UNIT 10 DIAGNOSIS RELATED TO ACHIEVEMENT

10.1 INTRODUCTION

The diagnosis of student deficiencies in academic achievement is one of the most difficult tasks that confront teachers in their day-to-day life. If individualized instruction is to attain maximum effectiveness, it must be based on educational diagnosis. The term educational diagnosis includes all activities in measurement and interpretation that help to "identify growth" and their causal factors for individuals or for class groups. Diagnosis in education resembles diagnosis in medicine. The aids used most frequently for diagnosis are known as diagnostic tests. These tests are used to obtain a picture of pupil difficulties. The process of determining the causes of educational difficulties is known as educational diagnosis. In this unit we will read about it in detail.
10.2 OBJECTIVES

After reading this unit you will be able to:

- explain the meaning and importance of educational diagnosis,
- discuss the purpose and use of diagnostic tests,
- explain the difference between diagnostic, formative and summative evaluation,
- distinguish between diagnostic and achievement tests,
- describe the steps involved in the process of diagnosing and remedying,
- describe the area and content of diagnostic tests,
- describe Diagnostic tests in Mathematics and Spelling,
- write questions for diagnosing specific difficulties,
- explain the process of remediation and its importance, and
- describe the characteristics of effective remedial materials.

10.3 MEANING AND IMPORTANCE OF EDUCATIONAL DIAGNOSIS

Educational diagnosis implies the use of technical procedures designed to locate specific learning and instructional difficulties, and if possible, to determine their causes. For the medical expert, diagnosis means the careful and extensive observation of the patient under controlled conditions. It includes the use of professional instruments, such as the clinical thermometer, the stethoscope, and the microscope, which make possible exact and objective observation. It means the assembly of a complete case history of the background of the difficulty, the examination and analysis of many similar cases, in order that common factors may be identified.

Unfortunately, much of the exactness, objectivity, and precision of the medical diagnostician’s instruments are likely to be missing in the teacher’s equipment. Even today only a few objective measuring instruments capable of rendering reasonably precise diagnosis are available to the pedagogical diagnostician. The well prepared modern teacher now has at hand reasonably adequate statistical techniques, analytical diagnostic tests in different subjects and diagnostic charts. They also have instruments and devices for measuring oral activity, vision, and binocular fusion and many other highly important qualities that may account for a pupil’s lack of progress in many fields of learning. It is thus apparent that diagnosis in education is moving rapidly in the direction of scientific accuracy.

The diagnosis of difficulties underlying educational accomplishment undoubtedly constitutes the high point in the supervisory and instructional uses of educational tests.

Deficiencies of a general nature are revealed and brought to light by general survey tests. Specific weaknesses, and to a certain extent the causes of such weaknesses, are identified by the use of properly selected diagnostic tests. Practically all of the more exact types of diagnostic procedures, such as the location of defects in speech, hearing, and vision, are dependent upon educational test results for their initial steps.

10.3.1 Analysis as the Basis of Diagnosis

The successful development of school learning depends upon the care with which the underlying and basic skills of the subjects themselves are recognised and utilized in teaching. For instance, teaching a child to add consists not only in developing the habit of responding automatically and correctly to the basic combinations but also involves higher levels of skill, such as bridging of the tens, control of the attention span, and carrying from one column to the next. The teacher’s task is made obvious and objective if he/she understands this. Similarly, it can be shown that silent reading comprehension is not a single isolated ability. It is a composite of many elements, such as knowledge of word meanings, ability to get meaning from sentences, ability to arrange through unit and sentence units into logically organized wholes, and ability to find desired material quickly. The teacher has a real basis for instructional procedures with this knowledge.
Language is another basic subject in which many delicately balanced skills are interwoven in an extremely complex manner. Here again the elements of achievement in the total process must be identified. Blind trust in general practice on the total skill must necessarily give way to the exact identification and discovery of the particular points of pupil weakness as a basis for special emphasis.

