

with objects that can be seen and handled. It is easy to make number lessons too sensuous, as well as too abstract.

But I shall not here attempt to pass judgment on what is called the ratio method of teaching number. In actual practice a method is often much better than the theory which it is supposed to embody. Beautiful lessons in form and measurement can be given to young children, but in such lessons, when not made artificial, number is incidental. The measurements of lines, surfaces and solids, and the relations thus disclosed, belong primarily to geometry—the science of *space* relations, and may be made an important element in form training. Arithmetic deals primarily with *time* relations, and it would seem to be an error to make space relations the chief source of the child's ideas of number.

Permit me to add, with no special reference to the "ratio" method, that the early forcing of abstract relations and logical processes upon young children has been *a wide and serious error in primary instruction*, especially in arithmetic. In the past forty years, I have seen a half score of new methods of teaching number to young children, each attended with exhibitions of wonderful attainments. Forty years ago mental analysis was the hobby, and even primary classes were put through persistent drills in analytical reasoning. The marvelous feats in such reasoning by young pupils occasioned a genuine pedagogical sensation! An excellent training for pupils twelve to fourteen years of age was forced upon children as early as eight years of age. What was the result? Over thirty years ago one of the very ablest mathematicians in the United States, Dr. Thomas Hill, then President of Harvard College, (*Ohio Educational Monthly*, pp. 5-10, 168-173, Vol. II.) with unusual facilities for ascertaining the facts, published the opinion that this early training in analytical reasoning had not only been fruitless but "an injury to pupils." Pupils who were marvels in mental arithmetic at nine years of age became indifferent, if not dull, at fourteen. Teachers in grammar grades were surprised at the weakness of pupils in written arithmetic who had been prodigies in mental arithmetic in primary grades.

The Grube method, though not so great a pedagogical sinner, has had a similar history. What superintendent or teacher has found in the fifth or sixth school year arithme-