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State of Iowa  
Board for Vocational Education  
Des Moines

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# The Evening School Instructor and His Job

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An Abridged Text for the Use of Those Evening  
School Teachers Who Are Anxious to Render  
the Best Service to Their Students

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Bulletin No. 26  
Series T. I.-9

June, 1937



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## Foreword

This bulletin represents a revision of a special series of five teacher training pamphlets which were first published by the Iowa state board for vocational education in 1927.

The original material was prepared by Professor J. V. Lynn, formerly trade and industrial teacher trainer for Iowa, in cooperation with a number of other trade educational specialists from nearby states. In addition to a revision of the original manuscript, this bulletin also contains some new material. The revised bulletin has been prepared by Professor E. S. Baird, trade and industrial teacher trainer of Iowa State College, and Mr. Harry W. Carmichael, state supervisor of trade and industrial education for Iowa.

The bulletin in its present form is an attempt to bring together under one cover a concise and practical set of suggestions for the successful management and teaching of adult classes in the trade and industrial field. It is accordingly hoped that it may prove to be of value and assistance to teachers, local supervisors and superintendents who are responsible for the development of evening school programs for industrial workers.

F. E. MOORE, *Director*

*Board for Vocational Education*



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## The Evening School Instructor and His Job

I

### THE EVENING CLASS AND ITS TEACHER

#### THE GROUP

The organization of an evening school group is sometimes a hurried one. The state supervisor of trade and industrial education and the local school officials visit a local plant and present the proposition. It is in turn put before the men and a number of them sign up as prospective members of the class. Meantime the school officials look about for a prospective instructor in case there are enough signers. They decide upon a "likely" workman or foreman and ask him if he will agree to instruct the class for ten weeks in shop mathematics or blue print reading. The man who is approached feels flattered by the request, assumes that he has been asked because he "knows his stuff," and says he will undertake it. Everything is now arranged and the class will meet next Tuesday evening at 7:30 p. m. Easy, isn't it?

But as soon as the door closes upon the visitors the newly accepted responsibility falls upon the once-pleased teacher-to-be like a wet blanket which causes him to break into a cold sweat, and he begins to realize what he has done. He thinks of schools and teachers and what they did when he was there. He thinks of lessons and lectures, books and blackboards, desks and discipline. He wonders what he will do after he calls the roll. But he is quite wrong in thinking he will have to conduct an evening class like the day school he remembers. This bulletin is being written to be read just at this time with the idea of easing the worried mind of the new teacher.

First, the group will be made up of adults who have left off their childish pranks and begun the serious problem of earning a living and learning a trade as the means to that end. They may take this more or less seriously according to the opportunity in a business-like way. They have many other things to occupy their leisure time and this evening session of two hours once or twice a week is an engagement



which they wish to make but find it necessary to sacrifice still some more of their time. However their spare time may be employed, the evening class hours are given out of it and therefore this time should be used to their advantage by the instructor. He must not, they think, waste their time, but must give them some real help. Moreover, this is in most cases all the time they can give to the study. Evening classes should be self contained unless certain ones ask for work to do at home. The instructor cannot, as in day schools, assign outside reading or problems to be done at home in preparation for the next class. Men are too busy and want to get all they can in the time they are giving for class instruction.

They come, too, with very specific needs. One fellow wants to get an understanding of rafter framing while another in the same gang doesn't want that just now, but does need some stair work. If each is not accommodated the ability to hold them both will lessen. They will not remain if they do not get what they need.

Nor will all of them be equally capable of going ahead with the work. Several may need the same thing and enroll for it, but in a short time it will be plain that someone cannot get it because he only went through six grades in school while the others know all about fractions and can work it out. In most cases men are sensitive about their lack of education, even refusing to enroll or withdrawing from the group after enrollment rather than "show themselves up before the others." On the other hand, some are not at all sensitive on this point. They have their interest centered in numbers of things wholly detached from employment and come to class, if they come at all, just because a chum or the gang comes, or "just for the fun of it." Fortunately these are very few in number.

These varying interests and often pressing duties cause absence from class frequently. Where a group is to meet twice a week it is almost impossible to avoid conflicts in dates with lodge and union meetings and what not. Absence, therefore, is bound to occur with certain individuals all through the term. This has an effect upon the attitude of men towards the instruction being given. They "lose the thread," so to speak, of the instruction and become discouraged because they cannot seem to catch on to things when they are

there. This is also characteristic of a few who may be regular in attendance. They just don't seem to know how to learn, and consequently grow discouraged.

These few statements about the conditions and mental attitudes of an evening school group will suggest to the evening school instructor that he will need to become acquainted with each man as early as he can so that he can meet the situations and overcome them. There are some things he ought to know at the beginning so that he may start right with each man, for he has now learned that he cannot conduct his evening school like a grade or high school class where all are doing the same thing at the same time. To get acquainted with the needs of his group he will have to resort to different means. One good way is to have the men fill out a registration form which asks them to put down information concerning their education and experience that will aid the instructor in knowing their needs and attainments. Another source of information is the foreman under whom they work. If possible, an instructor should get the foreman's opinion on the men, and particularly upon those who are not attending class regularly or are failing to do good work. It need only be mentioned that the opinions of some foremen must be carefully weighed before being accepted as true. Foremen err in their judgments both for and against certain individuals. A third way is through personal talks with each man. To really get acquainted with a man this is the best way, for it provides a chance to ask informal questions and get first hand information.

#### THE TEACHER

Any craftsman, engineer, or other person who is engaged to teach an evening group should take stock of himself as well as of the class. If he will do this it will cause him to do many things more effectively as he instructs. In the first place, it is assumed that he is a master of his trade, an experienced journeyman worker or a trained engineer with executive experience. The mechanical and technical knowledge which is to be imparted is familiar. It is done automatically every day and this is exactly as it should be. The more thoroughly skilled or technically trained he is the more confidence the men place in him at the start. He has the basic qualifications



for instruction, in their judgment, for the subject content is already assured. But is it? Is there any guarantee that because a mechanic knows how to do a thing he is successful in getting others to learn it from him? Do they not often go away confused and "dumb," making serious mistakes in their effort to do as they were told or shown? Are they to be blamed for this? Maybe, but possibly not. The chief reason is that the skilled mechanic has forgotten how he himself struggled to learn these things some years ago and now looks upon them as very easy. Being so easy, he slights them in his presentation or perhaps passes over them without mention. Certain parts about a job, on the other hand, are spectacular or vivid and these stand out unduly in presentation. It is a problem for the instructor to balance the importance of all the teaching points about a job and take nothing for granted as known unless he previously has actually taught it.