Good diagnosis must parallel the process of good teaching. Effective diagnostic materials in any school subject can be prepared only after the skills contributing to success in that subject have been isolated and identified. Psychologically, the reason for this is that on the whole the child learns to do what he/she practices or does. Remedial work, accordingly, can function only when the point at which pupil mastery breaks down has been located. Thus, the analysis must be penetrating and the diagnosis must be precise.

10.3.2 Specific Nature of Diagnosis

Diagnosis must be more exact than merely a broad statement of general functions. It is not enough to discover that a child is unable to read silently. The exact nature of his/her handicap must be revealed before it is possible to undertake a remedial program. The more specific the diagnostic information revealed, the more exactly the remedial material can be made to fit the need. To return to a frequently used illustration, if it is found by diagnosis that a child is unable to add, unless the exact point at which his/her mastery of addition breaks down can be determined by the diagnosis, teaching or remedial efforts are largely wasted. One of the outstanding reasons why more effective teaching and remedial work has not been done in certain fields is that no adequate analysis of basic skills can be made or has been made.

10.3.3 Importance of the Diagnostic Use of Test Results

Tests as such are incapable of improving instruction because of any inherent power. Existing conditions are merely revealed by them. Remedial or corrective teaching is the result of deliberate constructive effort by the teacher after the particular points of weakness in the instruction of the pupils have been revealed by the tests. The ease, clearness, and directness with which these needs are revealed by the tests are a measure of their real educational value. Very few existing tests are so constructed as to permit the interpretation of their results directly in terms of an effective remedial procedure. However, this seems to be no good reason for the failure of teachers to apply more directly the results of this work in testing to the improvement of their teaching practice. Just as the data revealed by the navigator's instruments require calculation and interpretation, so is it necessary to analyze test data carefully in order to make them the basis of genuine remedial program.

The interpretation of test scores and the planning of remedial procedures are the most difficult and also the most important parts of the use of educational test results. One of the greatest needs in education today is the provision for genuine diagnostic testing in all instructional fields, supplemented by valid remedial work designed to correct the weaknesses and defects of individual pupils as revealed by the tests. It is important to learn, as a result of using tests in the classroom, that a pupil or the entire class is below the norm in the subject, but unless it is learned with some exactness what causes the low level of achievement, the testing program will do little, if anything, more than supply interesting information.

10.3.4 Diagnosis as the Basis for Remedial Work

Accurate diagnosis of class and individual pupil difficulties, coupled with application of remedy is not only important but necessary for teachers. The success of the remedial or corrective teaching depends upon the accuracy and detail with which the specific skills involved in successful achievement in the subject are identified and isolated in the test. Tests of the general survey type, or tests that report single unanalyzed scores, cannot supply this information in sufficient detail.

10.3.5 Diagnosis as the Basis for Preventive Work

An examination of the number and types of skills identified as a result of the diagnostic methods discussed in the preceding section leads to a suggestion of a still more constructive use of analytic and diagnostic test results. Diagnosis as applied in education has taken on a meaning indicative of a breakdown in method, a failure of instructional techniques. Unquestionably, one of the basic purposes of diagnosis is the location of weaknesses and the determination of their causes, but there is nothing in the method that precludes its use in the
prevention of weaknesses through anticipation of their causes. Out of the knowledge gained
through the use of diagnostic procedures should come the basis for preventive work of all
types. It is quite noticeable that the major emphasis in the fields of dentistry and medicine is not
on correction but on prevention. The existence of a weakness implies a failure at some point in
the program. The discovery of it would not be marked as important merely because it is then
possible to correct it. The real importance in the discovery should lie rather in the prevention of
its reappearance elsewhere under similar conditions.

Another illustration from the field of medicine may make this point somewhat more concrete.
In every medical examination for diagnostic purposes a complete analysis is made and an exact
case record of all observations is kept. Out of the analysis of these records has come a better
understanding of the causes and characteristics of certain types of human ailments. Out of this
same type of analysis has also come the basis for much of the preventive work that
characterizes modern medical science.

