mendous disturbance over a small matter, I must emphasize that our whole teaching of physics is made up of small matters, and it is only by detecting and correcting these small faults, that we shall be doing the much-needed work of improving our teaching on this subject. The day will never come when we can say that our laboratories are perfect.

Note: The writer feels that his best thanks are due to the Detroit Automatic Scale Co., Detroit, Michigan, for their generous coöperation in the development of automatic springless scales for the use of physics laboratories. They are now prepared to furnish two types of scales with flat weighing platforms; one reading to 1,500 grams, and one to 500 grams. Anyone interested can learn more details by writing directly to the company.

INTERPRETATION OF RESULTS IN CHEMISTRY TEACHING.

BY JESSIE CAPLIN,

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A chemist employed in the technical testing of the raw material and finished product of a manufacturing plant visited in Chicago a school where the chemical methods used in that industry are taught in three months!! In discussing the value of such a course, the chemist said that it might be advantageous for the son of a man owning a small plant; but that for a chemist to be of real value, he must be able to interpret results.

What is the high school teacher teaching chemistry for?

When a large proportion of his pupils go to some college and continue work in the subject, he is foolish if he does not consider the freshman work demanded as well as entrance requirements. When newspapers and magazines contain in almost every issue items in which chemistry and its applications are so plainly concerned as to be headlined, the teacher is losing an opportunity of enhancing the interest in his subject and increasing its value if these items are not in some way related to class work. When the practical value of chemistry to industry is increasing each day, a statement of the varying phases of work to be done will often make the high school class a small but valued feeder through the university to the industrial laboratory.

The value of high school chemistry to those who go no further with the subject or with formal education is important. It can

give training in careful observation, exact statements, and logical thinking. This should be the underlying purpose whether preparation for the university, interest and judgment with regard to its commoner applications, or the turning of a very few to its specialized use in commercial laboratories is the aim.

The high school teachers of chemistry should take the time and make more effort to test their teaching and *interpret the numerical results*. The chemistry teacher is most favorably placed. 1. He has seniors—many of the undesirables have been weeded out and experience has taught many of the others how to apply themselves to study. 2. The subject is often elective—few have to take it who do not wish to. 3. Success in it is not dependent on proficiency in other courses in science and mathematics. 4. This last, together with the novelty of the subject, discourages prejudice, while the subject matter and experiments arouse immediate interest and enthusiasm.

When the test comes—the daily quiz, the monthly review, the “final”—there should be for the teacher two points of view in making the questions, and in using the results—first, to determine the character of the raw material—the preparation of the pupil for further work; second, the nature of the product—how well the teaching has been done. The two lines of vision converge at a focus determined by what the teacher considers important in the unit of work tested and how sharp an image the teacher desires.

Now as to the testing and interpretation of results. The teacher has to depend on university reports and occasional conferences with pupils back from college to determine how satisfactory his preparation has been to the university and to the pupil. The teacher can grade *his* efficiency in this regard. In case of failure in college, a reading of the text used, an investigation of the quiz questions set, together with a conference (often necessarily written) with the university teacher and the backward pupil will cause the high school teacher to change the emphasis and the rate of progress. Successful pupils can often give valuable information as to where the preparation and method were helpful.

The degree in which the pupil relates his class chemistry to his reading and everyday life can be estimated by reports on what is read, the bringing in of clippings and titles of interesting articles, and by the amount of material brought in for testing. The interest shown by the pupils during a discussion will give a

general estimate as to the value derived; and the use of illustrative material and reading as the basis of English themes and commencement essays will give a sufficient bonus for extra work.

In the classroom what is the recitation worth to the individual pupil and to the class? Is the pupil ready for the next work? Can he see and make a connection between the new work and that of the past? The teacher who cares about these things will surely stress certain parts of the new lesson because of its relation to the old one; drill on other parts because it is a necessary foundation for further work; discuss other points because the foundation must be as broad as possible. The teacher will sum up with a very definite series of questions designed to test these results: to see whether the relation to the old topic is understood, how well the new work has been started, how much of the additional information has become a part of the foundation. These results should be checked as soon as possible by written work. If a large percentage fails on one or more questions, it is usually the teacher's fault and the work must be repeated. In the case of individual pupils the mistake should be corrected in writing and the teacher should try to find the cause of the error.

In the monthly quiz, it is presumed (1) that the teacher wants additional aid in determining the grade to be sent to the office and to the parent; (2) he wants to find out whether the pupil knows certain topics studied. *The more definite the teacher makes the assignment for the review, the longer the pupil will work in preparation. He will drill himself on what the teacher, from experience, considers most important;* (3) from these results the teacher will plan the succeeding work to fill in crevices he has left, and strengthen the foundation, to build anew and better because of past experience.

RAILROAD MAPS.

At the November meeting of the Central Association of Science and Mathematics, a resolution was introduced at the general meeting and unanimously passed, that it was the sense of that Association that Congress take some action to correct the railroad maps of the United States, which everyone who knows anything about the country realizes are absolutely untrue in most instances. It was suggested that the railroads be compelled to issue their maps in accordance with the United States government geological survey map. It was also suggested that all educational associations and teachers be invited to co-operate in bringing about a remedy for this evil. It was voted that a committee of fifteen be appointed to take the matter under consideration and devise schemes for the best course of action.