

in which he is at the moment interested. But such a snubbing is apt to destroy his interest altogether, so that it will be not forthcoming at the right time. It is entirely a matter for individual discretion when and how far to vary a programme that has been thoughtfully planned. All I say is that it must not be regarded as invariable. The variableness by no means neutralizes the advantage of having made it.

All the earliest teaching, and much of the later, should be oral. Oral and written teaching have each their peculiar advantages and peculiar difficulties. Oral teaching should be mainly catechetical; the sermon style is quite unsuited to mathematics. The persistent silence of a solitary student is sometimes too much for the eagerness of the teacher, and he may be thereby induced to make the mistake of telling the pupil what the pupil is capable of finding out for himself. Telling is not teaching. It is an advantage of corresponding teaching, which somewhat mitigates the grave defects of that mode, that the pupil is compelled to produce something for himself. Again, a class, especially a class of girls, is sometimes only too willing to let a forward pupil answer for all, and there is considerable difficulty in inducing some of them to speak. It may be wise in such a case to make the timid pupil begin by repeating the answer of her companion, and then to require her to put it into her own words.

The common practice of the elementary schoolmaster of so framing his question that it requires but a single word to answer it, is one against which I must protest, although it is so general as to induce the belief that is prescribed by authority. In my opinion this practice deserves to be suppressed like the other "missing word" competitions.

In the oral teaching of arithmetic, the teacher should seldom be satisfied with the right result: he should ascertain how it has been obtained. Possibly it has been obtained in a sound though clumsy manner; perhaps by performing mentally the process which would have been written down. In these cases a further lesson is needed. The methods appropriate to mental arithmetic are not those commonly used in written. The right result may be a mere guess or it may have been whispered by a neighbour. Not only in spoken, but also in written arithmetic and algebra, the answer is the least important part of the matter; but is absolutely necessary that the answer should be right. The habit of attending to the answer only should not be formed by teacher or pupil. The worship of the answer is idolatry. The greatest difficulty of all is the want of desire to learn; this has been alluded to. When it takes the extreme form of the hatred of knowledge¹² for its own sake, it is simply insuperable. Why people should not want to learn mathematics is a question that would carry us too far from our subject, which is how to teach and to avoid mistakes in teaching those who do want to learn. A main difficulty arises from that chain-like connection of the parts of Mathematics which, properly employed, facilitates the learning of it. A weak link in the mathematical chain breaks under the stress that the attempt to make further progress imposes upon it. A student, for instance, who has been allowed to use the sign—without understanding it, who has been contented with a mere "rule of sign," can never be trusted, can never trust himself, not to trip in the use of it. Consequently he cannot follow a

¹² Proverbs i, 22, 29.