In a similar way, accurate and detailed educational diagnosis may ultimately offer the basis for
the development of a program of preventive work in education. For example, if after
diagnosing the addition of fractions in the fifth grade, it is found that the failure of pupils to
reduce the fractions to their lowest terms in the answers is a common weakness, the obvious
ting to do is to correct the defects at once and then proceed to reconstruct the first instruction
so that the following year the causes for this particular weakness may not operate so
powerfully. Similarly, any weakness identified now should afford the basis for decisions
calculated to reduce the probability of their recurrence in the future.

Check: Your Progress 1

Mention two ways in which educational diagnosis becomes important.
a) .................................................................
b) .................................................................

10.4 DIAGNOSTIC TESTS: PURPOSE AND USE

Diagnostic tests are designed to point out inadequacies in specific skills. The immediate aim is
to locate areas in which additional instruction is required or in which teaching methods have to
be improved. The purpose of diagnostic testing is to furnish continuous specific information in
order that learning activities may be most productive of desirable outcomes. Diagnostic tests
would be helpful in identifying the use of faulty, round-about or incorrect
procedures; the use of elementary processes where these could have been replaced by advanced processes; and
evidences of lack of understanding and lack of precision. A carefully constructed test could be
used as an inventory test towards the beginning of a year's work or topic and as analytical test
of competencies or skills involved in the different branches or units of study.

The diagnostic test results will reveal in a comprehensive way, the exact level reached by
pupils and the precise nature of the difficulties. These tests will help to find out the specific
kind of instruction and practice that will be required to bring achievement up to the desired
level. To tackle large classes, individual observation needs to be supplemented through
diagnostic tests. The tests are useful as guides to both the attainments as well as difficulties of pupils
whose achievements are not up to the mark; in isolating individual difficulties; and for dividing
pupils into groups for special coaching or remedial teaching as the case may be.

10.5 DIAGNOSTIC EVALUATION VS. SUMMATIVE
AND FORMATIVE EVALUATION

Diagnostic evaluation is concerned with the pupils' persistent or recurring learning difficulties
that are left unresolved during the course of classroom teaching and formative evaluation. If a
pupil continues to experience failure in Reading, Mathematics, or other subjects, despite the
use of prescribed alternate methods of instruction (e.g. programmed materials, visual aids) then
the need for a more detailed diagnosis is indicated. To use a medical analogy, formative
evaluation provides first-aid treatment for simple learning problems, and diagnostic evaluation
searches for the underlying causes of those problems that do not respond to first-aid treatment.
Thus, diagnostic evaluation is much more comprehensive and detailed. It involves the use of
specially prepared diagnostic tests as well as various observational techniques. Serious learning problems are also likely to require the services of psychologists, and medical specialists. The primary aim of diagnostic evaluation is to determine the causes of learning problems and to formulate a plan for remedial action.

The difference between diagnostic evaluation and such types as summative and formative evaluation is perhaps best reflected in the sort of answers each type is expected to elicit and the uses typically made of the evaluation results.

With summative evaluation, the central question is: How well has the student achieved the learning objectives by the end of a period of study, that is, by the end of a textbook chapter or by the end of the school year? Results are typically used for grading or certifying students, judging the effectiveness of the teacher, and sometimes evaluating the curriculum.

With formative evaluation, the question is: During a period of study, how well is the student progressing towards mastering the various learning objectives? The results are typically used for giving the students and teachers feedback on the students' progress and consequently, for locating errors in terms of the structure of a study so that remedial alternative instruction techniques can be adopted.

10.6 ACHIEVEMENT TESTS VS. DIAGNOSTIC TESTS

Achievement tests are used to measure the relative accomplishment of pupils in specified areas of learning. From the point of view of diagnosis, the total score on an achievement test is not of any valuable help. Achievement test results reveal difficulties only when they are originally designed for diagnostic purposes. The diagnostic test differs from an ordinary classroom test or a standardized achievement test in that its main object is to analyse and not to assess. In a diagnostic test, the speed factor is neglected and ample time is provided for pupils to complete as much of the task as they can.

