A little girl I knew once was being introduced to decimal fractions , and learnt , in doing so , that there were mathematical quantities smaller than the units beads . Suddenly her eyes lit up with an intense joy and she exclaimed : "I have often wondered if there was anything smaller than the units , and now I know ! "

Always , as the child's mind develops and its horizon widens it tends to go beyond the limits set by the materials . To them , as to Tennyson's Ulysses

" all" experience is an arch wherethrough
Gleams that untravelled world , whose margin fades
For ever and for ever as I move "

They are like the pilgrims in Elroy Flecker's Hassan whose desire was "always to go a little further " .

At first the materials serve as a stimulus and a support , but there comes a time - not the same for each child or for each material -when they are felt to be more a hindrance than a help . Then the child automatically abandons the materials as his mind goes soaring into more abstract regions . He leaves them behind at the right moment just as an aeroplane takes off from the ground when it is ready to rise into the more ethereal medium of the air .

POINTS TO LOOK OUT FOR

1. Where corrections , alterations ,and blockings in etc. have been done , to see that the text reads straight-forward and makes sense .
2. Cover in with a strip of gum paper any erasions that have not been covered up .
3. Put a marginal comment in pencil - (?) by any sentences that seem obscure in expression
4. Make a pencil comment (repet.) next to any passage which seems to be an unnecessary repetition .
5. Many of the pages contain descriptions of children working with the materials . If it seems to you that it would help the reader to understand what it is all about it would be a great help to write the word (illustn) in the margin , and an illustration could be found .
6. If the pencilled corrections seem too faint in any places they should be gone over either in pencil or with a biro .