IV. The initiation of experimental teaching (a) to determine the most efficient methods, (b) to discover the most difficult and most commonly misapprehended points in the subject matter from the pupils reaction to them.

V. To list, standardize and develop projects and problems.

VI. To devise means for grouping pupils according to abilities in science work, and to adapt materials to such abilities.

Somewhat apart from this logical sequence in the larger plan is that concerning the introduction of the history of the great scientific ideas and their relation to man's progress. This involves investigation and agitation as well as the organization of such a course as to content.

Finally, if we are to bring our science work into accord with modern educational demands, and if we are to keep pace with the progress now being made in other subjects, we must follow some such plan as I have tried to present. I therefore submit it for your consideration and frank criticism.

TEACHING BOOKKEEPING BY THE HISTORICAL METHOD.¹

By A. P. R. DRUCKER.

Those who have had experience in teaching bookkeeping know only too well the difficulties they have encountered in their attempt to explain to students the reasons for the rules of bookkeeping. Indeed, very few teachers ever try to assign reasons for these rules; they simply insist that the students master the rules and then work out the exercises illustrating their application. In other words, they teach the *hows* but not the *whys* of bookkeeping science. The result of this insistence upon the memorizing of unexplained and uncomprehended rules is naturally more or less confusing in the minds of the learners. The vagueness of the subject finally discourages the students, who are for the most part groping in the dark, never sure of their ground, their weak grasp of the subject becoming fatal to their enthusiasm.

The answer of a certain student to the question—what would he do in case he received a telegram from the freight agent notifying him that the consignment of goods he had expressed to John Brown had been destroyed en route: that he would debit the telegram in accordance with the rule to “Debit whatever is received”—ludicrous as it may sound, is nevertheless typical of the bewilderment resulting from the usual vague presentation of the subject and of the uncertainty the student feels in trying

¹Address made before the Commercial Section of the Oregon Teachers Association.

to apply the rules of bookkeeping to business transactions. As a matter of fact, very few even among practical bookkeepers have more than a hazy idea about the application of the rules of the subject.

By defining bookkeeping as an art, the old textbooks themselves admitted that the rules of the subject are those of an art—intuitive only, and therefore not referable to reason or demonstration. In this way they evaded the necessity of assigning reasons for the rules of debit and credit.

This method of teaching bookkeeping, however, is not only futile, but it is also far from a true appreciation of the rules of the subject. For these rules are no more inexplicable or obscure than are the rules of arithmetic or algebra. Bookkeeping rules, like those of mathematics, are based on logic pure and simple. For indeed the obscurities ordinarily attributed to them are more apparent than real, more due to a lack of historical perspective than to the fact that the underlying reasons cannot really be found.

The obscurity surrounding the rules of bookkeeping is largely due to the peculiarly uneven historical development of the subject during the centuries of its growth. If we study the history of bookkeeping carefully, we shall find that while the systems, forms, and methods of bookkeeping progressed steadily, in accordance with the demands of business needs, the rules were not changed to fit the new conditions. Instead, they were simply extended—stretched out, as it were—to embrace the newest methods and devices. Under these circumstances it was only natural that the rules when taken out of their historical setting and applied to new systems and practices, should lose their original axiomatic reason and appear obscure and incomprehensible. By looking at these rules from a historical standpoint, however, we can readily detect not only the basic reasons but also the logical and reasonable method of development.

An illustration will make this point clear. If a student should ask the instructor the reason for the rule to "Debit cash when it is received into the business," the instructor would be at a loss for a clear explanation. If he himself has never studied the subject from the historical standpoint he will be quite unable to assign any reason for this rule. Some authorities, in their endeavor to give some kind of explanation for the rules of debit and credit, have resorted to rather fanciful reasons. They have adopted what is known as the "personification idea"; that is, they have

personified the impersonal accounts. We debit personal accounts, they say, when the persons receive something of value from the business. In the same way we may personify cash and thus debit it when "cash" receives money, because we look upon cash in the light of a person. Such a fantastic and rather farfetched explanation goes to show the straits to which the teacher is driven in trying to find some kind of reason for an apparently obscure rule.

Again, Professor W. M. Cole of Harvard has modified this personification idea somewhat by a rather ingenious turn. He tells us that *debit* means assuming responsibility, and *credit* releasing responsibility. In personal accounts, Professor Cole reasons, we debit a person who buys goods of us because he becomes responsible to the business for the debit, and we credit him when he pays the debt because by paying he is released from his responsibility. By applying the same idea to impersonal accounts, Professor Cole assumes that when cash is received into the business, *cash* becomes responsible for the amount thus received and hence is debited for the amount. On the other hand when money is paid out of the business cash is credited for this amount because "cash" is released from its responsibility for the amount in question.

While this explanation is most ingenious and in many instances most helpful, it is nothing more than a fine modification of the old personification idea. We hold "cash," an impersonal object, responsible for money it receives by personifying cash. Besides this attempted explanation does not account for all the applications of the rules of debit and credit. It cannot for instance explain these rules as applied to profit and loss. Why should we credit profit? Where is the responsibility released?