The two differ in scope and nature of coverage. Diagnostic tests are generally designed for students of below average performance in the particular subject/s. On the other hand achievement tests are, in theory, meant for the average students. The diagnostic tests are meant to identify difficulties and weaknesses so that these can be remedied while achievement tests are aimed at evaluating the achievement level of pupils in order to grade them and compare them with other students. The diagnostic tests concentrate on the areas of perceived difficulty as observed during the teaching-learning process, while achievement tests have to cover the whole unit learnt.

As far as the analysis of answers is concerned, achievement tests are checked and marked for finding out what and how much has been learnt while diagnostic tests are used to find out what has not been learnt and to locate the exact source of the difficulty? A diagnostic test is an evaluative procedure which stresses incidental rather than crucial objectives that are determined before hand for guiding educational activity. The test attempts to identify those specific elements which may hinder learning and adjustment. An ideal diagnostic test should contain a cross-section of the test items that reflect the various aspects of achievement which the student should possess.

10.7 DIAGNOSING AND REMEDYING LEARNING DIFFICULTIES: STEPS INVOLVED

There are four major steps in the diagnosis and remediation of learning difficulties: (1) Determining which pupils are having learning difficulty, (2) Determining the specific
10.7.1 Determining who is having Difficulty

There are a number of methods for identifying those pupils who are experiencing learning difficulty. One of the most common is to observe/analyse the results of achievement tests.

In some cases it is desirable to analyze an achievement test item by item and make a tally of those missed by each pupil. Items which are missed by a large number of pupils indicate areas where the class as a whole is doing poorly. This might suggest that either the test has inadequate content validity, or that changes in teaching method are needed. The errors of each individual pupil can also be studied for clues to his/her particular learning difficulties. A major caution in using an analysis of item responses to determine individual learning difficulties pertains to the small number of items representing each area. At best, such an analysis merely provides clues which must be followed up by further study and observation.

Informal classroom evaluation procedures can also be used to detect learning difficulties. Anecdotal records, and other observational devices provide clues to identifying learning problems. The day-to-day observations and judgements of an experienced teacher are especially valuable; he/she frequently can spot a pupil’s difficulty before it becomes serious.

In determining which pupils are having learning difficulty, we should not confine our efforts to those with problems in the basic skills and the content areas. Pupils who are having difficulty in social relations, emotional adjustment, and other aspects of personal-social development also require attention. Learning problems of this type are significant in their own right, and they have a direct bearing on the pupil’s ability to learn in other areas.

10.7.2 Determining the Specific Nature of Learning Difficulties

The diagnosis of learning difficulties is a matter of degree. In some instances, the general procedures for locating pupils with learning difficulties provide sufficient information for immediate corrective action. In other cases, it may be necessary to supplement this information by further diagnostic study before planning remedial work. In still others, the learning problem may be so persistent and severe that the pupil should be referred to a specialist for intensive diagnosis.

When a pupil’s learning difficulty is in one of the basic areas, a logical follow-up procedure is the administration of a diagnostic test. Such tests are based on the common errors pupils make and thus provide a systematic method for locating the specific problem. Diagnostic tests tend to provide a more reliable sample of a pupil’s errors than general achievement tests because they have a large number of items representing each particular aspect of the skill being measured. The test manuals and accessory materials accompanying published diagnostic tests typically provide suggestions for further diagnosis and for use of the test scores in remedial work.

The procedure of analyzing a pupil’s responses to each test item, described in the previous section, is one approach to this problem. Another is to administer a general achievement test and ask the pupils to describe aloud the mental process they are following as they answer each question. The “thinking aloud” provides clues to the pupil’s weaknesses in knowledge, skill and method of approaching problems. Since the test is administered on an individual basis, it is also possible to note any emotional factors or undesirable habits which might be interfering with the pupil’s responses. Clues concerning the specific nature of a pupil’s learning difficulties might also be inferred from his/her cumulative record. An examination of past results, course grades, anecdotal records, and other evaluative data can frequently throw light on the nature of a pupil’s present difficulty. This, of course, is also a vital step in searching for the causes of the problem.