The chief point of difficulty is that the new work being undertaken belongs to another trade. Teaching is as truly a trade as is blacksmithing, and it has to be learned just like an apprenticeship in blacksmithing is required. Supposing you, a plumber, were asked to come over to a house and hang a door. You would immediately say, "Get a carpenter, that is not in my line." Now if you were consistent when asked to teach an evening class you would say, "Get a teacher, that is not my trade." But the big point about it all is that in trade training the instructor must know both trades. He has to know what he is going to teach and he must know how to teach. The "what" is the mechanical trade and the "how" is the teaching trade. One of them in your case is already known; the other you are just about to begin and, therefore, must learn. As a skilled mechanic can teach an apprentice how to do trade work, so a skilled teacher can teach a beginner how to teach. There are teaching tricks just as there are tricks of the trade.

Now a few points about this new trade which you are to begin—let us feel at once that it is not a difficult trade. It is just some common sense applied to our method of going through a teaching job. It is done by performing a series of teaching operations, and these will become automatic with practice just like any trade operation. Each operation is carried through by means of teaching tools, and you will soon

learn how to select the right teaching tool for the operation just as you know how to pick up the right trade tool for a particular trade operation. Study the following chart so as to see it all at a glance.

## PRODUCTION AND INSTRUCTION

### A Comparison

Read each column downwards separately before comparing

The Mechanic	The Instructor
Takes raw material	Takes a green or partly trained learner
Works according to a set of specifications, blue-prints, etc.	Works according to a specified course of study
Performs a number of operations upon the material	Goes through a series of teaching operations upon the learner
By using certain tools common to the mechanic's trade	By using selected teaching methods common to the teaching trade
With the result that he has a house, water system, machine or what not.	With the result that he has a carpenter, plumber, machinist, or what not maker.

Like the mechanical trade, it becomes easier to carry on as one practices at it. This just amounts to saying that we learn to do by doing, but everyone realizes that it is slow and uncertain to learn how to teach in that way. If we could only have the assistance of someone throughout the early, experimental hours of our apprenticeship in evening school teaching it would help us over many a bump. Now this is just what the state board for vocational education does. It wants to have knowledge of your difficulties so that it may assist. When you find yourself up against something which is giving you trouble, just write in to the supervisor of trade and industrial education and he will be glad to write or visit according to the nature of the difficulty. These preliminary notes are being written with the same motive. The board wishes to see you get the best possible start under the circumstances.

For a general introduction of the teaching problems, the following will explain briefly what teaching is.



We begin first by stating that telling a learner how to do something is not teaching him. So often we hear it said, "I've told him time after time and still he doesn't know the first thing about it." That is why he doesn't know. He was told and not taught. For example: An apprentice or evening school student asks, "What is  $\frac{1}{4}$  of  $\frac{3}{4}$  inch?" To say in reply " $\frac{3}{6}$  inch," means nothing to the learner beyond an answer. If he can say so a week from now it is just memory and not understanding that brings it up. If the instructor starts a little dialog something like this, he will get the student to answer his own question through self-reasoning:

Student: What is  $\frac{1}{4}$  of  $\frac{3}{4}$  inch?

Teacher: Look at your rule and tell me what is  $\frac{1}{4}$  of  $\frac{1}{4}$  inch.

Student:  $1/16$  inch.

Teacher: How did you get that answer?

Student: I saw that each quarter inch was divided into quarters so there would be sixteen of these in the full inch and therefore one of the little spaces would be called a sixteenth inch.

Teacher: That is the right way to get the name of the space at any time and with any set of figures. Always deal with one of each kind until you get the name of the resulting kinds. If  $\frac{1}{4}$  of  $\frac{1}{4}$  inch is  $1/16$  inch, then what is  $\frac{1}{4}$  of  $\frac{3}{4}$  inch?

Student: That is what I asked you. I don't know.

Teacher: You just said a while ago that  $\frac{1}{4}$  of  $\frac{1}{4}$  inch is  $1/16$ . How many  $1/16$  would there be for each  $\frac{1}{4}$ ?

Student: There would be one for each quarter.

Teacher: And how many quarters did you ask about?

Student: I asked about three quarters.

Teacher: And if you get  $1/16$  for each of the three, how many  $1/16$  will you have?

Student: I would have three sixteenths.

Teacher: Well, that is what I could have told you, but you have found out for yourself.

Student: I see now that what I have to do is to get the name of my final part first and then find how many of these there should be.

Teacher: That is correct, so what is  $\frac{1}{2}$  of  $\frac{1}{8}$ ,  $\frac{1}{2}$  of  $\frac{5}{8}$ ,  $\frac{1}{4}$  of  $\frac{5}{8}$ ,  $\frac{1}{8}$  of  $\frac{5}{8}$ ,  $\frac{3}{8}$  of  $\frac{5}{8}$ ?

Student: Dealing with one of each kind first: Halves of eighths give sixteenths—answer  $1/16$ . Halves of eighths give sixteenths—answer  $5/16$ .

Quarters of eighths give thirty-seconds—answer  $5/32$ .

Eighths of eighths give sixty-fourths—answer  $5/64$ .

Eighths of eighths give sixty-fourths—answer  $15/64$ .

Teacher: Now that you can get any of these correctly and speedily, you will not need to ask me again.

Student: No, I see now how it is done, and before this it was impossible. I will not have to try to remember bare figures hereafter.

This little dialog shows what teaching is. It is causing the learner to think for himself, to reason things out in little steps at a time until he finally sees the light. When he does see it he will show it in his expression and statements, and you will not have any doubt about whether he has learned and you have taught. Have you seen a snapshot taken out of focus? Everything blurred! Well, that was just what his thought was like about those parts of the inch at first. The teacher, simply by asking questions carefully and logically, brought his mind into focus so that he could get a clear picture of the thing which previously he had so disorderly in mind. Learning is focusing thought on ideas, and teaching is helping the learner to focus.

In the paragraph which you have just read there is another illustration of what teaching is. Your attention was called to an idea which was familiar to you, the blurred photo, and you were asked to set the idea of learning beside it to compare them and see how similar they were. Teaching is causing the learner to call to mind old ideas for the purpose of comparing or contrasting new ideas with them. When you associate new ideas with old ones you draw conclusions about them and enrich your store of ideas. That process of consciously associating your ideas is learning, and when the teacher directs the learner so that he can get the right ideas associated he is teaching him.

In the following example you will see how association of ideas works out in any question in arithmetic.

New idea—A 7 inch stovepipe is to be made.

Old idea—Circumference of circle is 3.14 times its diameter.

Conclusion—Length of sheet iron for this pipe will need to be 3.14 times 7 inch plus laps.



The teacher's job here is to get the learner to fish out from all his old ideas in mind just the right old one to associate with this new one, and from that connection to draw the conclusion which will be needed.