But above all, neither the personification idea nor its modification, the "responsibility idea," are true to the historical development of bookkeeping. Neither of these ideas were in the mind of the bookkeeper who first extended the rules of debit and credit, to impersonal accounts. In order to arrive at a true insight into the mental attitude of the originator of the application of the old rules for debit and credit to cash in double entry bookkeeping let us for a moment trace the historical development of bookkeeping and note the actual reasons for the application of the rules of debit and credit to impersonal accounts, as they occurred to the inventor of the system.

The first attempt at scientific bookkeeping was the single-

entry method. At first only the daybook was used. In this book only personal accounts were recorded, and in this connection of course the terms *debit* and *credit* had a clear meaning. The word *debit* comes from the Latin verb "*debere*," to owe; *credit* is derived from the Latin verb "*credere*," to trust. Hence, these terms when applied to personal accounts had a perfectly lucid meaning. The term *debit*, meaning "he owes," was applied to a person who purchased goods of the business on account; while the word *credit*, which means "he trusts," was applied to a person who sold goods to our firm on account and trusted us for the amount. Therefore, the rules for *debit* and *credit* were as follows:

"Debit a person for what he receives from the business on account (i. e., for what he owes); and

"Credit a person for what he gives to the business on account (i. e., for what he trusts)."

At this stage of its development, bookkeeping called for such books of record as helps to the memory only; hence, where there was no need to remember an item of business, there was also no need to keep a record of the transaction involved. Accordingly, when a customer paid his debt to us or when we paid our creditor, the transaction was completed and the account was crossed off the books. Hence, there was no other record made of the payment.

The growth of commerce, however, made this simple kind of bookkeeping impracticable. Customers sometimes paid only a part of their debt and thus placed the bookkeeper in a dilemma as to how to keep a clear record of their account. Or again, we bought merchandise of a certain firm several times in the course of a short period. Under these conditions it became easy to make mistakes, such as crossing off the wrong transaction. Besides, it took a long time for the bookkeeper to locate the various items relating to the one customer in the many pages of the "day-book" in order to know whether this customer bought four or five times in the course of a month. For these reasons the helpful ledger with its assembled accounts under the names of the various persons doing business, made its appearance.

The ledger carried with it a new and revolutionary principle, namely, the principle of "counterbalancing" accounts. The whole principle of the ledger is derived from the action of a pair of scales or perhaps a lever and a fulcrum. When the bookkeeper observed how one scale with a weight could be counterbalanced

by placing an equal weight on the other scale, he thought that the same principle could be applied to his ledger. If one side of the account is weighted down because of merchandise sold, then when payment is made, this cash amount when placed on the other side of the ledger should counterbalance the original account. Therefore, not only did the bookkeeper of this period adopt the system of vertical and horizontal crossbars in his ledger—a device resembling the ancient form of a pair of scales, but he also adopted the principle of a pair of scales in his book-keeping by virtue of which, instead of subtracting one amount from the other when payment was made, he simply placed the subtrahend on the side opposite that containing the original item, and thus he counterbalanced the original account and made the two sides balance.

Under the ledger system, therefore, when an account was paid, instead of cancelling the old items or subtracting the money payment from the value of the merchandise item as was the old method and is still done in the arithmetical process, the bookkeeper placed the payment of the cash on the side of the ledger opposite that showing the original indebtedness, and the account was thus equalized or counterbalanced. The original rules of debit and credit were not changed, however; instead, their meaning was extended to include the new method. Thus the rules still read the same as before; "Debit a person for what he received from the business; and credit a person for what he gave to the business." Now, however, the meaning of the word *debit* was not limited to the case of the person buying the goods of us on account and thus really owing us money; but it was applied also to a person who received money of us for a debt we originally owed him. We now "debit" this person even though he does not owe us anything. This debit is nothing more than a counterbalancing or rather offsetting of the item on the other side of the account, the original item. And since the former happened to be a credit, we call its offsetting or counterbalancing item, a debit. The same idea holds true of the term *credit*. This term also is not limited now to the person who gives or entrusts merchandise to us on account, but it is also applied to the person who has paid us an old debt for which we had originally debited him. Being thus credited does not mean that this person trusts us for anything; it is used merely as an offset or counterbalance to the original debit item, and is therefore called a credit notwithstanding the original meaning of the term *credit* does not apply here.

This extension of the original meanings of the terms debit and credit was legitimate, because it followed in every instance the rule originally laid down for debiting and crediting. We debited personal account when the person received something (this time cash) from the business. Likewise we credited the personal account when the person gave something (in this instance cash) to the business.