10.7.3 Determining the Factors Causing Learning Difficulty

Some learning difficulties can be attributed to improper teaching methods, unsuitable curricular emphasis, or exceptionally complex course materials. Evaluation results can contribute to improved instruction.

Of particular interest to us here are the persistent learning difficulties of individual pupils that
cannot be accounted for by formal instruction. To determine the causes of these problems we must make a careful study of the pupil and his/her environment. The major areas to consider are work-study skills; health and physical condition; emotional adjustment and home environment. Unfavorable factors in any of these areas cause or contribute to learning problems.

It should be noted that the causes of learning difficulties are multiple and complex and can seldom be fully determined by the classroom teacher. However, a review of the pupil's cumulative record, special testing and observations (as needed), an interview with the pupil, and possibly a home visit, should provide sufficient information on which to base remedial action. If the pupil's learning problem requires more extended study than can be accomplished within the normal teaching situation, the pupil should be referred to a specialist.

10.7.4 Applying Remedial Procedures

There is no set pattern to be followed for helping pupils overcome learning difficulties. In some instances it may be a simple matter of review and re-touching. In others, an extensive effort to improve motivation, correct emotional difficulties, and overcome deficiencies in work-study skills may be required. The specific remedial procedures used in any given case will depend on the specific nature of the learning difficulty and the factors which have caused and contributed to it.

Testing and evaluation can play a vital role in most remedial programs. The use of periodic testing during remedial teaching might serve the following functions: (1) clarify to the pupils the specific types of responses that are expected; (2) provide further diagnostic information about the pupils' difficulties and learning needs; (3) give the pupils a feeling of success through the use of a carefully graded series of test exercises; (4) enhance motivation by providing short-term goals and immediate knowledge of progress; and (5) provide information concerning the effectiveness of the remedial procedures.

Though the immediate aim of remedial work is the correction of specific learning difficulties, our interest should not stop there. A careful analysis of evaluation results during diagnosis and treatment will reveal learning errors that can be prevented and causal factors that can be modified. The ultimate result of a remedial program should be more effective instructional methods.

In summary, evaluation procedures are useful in all phases of diagnostic and remedial work. Although they serve essentially the same functions here as for the general instructional program, attention in diagnosis is focused more directly on the specific responses of individual pupils.

10.8 DIAGNOSTIC TESTING

Diagnosis of persistent learning difficulties involves much more than diagnostic testing, but such tests are useful in the total process. The diagnostic test takes up where the formative test leaves off. If pupils do not respond to the feedback-corrective prescriptions of formative testing they need for a more detailed search for the source of learning errors is indicated. Such tests are also commonly called learning tests, quizzes, unit tests, and the like. We will need to include a number of test items in each specific area with some slight variation from item to item. While diagnosing pupil's difficulties in adding whole numbers, for example, we would want to include addition problems containing various number combinations with some not requiring carrying and some requiring carrying, to pinpoint the specific types of error each pupil is making. Since our focus is on the pupils' learning difficulties, diagnostic tests must be constructed in light of the most common sources of error encountered by pupils. Such tests are
10.8.1 The Teacher and Diagnostic Testing

Diagnosis is an important factor in imparting instruction. Instruction will not be complete without diagnosis and remedial teaching. Individuals differ and in a class of forty or fifty, pupils of different levels of ability are likely to be present. Naturally, there will be slow learners and fast learners as also average learners. They have to be catered to in different ways or at least a balance has to be maintained.

Tests are a must in schools and they in turn yield sufficient data to guide the child in addition to reporting attainment. The answer papers, if analysed, will provide useful data on the weaknesses of students. It is all the more true in the case of terminal and annual examination papers. Even the answer scripts of test papers will give clues to the types of mistakes that a child is likely to commit. An error analysis has to be attempted in order to diagnose the difficulties. If tests are administered towards the end of sub-topics, the analysis of the papers will yield more information than on a composite test.

A test has to be devised with enough number of items to represent all possible types of mistakes. Repetition of situations is important in any diagnostic test. The different types of questions are best suited for certain purposes, hence the type of tests included is also a contributing factor to the success of the test. Clarity and specificity of items included and their preciseness are to be judged in evaluating diagnostic tests prepared by a teacher or an expert.