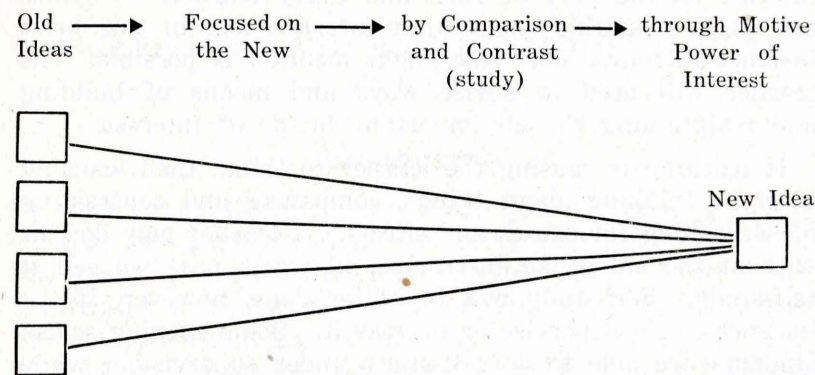
Showing is often thought to be teaching. By showing is meant that someone performs the operation of a job while the learner looks on and tries to remember what the shower did. Failure in this instance results because the learner does not know what to look at or look for, and he gets no help. To illustrate, a machinist was showing a learner how to cut V-threads on a lathe. When through he let the learner take over the work and went away. The first thing the learner did was to start the tool so that it cut right along the top of the thread instead of in the V. He could not understand why, so called the shower (he could not be called an instructor), who said, "Did you not see me looking at the thread dial?" Now the learner did not know there was such a thing as a thread dial, much less notice that the shower was looking at it. And yet the learner was held responsible for the error. No, showing is not teaching!

This would-be instructor thought he was demonstrating, but demonstrating is much more than showing. A demonstration as used in trade instruction is a combination of showing and direction of the learner's attention to definite features as the showing proceeds. It involves explanations, causes, reasons, effects, questionings, all the "whys" and "what fors." It is just another way of getting the learner to think about the work for himself and to get all his conclusions properly made from the new ideas which have just come through seeing, and the old ideas which he has called up by himself or through the aid of the instructor.

The teaching trade has many kinds of tools to use on the learner. We have just looked at two of them; namely, suggestive questioning and demonstration. Beyond these we have the lecture or talking method. The teacher often does not need to demonstrate anything but he must explain through words at least. Another tool is illustration. By drawing sketches of things he clears up vague ideas in the learner's thinking; again he uses the recitation tool. This

is a way of getting the learner to express what he knows so that the instructor can check up on him.

Another way of explaining the learning process is illustrated in the following diagram.



We learn new things in terms of what we already know. The more old ideas that are brought into play in the process of learning the new, the more effective is the learning process. In other words, we need to *see* the new idea from *several angles*.

We also recognize that there are the five senses through which the learning process is affected. We have noticed how more effective the talking picture is than the silent cinema. One reason is that we are using two senses, seeing and hearing, in the former; and one, sight only, in the latter. The more of the senses that we can bring to play in a learning situation the better the results. This explains why demonstration combined with explanation is so effective as a teaching device.

Now this learning process is carried on, as stated in a preceding paragraph, through making comparisons and contrasts of the new with the old. This process requires mental and sometimes physical effort which is correctly called study. This process is tiring to the learner; it is work and there must be some incentive to cause the learner to carry on this work process of comparison or study. This motive power is interest.

Here is one of the important jobs of the evening school teacher, to stimulate and direct interest of the learner so



he will want to study and analyze and solve his problems. The adult who comes to an evening class is of course interested or he would not attend, and the successful teacher will take advantage of this situation and further stimulate interest on the part of each and every learner. Volumes are written on this one subject *interest*, and in this brief instruction course only this slight mention is possible. The teacher will need to devise ways and means of building and maintaining the all important factor of interest.

If teaching is causing the learner to think, then learning must be thinking about things, comparing and contrasting ideas, looking for causes and effects. A learner may do this without the aid of an instructor, in which case we call it self-study. Self-study will be better done, however, if the instructor will supervise or oversee it. Some evening school students are able to do self-study under supervision, while others require the formal methods of direct teaching.

## II

### ORGANIZATION AND MANAGEMENT OF EVENING CLASSES

#### REGISTRATION

Adults registering for the first time in evening school classes will gain favorable or unfavorable impressions of the school within the first hour of attendance. To have this impression most favorable the administration of the school should be certain that all details of organization are carried on with dispatch and in business fashion. If this is done and the students find themselves assigned to classes under enthusiastic and pleasing instructors who are ready to get right to work, they are quite certain to respond to the situation in a most satisfactory manner.

Registration is the work of the evening school director and not of the instructors, who should be in their respective shops or classrooms with a prominent placard on the door indicating what is to be taught there, who is to teach it, and an invitation to come right in. The director will have filled out a card with name and address of student, date and subject to be studied. According to size of school the following data may also have been taken: Telephone number, name of employer with address and telephone number, and possibly the trade followed by the student. There may be a fee required for material or use of texts connected with certain courses, receipt for which will be shown on the card. A duplicate or stub of this card will be given to students to take to their respective instructors showing the latter that everything is regular.

The instructor should then secure such information from his students as he wishes to use. It is best done by handing a form to be filled out and returned. Instructors may select what they wish to know according to conditions obtaining in their local evening school:



1. Married or single—indicates possible absence duties
2. Schooling—so that ability may be properly gauged
3. Where obtained—that is, foreign or American
4. Previous evening school work and kind
5. Correspondence courses completed
6. Any of the information referred to on the director's card but kept on file there
7. Employment information

All men enrolled should be made to feel at ease, and this is best done by getting them at work as soon as possible on the first evening.

#### EQUIPMENT

Nothing contributes more to the success of evening school work than to have a comfortable class room in which to meet. It need not be elaborate, but it must be comfortable. If adequate classroom facilities are to be provided, there must be enough light to see without eye strain, tables must be just the right height for standing, or stools must be just right for adults rather than boys. Some schools do not plan for storage, requiring men to carry boards, books, tools, and partly finished work home with them, or stacking such in places where they become lost or damaged. No day school students should have access to the work of evening classes. Some school boards provide only partial janitor service, places being opened but not dusted or swept out; while in other cases the evening school gets the residue of heat from the day school, and no more. This may be sufficient for shop work but is not satisfactory for drawing or mathematics classes.

Evening classes should not be advertised or offered unless shops are adequately equipped to give students satisfactory training. Smith-Hughes requirements call for standard industrial machines and tools in the equipment for shop courses, and laboratories for vocational courses should be equipped with complete scientific apparatus. It is often true, however, that a resourceful teacher can construct home made apparatus which will often explain things better than some which is secured from commercial supply houses, but the point to be stressed here is that there must be instruc-

tional material to aid the teacher. This extends to books, pamphlets, note paper and drawing supplies.

Experience with evening classes everywhere advises that classrooms with seats as used through the day are not at all suitable for adults even in arithmetic classes. Odd rooms with tables and chairs and portable blackboard are much preferred.

When teachers of evening classes use shop or laboratory equipment that is used also by the day school, there is always possibility of friction between the day and the evening instructors on such matters as the condition in which equipment may be left, and in accounting for breakage, misuse or disappearance of materials or tools. Definite understanding needs to be had by both teachers and sincere cooperation will be needed where two classes use the same equipment. The evening class teacher should learn just what responsibilities he is to be held accountable for as this tends to reduce misunderstandings and trouble.

