6. The method should be by projects, which may cover a period of one hour or extend through several weeks.

7. Tendencies to be avoided:
   (a) An eclectic course of a little from each of the sciences as they have been arbitrarily defined by man.
   (b) Believing nothing in science is educational unless it is thorough.
   (c) The slavish use of crystallized general science in the form of a textbook.

SOME PRESENT LABORATORY METHODS INDICTED.

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Present methods of conducting laboratory work seem to include some absurdities. Eminent educators argued that the inception of the laboratory method of teaching would develop ingenuity and facilitate scientific reasoning. Now, this way of teaching has been in vogue for some time, yet the product turned out is neither more ingenious in his action nor scientific in his reasoning than the individual developed by the old school of education. Unquestionably, the laboratory method is a latent force that may stimulate the development of a more intelligent and ingenious citizen if conducted under correct conditions.

So far as my own laboratory work goes, so far as I have observed the laboratory work of others, and in so far as laboratory manuals have been perused, present ways of dealing with a pupil in the laboratory are quite similar to tactics pursued in fattening a goose. Let us imagine that the goose is caged. We prepare a pill and push it to him, expect him to swallow it and call it good. If he gets fat, we count ourselves fortunate, and if he remains lean, we say it was just our luck. Similarly, let us picture the student in the confines of the laboratory. Do we tell him what is to be done and then allow him to arrange materials at hand that he attains the goal? Do we ask him to do any constructive thinking, reasoning from the known to the unknown? Upon your life, we do no such thing! We penalize ingenuity and curb any outcrop of methodical reasoning if it does not coincide with our own. We put into the hands of the learner a set of printed directions with glaring offsets as follows: TITLE, OBJECT, APPARATUS, METHOD, SKETCH, CONCLU-
SIONS, etc. We say what is to be done, how it is to be done, what materials should be used and what conclusions should be reached. This statement may incite some quibble regarding the so-called "thought questions" that are often asked under the heading of conclusions, but really these interrogations usually dictate their answers. Is there any incentive for development of originality? If the boy puts the apparatus together any different than is specified in the directions, he is promptly reminded of the trail already blazed. Any chance for logical conclusions? Not a bit! What worries the pupil is how to manipulate the material so that the result indicated in the manual of directions will obtain.

Then, again, why all the writing? The usual laboratory method is thirty minutes of work and an hour of writing. Educators have tried to justify this writing by two reasons: (1) It may impress the operation more firmly on the mind of the learner, or (2) it may make a permanent record to which the child can refer. Both these reasons are askew from actual fact. Experience in conducting laboratory work leads me to believe that the impression of the experiment is made more lasting by doing the experiment three times, rather than doing it once and writing it up in twice the time it took to do it. A little memorandum is good, but too much writing defeats its own object. Nothing could be sillier than to believe that the notebook will be used for further reference except in very few cases. I pride myself on the notebooks I kept in physics and chemistry, but now these notebooks are curios and occupy no very important place on the shelves of my reference library. I have never looked inside the covers of either book unless it be to show how much pains I took with the drawings.

To be perfectly frank may not always be well, but just among us teachers of laboratory subjects, it appears to me that most of the writing in the laboratory notebook is a force for keeping the student busy rather than a matter of lasting impressions or the development of a valuable reference book. I have been guilty of having experiments painfully "written up" to keep the students busy. Was I alone in this? The educational value of such a procedure is, however, something less than zero. Is it not possible for us to plan our laboratory experiments in such a way that they will truly mean the development of ingenuity and a training in systematic reasoning? In addition, the requirement of painfully written descriptions is one that can stand a great amount of introspective scrutiny.