On analysis, suggestions for remedial actions in the light of their relationship to the improvement of instruction have to be carried out to judge the sufficiency and adequacy of the tool. A good teacher could do this easily without hindering the curiosity and ability of the brilliant ones in the class. The success of a teacher depends on how well he/she performs this task.

10.9 AREAS AND CONTENT OF DIAGNOSTIC TESTING

The analysis, identification, and measurement of the abilities that underlie and condition educational achievement unquestionably constitute the high point of the use of tests in educational practice. Forming the background of practically all possibilities of learning is that curiously interwoven maze of traits, tendencies, and mental abilities. Naturally enough, instruments designed to sample into this field constitute an important unit of the teacher's diagnostic equipment. Some important areas that constitute the content of diagnostic testing and remedial teaching are discussed below.

a) Intelligence: The acceptance of the definition of intelligence as the capacity or power of the individual to learn or to adapt himself/herself to new situations makes it relatively easy to set up devices for its measurement and interpretation. Intelligence tests are incapable of securing a direct measure of capacity unaffected by experience and training. They measure neither the actual process of learning, nor the quality of the learning equipment directly, but they provide the basis for inferences about the equipment from the amount of learning that has taken place under certain conditions. The value of the intelligence test, carefully used and critically interpreted, constitutes an effective and useful instrument for classroom diagnosis.

b) Personality: In the sense that an individual's personality is revealed in all his/her behaviour, this aspect of classroom measurement is all-inclusive. In a somewhat narrower sense, personality has to do with such forms of behaviour as attitudes, interests, and emotional adjustment, all of which are important considerations in the classroom. Personality inventories and scales afford evidence of types not realized from intelligence or achievement tests which teachers should find valuable in the guidance and adjustment of their pupils.

c) Achievement in Specific Subjects: It is now possible to evaluate achievement and to diagnose disabilities with practical accuracy in the fields of whole numbers, fractions, decimals, percentage, mensuration, interest and problem-solving in Arithmetic. The subject lends itself well to analysis and identification of specific skills, and thus to diagnosis. In other subjects, such as language, a similarly exact identification of skills has not been accomplished, although some progress has been made in the analysis of factors.
underlying achievement in broad skill areas in it. Tests capable of furnishing results accurate for individual diagnosis are available for such reading skills as word meaning, sentence meaning, paragraph, comprehension, rate of reading, and for certain of the more mechanical elements of written language. These skills have been analyzed and can be measured with reasonable success.

d) General Educational Achievement: While the emphasis is somewhat more on the measurement of the specific rather than the general aspects of school accomplishments, there is a recognizable need for the measurement of the latter. For general survey purposes, for evaluation of curricular content, and for later individual detailed diagnosis, such general achievement tests are valuable. This, of course, includes the three areas mentioned above.

10.10 REMEDIATION

The question "After testing, what?" is at the back of the mind of every classroom teacher and every supervisor. Much of the early use of tests was futile, since such broad and vague phases of educational achievement were tested that, even though reliable results were obtained, nothing specific could be done about the situation. Furthermore, a great deal of the early use of tests in the classroom was a matter of satisfying curiosity. Teachers have a right to expect that something tangible will be given to them in return for pupil time spent in testing. Pupils themselves have some rights in the matter. One way to ensure this return is for the teachers themselves to take an active part in the program. A type of training, an attitude towards their profession, a clearer insight into the difficulties faced by their pupils, are thereby gained, which may not come to them in any other way.

The results of supervisory tests given periodically for the purpose of checking the efficiency of pupil learning should be revealed to the teacher and the pupils in terms of specific suggestions for the further improvement of the situation. Instructional and diagnostic tests used by teachers in the classroom should furnish such specific information concerning the abilities and limitations of their pupils that a program of preventive and corrective instruction can be begun at once.