#### CONDUCT OF CLASSES

Instruction must start on time. If the hour advertised is 7:30 and the instructor waits till 7:45 for late comers, he is doing a grave injustice to those present. Those late without reason should bear the loss and those with reason will agree to lose it or will come to the instructor personally after the hour. This refers to strictly class or group organization. If it is individual instruction, then each will get only what he gives to it. His progress will depend upon his own effort and he will have to be satisfied with the personal attention he can get within the evening session.

In like manner the sessions should stop on time. This tends to make students work harder while there and gives to everything connected with the school a more business-like attitude. Moreover, it is only fair to the instructor, for there are always some individual students who have questions and problems to bring up after the session when the instructor can give them undivided attention.

Individual instruction is very likely to lead to unequal distribution of the instructor's time. It may be either consciously or unconsciously done, but in either case it leads to



a claim of favoritism on the part of others who do not get as much attention as they think is due them. In most cases it is justifiable to spend more time with the slow than with the fast workers, but this may be overdone. What is more objectionable is that an instructor hang around where the bright and socially agreeable students are working. Avoid this always. Do nothing that may be looked upon by certain members of the group as an indication of favoritism. It is well to visit frequently for shorter periods with students than to spend the same amount of time in one visit.

Interruptions to an evening school program are to be avoided if at all possible. Even the national holidays affect some attendants. But when it comes to changing the date of class meeting to accommodate a fraternal dance there should be no consideration. There are other kinds of interruptions which need to be given attention. Chums of men enrolled cannot be allowed to make it a "hangout" for some date which is to follow the session. Visitors are welcome as long as they do not take up time of the instructor rightfully due to the students. The instructor must get his material ready before hand so that he does not have to leave the men while he hunts for chalk or books or what not. Equipment needs inspection so that it will not be found out of order when men are there ready to start work.

Each member of the group who works faithfully to master the assignments given him should have approval for the effort whether he actually succeeds or not. Instructors too frequently fail to give a word of encouragement like, "Well, Jim, you worked hard on that one and the next will come easier. You are coming right along." These heartwarming statements do more for the success of your work as instructor than you may think.

It may surprise you, too, to know that even the slowest member of the group, discouraged and absenting himself, will return and try again if the instructor calls him up or calls on him at work or at home to ask why he was absent and to assure him that he was missed from his accustomed place. The same is true of the indifferent ones. Anyone absenting himself, and finding that the instructor never even inquires of him why he was away, feels that

he could not have been missed or the instructor would have said so. Keep close personal tab on each student. A post card or letter to the absentee often helps. It pays big dividends for the investment of a little effort.

The bookkeeping part of an evening school instructor's work is confined to records and reports. Records should be kept of all supplies, showing amount received, to whom issued, amount given, charge or cash received, and balance on hand. Record of attendance must never be neglected. Names may be called aloud at beginning of the session or marked quietly at any leisure time. Lates are not recorded, but absences may be marked "S" for *sick* simply as a reason when it applies. Where refunds of tuition fees are made when attendance reaches some designated percentage of the possible total, it is essential that records be accurate. The same applies where certificates are issued to those attending for a specified minimum of sessions and finishing assignments satisfactorily. All records are kept primarily for personal use, but they are usually turned in as reports to the director at close of the school. In any case they must be correct, complete, neatly written, and turned in on time.

Certificates are always valued by those attending evening schools. These may be issued to all, or to only those who attend at least a certain minimum number of times and at the same time have done satisfactory work. Certification is directly the work of the director, but recommendation comes to his desk from the instructor, who is therefore the one to evaluate the effort put forth by students on the assignments. These evaluations are made throughout the term and the result is checked into the register opposite the student's name by some system which will indicate the progress the student has made.

These brief notes will convey to you some idea of how to get started. The suggestions are brief and to the point. The person who intends to continue to teach evening classes should plan to study more complete courses in how to teach and how to manage classes. Such courses are available as indicated in the appendix.



### III

## METHODS OF TEACHING

### REVIEW

In the first part of this bulletin we referred briefly to learning and teaching with the idea of defining these terms. We saw that the learning process is a sort of mental clearing of ideas, sorting out suitable old ones and putting them to work on the new ones so as to produce a bigger or better one, or to enrich the detail of the former one. It is a mental juggling act with ideas, wholly within the field of association through reason. Teaching, therefore, must be aiding the learner to do this. We all are learning something every day and some of us are teaching quite frequently when we are not aware of it. It is a perfectly normal situation, as natural as our eating and sleeping. The question is, can we make it business-like when we undertake to do it in an organized evening school?

Previously we also stated that telling and showing could not be considered teaching just as they stand. They must be used, but it is in connection with something else which makes the telling and showing become teaching. We wish to look at this "something else" somewhat closely at this time.

### TEACHING THE LESSON

A job is any assigned task whether of long or short duration. It is performed by going through a series of steps or operations in a certain order with the result that each operation advances the workman a definite stage forward in the completion of the job. When a letter is to be typed the stenographer does the job by:

1. Inserting the paper and carbon under platen roller
2. Typing the message
3. Removing the paper and carbon
4. Inserting envelope in machine

5. Typing address
6. Removing envelope
7. Signing the letter or delivering it for signature
8. Folding and enclosing letter and sealing envelope
9. Filing carbon copy

Here are nine distinct steps or operations all correctly arranged in their order for completing the job. Just so in teaching; any lesson is a teaching job and it is performed by going through a series of steps or operations. Instead of nine steps as illustrated above, there are in trade instruction always four. As we saw in the comparative chart, these teaching operations are performed on the learner. If you were to teach a person how to type a letter it is true that you would go through the operations on the machine, but what is so completely new to you is that at the same time you are going through four operations on the learner. That is why we said you have two trades, one of which you know very little. It is a safe bet that you could not even name these four operations, so we shall list them and briefly describe them for you. The teaching job or lesson is performed by going through the following steps or operations:

1. Preparing the learner
2. Presenting the new ideas to the learner
3. Having the learner apply these new ideas, i. e., make use of them himself
4. Putting a test on the learner to make sure that he can use them alone without your further assistance

These will now be described separately.

### THE PREPARATION STEP

If you look back at the beginning of this topic, you will see that we started with a review. This was done to prepare you for what was to follow. It set you to recalling ideas that you had formerly acquired and which we wished you to use. These ideas are like hooks in a clothes closet. We want you to hang some new ideas on them. The educationist calls it "building on present knowledge." It can also be likened to laying the foundation for a building. As the super-structure cannot be built until the foundation is in, so the learner cannot erect his conclusions unless he



bases them upon former ideas which he is able to recall. The preparation step in the lesson, then, is just getting the learner into the correct frame of mind, getting him to possess a *feeling of need* for what you are about to present.

This may be done in several ways but the most used method is to ask suggestive questions. By means of a few questions an instructor can help the learner recall his former knowledge on any particular topic. This will be about the only method needed with night school students.