It was the idea of balancing and counterbalancing accounts in the ledger that suggested the principles of Double Entry to the bookkeeper. It was apparent to every bookkeeper that a business transaction has a counterbalancing effect on the business; that is, the two factors that enter into the transaction counterbalance each other. In every transaction there are two factors, usually one personal and the other impersonal. If our business buys merchandise from John Smith on account, the two factors, Smith and merchandise, influence our business in such a way that their forces counterbalance each other—and so our business is left in the same condition as it was before the transaction. Suppose our business bought goods for \$1,000 on account from John Smith. In accordance with the rules of single entry, we would credit Smith for \$1,000 on our books. As the item is posted in the ledger it would show a liability on our business; it would show that we owe John Smith \$1,000; hence, our business apparently is poorer by this amount. But is the business really poorer? By no means, for as an offset to this recorded liability to Smith, the business has received an impersonal item, merchandise, worth \$1,000, as an added asset. Hence the personal liability incurred by the business in buying of Mr. Smith on account was offset by the addition of impersonal goods to the business.

The same principle holds true when the business sold goods on account. The personal account receivable that has apparently increased the assets of the business is offset by the amount of the goods sold to that person which is taken out of the business. Hence we see that in every business transaction one factor in the transaction offsets the other, so that the two counterbalance each other. Since accounts with these two factors would supplement each other, the idea suggested itself to the bookkeeper, why not keep a record with both, so that the books may always be in balance. The principle underlying this novel idea was not very complicated. All that was necessary was to apply this idea to the daybook and give it debit and credit columns and make

these two columns counterbalance each other. As the bookkeeper was already familiar with the idea of applying the terms debit and credit to offsetting accounts he could see no reason why the same terms could not be used in double-entry bookkeeping, by extending somewhat the ideas of these terms. For inasmuch as there exists a peculiar relationship in business transactions between the personal account and the impersonal item that was bought or sold, there was no reason why the words debit and credit could not be used including these ideas. In their original sense they could be used when they applied to personal accounts and in their expanded sense as counterbalancing or offsetting accounts when applied to impersonal accounts. Hence if we sold goods to Brown for \$1,000 on account, our bookkeeper would debit Brown for that amount—the word debit signifying that Brown owed us \$1,000. And as an offset to this personal debit to Brown, he would then credit an impersonal account—in this case merchandise, because it was for merchandise that Brown was debited. When Brown pays the \$1,000 we will credit his account, as explained before, as an offset to his original debit for the same amount. But in accordance with the rules of double-entry bookkeeping every credit must have an equal offsetting debit. Therefore, we debit an impersonal account—cash, as an offset or counterbalance, because Brown's personal account was credited for the cash he gave the business.

We can now understand the reason for the rule that cash is debited when received into the business. It is debited because the person who gave it was credited for it. Hence we debit the impersonal item cash that was given to the business in order to offset or counterbalance the personal credit.

From this historical illustration it will appear evident how the change in the methods of business forced the extension of the meaning of some of the terms beyond their original import, and consequently brought about an obscuring of the rules. The same holds true for some of the other so-called "obscure" rules of bookkeeping. The only way in which we can arrive at their underlying reason and explanation is by following their historical growth and noting their changed meaning.

In other words then, bookkeeping should be taught as a science and presented from the scientific standpoint, with reasons and explanations for its rules. In order to be able to explain the reasons underlying the rules, the teacher must follow the historical development of his subject from its early beginnings, showing

when, how and why the various improvements and modifications were made and the various rules applied. As the student learns not only the rules but also their reasons there is less and less need of routine memorizing and heavy lessons of practice work. As in the study of every other science, the students are thus given theory and practice in reasonable proportion. They themselves become interested and keenly responsive, and feel all along the way that they have the subject well in hand—a condition quite the reverse of the blind groping which has too long been the prevailing attitude of students of bookkeeping under the usual methods of teaching this subject.

THE RANGE OF INFORMATION TEST IN SCIENCE REVISED.

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In a previous article (School Science and Mathematics, Vol. XIX, pp. 228-233) the present writer reported the returns from a range of information test given to several hundred High School Freshmen, College Freshmen and Sophomores. Since then the test has been given to several hundred additional pupils, including a large number in the Quincy, Illinois, Schools, principally in grades seven to ten. I am indebted to Mr. O. D. Frank for conducting the tests in the Quincy schools. The purpose of the present article is to present the results of these additional tests and to combine them with those before obtained. As was suggested in the preceding article, it seems advisable to cut down the test for High School pupils to fifty words instead of using the full one hundred, since many of the terms are quite unfamiliar to them. This will shorten the test, at the same time rendering it no less efficient. This article will present the revised test and the method of its revision.

The test given consists of one hundred words and phrases selected to suggest important generalizations in science that it might be reasonably anticipated would be meaningful as a result of Nature Study instruction in the grades or General Science in the High School. Roughly, one-third of these are taken from Biology, one-third from Physiography and Geography, and one-third from simple Physics and Chemistry. Each pupil is asked to mark with an "E" such terms on the list as he can define or explain, with an "F" those recognized as familiar but which he cannot now explain, and with an "N" those totally new. He is also asked to define or explain the first three he marks "E."