10.10.1 Remedial Drill

There are in general two ways of maintaining a high level of pupil achievement in any subject after direct instruction has been discontinued. These are (1) broad, general drill with no integral units of testing to discover breakdowns in pupil mastery, and (2) systematic remedial drill devices to fight forgetting, plus diagnostic testing to discover the exact causes of weaknesses when such weaknesses begin to cause poor work on review drills. The first method involves the systematic use of properly distributed general practice over the complete function. The second involves the periodic location of the specific defects of each pupil by means of diagnostic tests and the immediate correction of these defects by the use of a properly constructed remedial drill.

Unquestionably, the latter is the more economical method of maintaining mastery of desired skills on the part of pupils. It is obvious that general review is valuable at times, but just to review with no specific idea of what the review is to accomplish is too naive and hopeful to be effective.

10.10.2 Steps in Remediation

The program that coincides most closely with the experience of successful teachers and with a sound psychology of learning calls for the following steps in the order indicated: (1) teach, (2) review, (3) test for weaknesses whenever they appear, and (4) follow with remedial drill units on the specific weaknesses revealed by the tests.
It may be worth while to note that material so constructed as to be effective for remedial purposes is also sound enough to be used for initial instruction. In fact, the chief distinction between good content for initial teaching purposes and remedial drill purposes is evident when they are to be used. The most effective remedial drill for the pupil who does not have an adequate sight-meaning vocabulary for silent reading purposes is a drill on the vocabulary he/she should have learned in the first place.

10.10.3 Effective Remedial Material

If remedial work is to be effective, drills of established validity must be provided for each specific skill which conditions achievement in the subject. The validity of drill material depends to a large degree upon the accuracy and completeness with which the analysis of skills is made. Difficulties in subject units which can be identified in only a vague manner cannot be remedied except by chance. Drills must closely parallel the skills they are supposed to remedy. For instance, if mastery of a certain minimal vocabulary is essential to effective silent reading comprehension, then drill on those particular words that constitute special weakness should take precedence over other drills.

Theoretically, perfect validity of drill material can be achieved only by taking a 100 per cent sampling of all of the possible basic facts or skills in the particular field. Naturally, it is impossible to take such a large sampling that all of the most frequently used and most important facts are included. Subject fields vary widely in the way in which they lend themselves to sampling of this kind. In fields such as Reading or Language, a complete sampling is almost impossible to obtain. On the other hand, many of the basic facts in Arithmetic are so readily identified that they may be sampled 100 per cent without difficulty.

Properly designed remedial and corrective drill material wastes no time on skills that need no practice, but strikes directly at the heart of the problem. Remedial drills in which careful control is kept over the distribution of practice on the basic skills are almost certain to be more effective than random exercise, even assuming in both cases that suitable motivation for improvement is provided. That drill will be most productive which most nearly provides a complete coverage of skills of basic importance in the hierarchy of habits upon which successful achievement in the subject depends. Poorly organized drills may or may not deal with all possible weaknesses, but they are almost certain to waste time on skills that are not in need of drill.

The validity of the drill depends upon the degree to which this sampling covers the basic or fundamental skills and the degree to which the exercises themselves actually develop the skills they proposed to develop. There are a number of places in which the complex chain may break. The task of diagnostic and remedial treatment is to locate and repair quickly those links of the chain that have snapped under stress, or have rusted out through lack of use. Correctly designed remedial material will not only parallel valid drill on the correct skill, but it will also cover all of the basic aspects of the skills. Furthermore, it should acquaint the child with the most important variants of each situation.

Effective remedial material must not only cover in a valid manner all of the basic or underlying skills upon which achievement in the field depends, but it must provide a means for bringing about a gradual union of these component elements into the total function. It is entirely possible that a mastery of the subsidiary skills involved might result in only a partial control of the end product, if that goal were not reached by the gradual bringing together of each distinct skill in its relation to the whole process.
10.11 DIAGNOSTIC TESTS AND REMEDIATION IN SPECIFIC AREAS

Diagnosis relates primarily to the single individual: Saroj gets a low score on a test of Reading Comprehension. Why? Pawan gets a low score on the Arithmetic section of the achievement test. What are the sources of the difficulty? Much, probably most, diagnostic testing is carried out with single pupils after it has been determined from a test or from the observations of the teacher that the pupil is not making satisfactory progress in Reading or Arithmetic or some other segment of the school program.