All preparations should aim to be short and snappy. Two or three well-thought-out questions are enough to do the trick. Do not waste valuable time on them.

A preparation step needs to be thought out before the lesson begins so that the instructor can proceed confidently after he is under way. This thinking out is called lesson planning. An example of a preparation thought out, and the preparatory ideas to be used in it noted on paper, follows:

Lesson Topic: *How to Saw a Board Squarely to a Line*

Preparatory Ideas:

1. Examination of poorly sawn end on a board
2. Examination of a buckled saw
3. Both are the results of an improperly used tool
4. Very few use a cut-off saw correctly
5. It is a simple operation when one knows the seven "kinks"
6. Would you like to know these "kinks"?

In the preparation just outlined the instructor has brought the learner into a state of mind where he is thinking about poorly sawn boards and damaged saws and chided him with a suggestion that he is among the many who cannot use a saw properly. If this is resented at first the learner is brought into line with another idea which shows up vividly to him that probably he is short on the seven "kinks," so he wants to know what they are. This is just the state of mind you wish him to have, so when he is focused in a thought something like "What are these seven?" you are then ready to present them to him.

#### THE PRESENTATION STEP

Here we begin to set up the new stuff for consideration by the learner in the light of what he knows already and

has just recalled. The presentation is a series of teaching points properly arranged as an answer to the focus question of the learner. In this case we shall illustrate by giving those which correspond to the previous preparation. Maybe you are curious enough yourself right now to want to know what they are.

#### TEACHING POINTS

1. Proper method of gripping saw in hand
2. Method of holding the board securely
3. Position of the body
4. How to guide the saw in starting
5. How to guide the saw in following line
6. Correct degree of pressure throughout the cutting stroke and return stroke
7. How to make the finishing stroke

Now you will have jotted down this list on paper for your own guidance in presentation. When actually presenting them you will use some method best adapted to making them clear. In this case nothing can equal a demonstration. To demonstrate means to use the same tools and materials as used in the trade and which the learner will use. It simply means an exact reproduction of the operation supported by a line of discussion, question and answer intended to direct the learner's thought so that he receives and digests the new ideas as they come up in the demonstration. In this way you are getting him to use all possible senses to obtain knowledge of the teaching points. He sees, hears, and just yet feels them in imagination. Like the photographer with his plates he *develops* his new conclusions, but they have not yet been put in the *fixing* bath.

The instructor can use presenting methods other than demonstration. He may decide just to talk it over; describe it in words. This is called the lecture method. In that case he asks no questions but simply explains things and lets the learner take them in or not according to his ability. This method reminds us very much of the milkman who puts the bottle on the front door step, leaving the householder to come out and get it. To make it safe from theft, souring, or freezing, the milkman should take it right inside to the refrigerator. Just so, the instructor who makes a word de-



scription of his lesson and relies upon that is liable to find that the learner never came out to take the new idea in. If the idea is simple enough from the learner's point of view, or if the learner is an experienced man, the lecture method may sometimes be all that is necessary to get it safely across. It saves time if it can be used.

A third method which may be used is the illustration. In the lecture method you may use word illustration as was done in the last paragraph, where the milk bottle story was used to illustrate something we wanted to put across. Do you recall how the minister or lecturer illustrates his discourse by numerous stories and examples? They are word illustrations to supplement his lecture. Another type is the picture illustration. Drawings and sketches may be made or shown by the instructor as he talks about his new idea. Impressions of these sketches enter the learner's consciousness by the eye while words enter by the ear and the two ways strengthen the learner's impression. Still another type is the model illustration where the instructor makes or secures from some source working models of mechanisms intended to clear up details of the operation. Cutaway sections of valves, steam traps, gas motors, turbines, and so forth; all kinds of laboratory apparatus are examples of this method of putting ideas across successfully.

There is a fourth method to use sometimes with matured learners who have enough experience to make it safe. The instructor gets the learner to perform an experiment and directs him as to what to do and what to look for, but leaves him to make up a report of what he found out. It is not so frequently used in teaching trade skills, but finds a common place in trade science courses in either physics or chemistry laboratories in the evening school.

The method selected for the presentation step will depend upon three factors, all of which must be considered in the planning of the lesson. First, learners will vary, and what might be successful with one may not be with another. You will find this out through experience with your different students. Second, the kind of lesson you are to give. Some will be successfully done by illustration while others will require demonstration. Third, the conditions under which you have to teach it. Lacking some demonstration or illus-

trative material, you may be compelled to present it by the lecture method. In any case you will find it decidedly to your advantage to use practical illustrations and practical trade problems in your presentation. It is not easy to do this unless you keep forever putting yourself in the learner's shoes so that you can see things as he looks at them.

#### THE APPLICATION STEP

Teaching would be very easy if we could rest with our presentation. The learner needs something yet before he or the instructor can be certain that he knows what was presented. Both only *think* so. A learner might say "I think I know how to saw correctly. I stand so and so, and hold the handle so and so," and so forth to the end of a word recitation. Would you accept that as proof? You might if it were a lesson on the multiplication table or the decimal equivalents of the inch fractions on a common rule. To have the learner recite is a generally accepted method of making an application of his new knowledge, but only when it is a suitable kind of lesson for that method. The recitation may be either oral or written. It would not be satisfactory in the sawing lesson, however, for the only sure method is to try to saw the board as his observation and consideration of your teaching points may direct his muscles. He must have a trial at the job itself. This then is a second method of *fixing* the teaching points. Do you remember the previous reference to photo film which was developed but not put in the fixing bath? The application step of your lesson is the *fixing* operation, and the two common methods used are recitation and trial on the job.

It is often good practice to use both, for a fundamental law in teaching is that the more ways of expression used, the more permanent is the impression. After your demonstration of the way to saw the board is over, you could review it by a recitation and write down the points on the blackboard, then pyramid the trial on the job method on top of that.

Remember, too, that the purpose of the application step is to check the effectiveness of your own part in the teaching. If the learner fails to perform satisfactorily it is because he or you were at fault. If he, you will go over the



weak point with him right there. If you, you will do the same thing. In both cases you "patch up the leak." Theoretically you should do no teaching in the application step, but sometimes in the presentation step a teaching point is forgotten and now it must be meshed in with the others. In actual teaching you repair poor presentations and supply missing points.

One application may not be enough to satisfy you that the learner has grasped the teaching points. We do not mean acquired skill and speed, but simply that he knows the correct procedure. Have it done repeatedly until the ideas are all fixed securely. Many teachers fail by passing into the testing step too soon with complete failure as a result. Here is a final question for you to think about: Should a teacher allow the learner to make mistakes in the application step or watch him so closely that he makes none?

#### THE TEST STEP

"Now," you ask, "haven't I just been testing him? What else is there to do? He has shown me that he can do it correctly." True, but the purpose of the step was to repair errors, either of yours or of his. You stood by while he performed. The two of you were on the job. But he will not have you with him always. He will not feel safe unless he can do the job "entirely on his own." The foreman for whom he works is going to say to him many times, "It is up to you. You are hired because you know what to do. I am here to get production, not to teach." In short, the foreman puts it up to you as the teacher to see that the learner can go on the job fully prepared to work without any further instruction so far as this particular lesson is concerned. That is why you must test him. He and you must both be satisfied that he can do without your help.

The method of carrying out the testing step may be much like the application step. That is, you may give an oral or written examination, quizz, or recitation; or you may try him out on the job. In all cases you will not prompt or assist in any way. The learner must feel the atmosphere of the shop and not of the school, and think of you as his foreman and not his instructor. This makes it appear as if the test step was not a part of the instruction process at

all, but it is. No instructor could leave it out and know whether he was a success or a failure. He must have it as a part of his job—the last operation on the learner—for here the learner learns something. He learns whether or not he can perform satisfactorily alone.

What should be done if the learner fails on the test? That means flat failure. It means that you will have to go over the lesson again, using in most cases, though not always, some other method in the presentation step than was used previously. Here are some reasons why you may have failed:

1. Learner can think and tell well, but cannot perform with his hands
2. Learner can perform with his hands, but cannot think and tell well
3. Learner thinks he knows already so is inattentive or superficial
4. Learner is incapable (only true after all methods fail)
5. Teaching conditions were not good; as, fatigue, poor light, ventilation, short time, too many to teach, poor apparatus, and noise
6. Lesson not properly taught; as, covered too much, chose wrong method, left out or shortened one of the four steps, assumed that learner knew something already and found differently in the test, lacked patience and tact, did not plan the lesson ahead of time, did not get demonstration material ready ahead of time, did not write out a lesson plan at least in outline

If failure results it will be necessary for the teacher to check up the cause and then plan carefully to repeat the lesson.



## IV

### PERSONAL MANAGEMENT PROBLEMS

#### MISCELLANEOUS LIST OF PROBLEMS

There are several items of importance to good teaching which should be discussed briefly. They bear little relation to one another, hence their inclusion as a miscellaneous collection under the topic of management problems. There are in this list the following items: *Questioning, Being Side Tracked, Trial and Error, Sustaining Interest, Building Confidence, One or Several Ways of Doing a Thing, Some Do's and Don'ts.*

#### QUESTIONING

Briefly, there are two kinds of questions: test or review questions in which the instructor seeks to know what the learner has retained about previous lessons, and development questions in which the instructor leads the learner to think out something for himself by suggesting old ideas and having him link them with new ones.

Test questions should be so worded that if the learner does not know he cannot answer. For instance, a machinist may be asked if he can use a micrometer. He may answer either "yes" or "no," but in doing so he does not convey any idea as to his skill or knowledge. The question might have been, "How many turns of the micrometer barrel are equal to one-tenth of an inch?" If he knows how to use one he will say "four," and if he does not he simply cannot answer the question. Do not use catch questions. To ask what kind of lubricant is used when turning cast iron gives a wrong impression for none is used, and the learner is not being fairly treated. Do not use a bad practice question. Men, if experienced, are not expected to know how to do things the wrong way. Be sure all questions are definite. A "How do you do?" question may often be very indefinite, like "How do you mix paint for a priming coat?" Answers may be "thin, with lots of oil," "in a bucket," or "with a

stick." They are all correct for the question asked, but the first is the only one which tells what the questioner wanted. Make it impossible for the answerer to say anything else. Sometimes questions are so worded that answers can be picked out of the question by the suggestive way it is asked. If a painter should say to his apprentice, "Do we put paint on a house to protect the surface, or to make it look better?" the latter gets his cue from the question and says, "both." It would be much better to ask, "Why do we paint the exterior of houses?" and have the apprentice dig up the answer.

*A prime guiding principle is that the instructor must decide what answer he wants and then so state his question that only that answer can be given if it is to be correct.*

Development questions are not given to test knowledge, but to lead thought. They go in chains, one growing out of the preceding one. That is, they are arranged in a logical order of reasoning from link to link. Frequently they spring from the answer just given to the previous question, because the instructor does not know just what direction the learner's thought may go. Example of a development chain from a lesson on the action of glue in joining boards together:

1. Q. Why do we rub or press the glued surfaces together?  
A. To squeeze out the glue.
2. Q. Is all of it squeezed out?  
A. No, only if there is too much.
3. Q. What becomes of the rest?  
A. It stays between the boards.
4. Q. Then the boards are not touching each other?  
A. Yes, they are.
5. Q. Then the glue really has no space to occupy between the boards?  
A. No, it squeezes into the pores of the wood.
6. Q. What does it do there?  
A. It fills them up.
7. Q. What effect will the glue have when "set"?  
A. It will be hard and act like tiny hooks.

In the above example, had the learner given the answer to number 5 which was intended to be for number 1, there would have been no need for asking questions 2, 3, 4, and 5.



An instructor needs to be alert so as to get the learner back into line again with as few questions as possible. Development questions should follow the principle of reducing erroneous answers to the impossible or absurd. This makes the learner think.

A few general rules on questioning may be helpful.

1. Avoid asking questions so that they can be answered by "yes" or "no," unless followed at once by a "why" question.
2. Do not make any suggestion of the answer.
3. Take care to word them so that the learner has no doubt in selecting the desired answer from among several which might be correct.
4. Make them brief but clear.
5. Make them simple for slow thinkers, but put a challenge up to the good thinker by giving him difficult questions.
6. When wrong answers are given do not discourage by ridicule or even neglect of them. Better to acknowledge it as your error in not asking the question properly and try it again differently.
7. If questioning a group of learners, ask the question first, so that all may get the answer ready, then name the one to answer aloud. This keeps all members "on their toes."
8. Distribute questions without any set order. Would you ask one who possibly knows the answer, or one who does not? Which has best effect on the rest of the group, a wrong or a right answer?

#### BEING SIDE TRACKED

With a group of learners it is very easy to get away from the purpose of your lesson. It is not intentional, but frequently a learner, because of his curiosity, will ask about something of interest to himself. Possibly it may be of interest to the others and possibly not. You must quickly decide upon its value to all. If worth the time to all and treatment can be brief, take time out right there but get back onto your lesson topic at the earliest opportunity. Do not let it run away with the time. If not advisable at the moment, acknowledge the question as a good one and arrange to take it up personally after the lesson is over. Always make good your promise. In general, such interruptions are not desirable because they break up interest in the lesson and it is difficult to get all the group back into line again. You should be guided by the degree of relationships with that which you are just then discussing. Sometimes the interjected question may be very remote. With individual

instruction it is not so pressing a problem, but nevertheless an instructor will do well to keep any lesson in hand, and see that he accomplishes what he intended to teach.

#### TRIAL AND ERROR

This has reference to the question of how far an instructor should leave a learner to discover for himself how to do certain things. Originally all things were learned that way, and all new things today are being added through experimental effort. Schools are needed to shorten the process for the mass of society. At the same time we cannot feed learners with a spoon. We should rarely tell what we can lead them to find out for themselves. Notice, it says "lead" not "leave." The teacher on the job should be encouraging the learner to a self-activity which is the force resulting in knowledge.

#### TEACH ONLY ONE METHOD OF DOING A THING

Some teachers will seriously question this. Where there is one best way of doing some operation with tools, and any other method is clearly not so good, it is undoubtedly a mistake for the instructor to demonstrate wrong ways under the impression that he is warning his learner against them. It is an error on two counts; namely, that some learners may become confused and afterwards are not just sure which one was the right method, and also that some learners will deliberately do it the wrong way either out of curiosity to check up on the instructor or out of natural obstinacy to show that they will do it their own way.

A single method in demonstration is usually more easily followed up in the application step but there are times when an instructor should demonstrate several methods that are distinctly different while equally efficient. A common example of this situation is found in the carpenter's trade where mortise and tenon construction is secured by use of draw-pins, wedges, keys, or locked dovetail. The plumber also may use the union coupling, right and left coupling, or the running thread and lock-nut type of connecting parts of a water system. All are equally efficient in these examples, so all should be taught.



## SUSTAINING INTEREST

Interest is the driving power which gets action or effort. No member of a night school can learn without the exercise of effort; and interest is that state of mind which causes him to give attention to something. The instructor can create or increase interest on the part of his students by making use of certain devices called interest factors. They act like crowbars or jackscrews in that they help to get learners out of an inactive rut or hole. The instructor must study his learner and then select from the following interest factors one which he can use with greatest success.

1. *Curiosity.* It is a natural characteristic in some people and it never grows old. They always want to know the why and how of everything which comes to their attention. This is desirable within limits in every learner, for it is the inquiring mind which makes for progress. The stolid, unimaginative, non-inquisitive boy who never sees anything to become curious about cannot be urged in this way to progress because he has nothing within to respond. Some other factor may work, however.
2. *Ability to Master.* "Nothing succeeds like success." All children at school are most interested in the subjects they get along in best, and this interest in turn makes them get along still better. The apprentice who finds that he has the ability to succeed in developing trade knowledge and skill will find it an agent in creating more interest. Confidence increases interest, while discouragement over failure lowers it. If you cannot see that this will help if used then examine the next.
3. *Attainment of Some Objective.* A realization by the apprentice that what he is learning will aid him in accomplishing something which he has had in mind to accomplish. It may be to become expert in workmanship, to get a good paying job, to be promoted to some better position, to buy a home, or anything he cherishes as desirable. If what he is learning now is pushing him more quickly towards his objective he will be very much interested in learning more of it. Find what his objectives are; what he hopes to do or be.

4. *Self Respect.* The thought of failure in the face of parents who expect him to succeed and of what they think of him causes him to renew his interest and effort. This includes in some cases the foreman and men in his department, but it is usually the poor opinion of chums and relatives which he considers most. An appeal of this kind may start something.
5. *Approval.* A desire for recognition or praise will create additional interest in some learners. It is a legitimate factor within limits for merited praise of good work is to be expected. Some individuals are not susceptible to it, while others will deceive in order to get it from instructors. Between these two extremes we may have all degrees of it. Use it where justified.
6. *Removal of Fear.* Some are afraid of the work or of the instructor. They are timid naturally, and this fear holds them. On the other hand, there are learners who are not susceptible enough to the seriousness of life. This is not true of the majority of evening class students because they are here by choice. A little wholesome rebuke of the right kind acts beneficially at times, but it must be done judiciously and privately. With those who are timid the instructor can do much to gain interest by building confidence. Threats inject more fear, which is an emotion, and all emotions restrict the ability to think. One cannot think correctly when angry, jealous, suspicious or afraid.



## V

### ORGANIZATION OF TEACHING MATERIAL

In evening schools for most trades the conditions are such that individual instruction gives much better results though some groups will be carried through with greater benefit if the members are treated as a class and the work somewhat standardized for presentation. In either event it is not always possible to find a complete text which can be used exclusively and the usual result is that instructors will draw from a large number of texts to get some few references on each topic which they wish to cover. These prove often to be mere suggestions for themselves and not at all adapted for use by members of the group. In fact the instructor is often required to fall back upon his own efforts to provide sheets of questions and problems which he makes up. It is the preparation of such instruction sheets as you may need that will be described under the following headings:

#### INSTRUCTION SHEETS

Any such lesson sheets as an instructor would use to aid the effectiveness of his work are called instruction sheets. The expression job sheet is also used but we prefer the other term. Instruction sheets are of two kinds according to whether you are teaching how to do skilled work with tools, or are teaching what knowledge like arithmetic, drawing, or science must be acquired in order to be an intelligent craftsman. Instruction sheets of the first kind are called operation sheets, while the latter are called information sheets. We shall take up each in turn.

#### OPERATION SHEETS

Any trade or craft is made up of a number of fundamental operations which appear frequently in practically the same form each time. For example, the cabinet maker finds that a great many times he is called upon to fasten pieces together with screws, even though they may be large or

small, flat, round or square headed. This fundamental operation of fastening with screws forms a unit of instruction on how to do it. In the same way others might be hand planing a board to dimension, or preparing wood surfaces for finishing, or boring holes with brace and bits. Any fundamental operation of the trade which is a unit of instruction sufficient to write up in an organized form, can be put into an operation sheet.

The teacher should make use of all references found in print so that his own write-up may be as brief as possible. An effective operation sheet will point out to the learner where he can find such references by naming author, title, and page.

Next should follow any elements of the operation which the instructor wishes to describe further than would appear in the references. They should be accompanied by sketches wherever such will help.

Finally there should be a few well worded questions which will cause the learner to think about what he is doing. These usually are of the "why" type. Why does he do this and that? He should have reasons for the things he does in such ways.

These three features, then, constitute a good operation sheet. There is no detailed definition for a fundamental operation. It is any unit of instruction which involves trade skill and appears repeatedly in practically the same form. Where you find need for an instruction sheet to cover an operation which meets these specifications you are safe in writing it up on the three points named and described. A sample operation sheet appears in the appendix to this pamphlet. Remember that an operation sheet refers entirely to some unit of work which the learner is to learn how to do.

#### INFORMATION SHEETS

There is in any skilled trade a large body of knowledge which the intelligent craftsman should possess. Information topics include all items related to materials, tools, safety, trade terms, how to meet the public (for plumbers, electricians, etc.), in fact anything which should be known. Like the operation sheet, they each have three factors; namely, references, items of information not covered by references, and a set of questions. The questions may be "why" ques-



tions or any kind which will test the learner's thinking power and check on his digest of the references. A sample information sheet will be found in the appendix.

#### ASSIGNMENT SHEETS

These sheets convey no information beyond what may be found in references. They are usually just a set of questions or problems to be answered. A page of arithmetic problems would be an assignment sheet; so would a sheet of problems in sketching. In the latter case there might be also some references to texts where solutions of a similar kind are treated. An example is appended.

#### JOB SHEETS

There are cases where the instructor may desire to use the "job" as a unit of instruction or where he desires to study a job which may be composed of several unit operations. If one would consider that the unit operations of a trade make up the alphabet, then jobs may be compared to words in the language, combinations of letters that have definite meaning. Jobs are made up of definite combinations of unit operations. In some instances the instructor will want to provide job sheets for student use and in some cases he may require the student to work out a job sheet before starting a job; in this case it becomes a job plan. The job sheet may be supplied the elementary learner while the advanced learner may be required to build his own job sheet subject to the instructor's check in order to provide training in how to plan work. A sample job sheet is found in the appendix.

The foregoing types of instruction sheets are fully described in a valuable book that every trade teacher should study. The title of the book is "Individual Instruction Sheets and How to Write and Use Them," and is included in the bibliography in the appendix.

For the instructor who is looking for a very simple yet effective plan of analysis the text "The Instructor, the Man, and the Job," by Chas. R. Allen, is recommended. In brief the plan in its simplest form includes a two column listing of the *doing* and *knowing* factors of a job. This textbook is also a valuable treatise on method of teaching trades and every trade teacher should be familiar with it. See appendix for publisher.

## VI

### APPENDICES

#### APPENDIX A

##### Sample of Operation Sheet

PRINTING TRADE

OPERATION NO. 25

##### HOW TO LEAD TYPE

###### References:

HENRY, *Printing for School and Shop*, p. 10.

HENRY, *Essentials of Printing*, p. 10.

###### Elements:

1. When type is to be leaded, place one lead after each line as it is set in the stick.
2. When necessary to spread type to fill a larger space, insert leads above headings, between paragraphs, and above and below display lines.
3. When necessary to contract a leaded article, begin removing leads from the end of the article.
4. When necessary to spread an article to fill a given space, begin inserting extra leads by opening up between lines at the beginning of the article.
5. When full-length leads cannot be had and it is necessary to piece the leads, use a long and a short lead, alternating the short piece first on one end and then on the other.

###### Questions:

1. Why insert the extra leads above and below headings and display lines?
2. Why alternate the long and short pieces when using pieced leads?



## APPENDIX B

### Sample of Information Sheet

PLUMBING TRADE                      INFORMATION SHEET NO. 10

#### SOLDER

**References:**

STARBUCK, *Standard Practical Plumbing*, Chapter II.  
 DIBBLE, *Elements of Plumbing*, Chapter III.

**Information:**

Solder used by plumbers is of two kinds: "bright solder" or "fine solder," and "wiping solder." The first is used with the soldering iron and is composed of equal parts of lead and tin. It is often referred to as "half and half" solder.

Wiping solder usually is composed of about two parts tin and three parts lead. The metals should be pure and clean. Lead melts at about 620 degrees and tin at about 445 degrees Fahrenheit. The mixture of the two metals as in solder melts at a temperature considerably below that required to melt either metal alone.

To test wiping solder pour a small quantity on a brick. If the mixture is correct it will have a mottled appearance. If it has too much tin it will be bright.

To purify solder, heat until it shows a low red in a dark place and add a small lump of sulphur, stir well and skim off impurities. Solder should be stirred occasionally while being used.

**Questions:**

1. What is solder used for?
2. What metals can we solder?
3. What is the action which causes the solder to adhere or stick?
4. Why should wiping solder be stirred?
5. What conditions are necessary in order to have solder stick?
6. What precautions should we take in order to prevent impurities getting into the solder?
7. What are the common sources of impurities and how may you detect them?
8. Is it an advantage to have solder melt at a lower temperature than the other metals? Why?

## APPENDIX C

### Sample of Assignment Sheet

#### ARITHMETIC

To multiply together numbers where one or both of the numbers contain a decimal.

**Reference:**

NORRIS AND SMITH, *Shop Arithmetic*, pp. 36-37.

**Problems:**

1. In the following examples, count the decimal places in the multiplier and multiplicand and see if the decimal point is properly placed in the product:

60	.07	.0027	6.21	3.42
.8	8	02	.14	2.5
.480	.56	.00054	2484	1710
			621	684
			.8694	8.550

2. Complete the multiplication in the following problems and place the decimal point in its proper place:

3.65	.124	.004	68.4	1.21
.24	.003	.002	.26	5

Check your work by adding these products. The sum of all the products should be 24.710380.

3. If an apprentice receives 29 cents an hour, how much will he receive per week if he works eight hours a day for six days?
4. If one brick weighs 7.26 pounds, what will a load of 825 brick weigh?
5. The circumference of a circle is found by multiplying the diameter by 3.1416. What is the circumference of a pipe whose diameter is 6.5 inches?



## APPENDIX D

### Sample of Job Sheet

ENGINE UNIT  
BEARINGS

JOB SHEET

#### HOW TO FIT NEW CONNECTING ROD BEARINGS

##### Information:

When the bearings of a connecting rod are badly worn, broken, or loose, it is necessary to install new ones.

The procedure of fitting new connecting rod bearings differs very little from the fitting of main engine bearings. The rod bearings, like the main bearings, must be fitted accurately.

##### Directions:

1. Glue the bearing on the crankshaft where the rod is to be fitted.
2. Bolt the rod bearing on without using shims.
3. The piston need not be inserted in the cylinder, but can be held upward above the base of the engine. Draw the bearing up snug, and while holding the piston with one hand rotate the crankshaft to mark the bearing.
4. Remove the bearing and note the high spots.
5. Place the bearing in a vise and carefully remove the high spots with a bearing scraper.
6. Spot the bearing again and continue the process until the whole surface is marked.
7. After the bearing is fitted, place the piston assembly in the cylinder and adjust the bearing.

##### References: (If any)

(Taken from Principles of Auto Mechanics, Selvidge and Kelsey.)

## APPENDIX E

### BIBLIOGRAPHY

The following list of books and pamphlets is presented as further aids for the teacher who really desires to become proficient in his job of instructing evening classes.

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PROSSER, C. A., AND BASS, M. R. *Adult Education: The Evening Industrial School*  
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SELVIDGE, R. W. *How to Teach a Trade*  
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The Manual Arts Press, Peoria, Illinois

STRUCK, F. T. *Foundations of Industrial Education*  
J. Wiley and Sons, New York, 1930

BULLETIN 17. *Trade and Industrial Education. Organization, Administration and Operation.* U. S. Office of Education, 1929. Superintendent of Documents, Government Printing Office, Washington, D. C. Price 25 cents

BULLETIN 150. *The Training of Teachers for Trade and Industrial Education.* U. S. Office of Education, 1930. Superintendent of Documents, Government Printing Office, Washington, D. C. Price 30 cents

For specific instructional materials such as texts, analyses of the various trades or other teaching materials consult the State Board for Vocational Education, Des Moines, Iowa.



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