Decisions relating to remedial teaching constitute one subset of instructional decisions. Diagnostic tests given for the purpose of helping with these decisions are in some ways very similar to content-or criterion-referenced test; one tends to focus on specific competencies and the other tries to identify specific deficiencies. However, diagnostic testing is not ordinarily based on immediate past instruction; it grows out of a child's general educational problem, such as inadequate reading, and is directed towards understanding the dimensions and the roots of the present difficulty.

Like a content-referenced test, to be useful a diagnostic test needs to be sharply focussed. Each test must give evidence on the strength or weakness of a very specific skill, and collectively as diagnostic test battery should cover most or all of the specific skills that underline the more general skills that we call "reading; or long division", or "expository writing". Whereas day-to-day instructional tests are primarily forward looking (asking, "Where do we go from here?") diagnostic tests are primarily backward looking (asking, "how did the present difficulty develop?")

The foundation upon which any programme of diagnostic testing is built is a thorough and precise analysis of the skills that are required if one is to perform the complex task currently under study. We will discuss diagnostic testing in the very important and basic fields of Mathematics and spelling in this section.

10.11.1 Mathematics

Teachers are likely to find skill analysis much easier to perform than task analysis since it is not necessary to build a model of structure to carry it out. It is really little more than a systematic analysis of a homogenous set of performance items (e.g. a number of similar arithmetic problems; several written paragraphs; a set of comprehension exercises) in order to detect errors. Those which occur frequently are held to be more relevant to the diagnosis than those which seem to be "careless slips". As an example, consider the performance on an informal test of subtraction administered to a group of seven year olds. The teacher has marked all those items where a particular pupil has made mistakes and has concluded, after study of the performance and questioning, that the child has been confused by the presence of noughts. In particular he seems to have multiplied by nought in some cases.

\[
\begin{array}{cccccc}
67 & 39 & 28 & 75 & 88 \\
-43 & -20 & -15 & -40 & -45 \\
\hline
24 & 10 & 13 & 30 & 43 \\
\end{array}
\]

\[
\begin{array}{cccccc}
347 & 182 & 883 & 975 & 578 \\
101 & -90 & -570 & -622 & -220 \\
\hline
206 & 90 & 310 & 353 & 350 \\
\end{array}
\]

Similarly, at a more advanced level, an older pupil has reached a wrong answer when simplifying an algebraic expression which involves factors and fractions. Here the teacher observes that an error has been made when factorising the expression \(x^2 + ax + b\). If this type of error were to be repeated in similar items a clear diagnosis with implied remediation would be made. At this stage, source of difficulty rather than interpretation of the problem is the goal of the analysis.

\[
\frac{2}{x + 4} - \frac{x - 5}{x^2 + 7x + 12}
\]
Skill analysis can be carried out most easily in school subjects where criteria of 'correct / incorrect' can be applied or where the performance varies along a continuum of 'good to poor'. Too often, teachers have little time to go beyond the correction of errors in children's work and, if the work has then to be covered in red ink (or its equivalent) this can be very depressing. Nevertheless, the principal purpose of this kind of analysis is to discover learning problems, followed by constructive attempts to remediate performance, not to 'bind the pupil down'. So there is no real need to cover the pupil's work with actual 'corrections' to fulfil the aim of analysis. Notice that it is not the purpose here to offer explanation of the learning problems nor to suggest possible remediation.

This is criterion-referenced assessment which can serve the functions both of assessing progress as well as diagnosing learning failure, if not learning disability.

10.11.2 Spelling

Spelling tests and scales afford valuable sources of material that may be used to determine both the pupil's present status in spelling and his/her growth in accomplishment as a result of a period of instruction. If scales based on a sound philosophy of subject matter content are used, they provide the most effective materials for the identification of the spelling difficulties of individual pupils. Samplings from scales used as tests give the teacher an objective basis for the study of these personal difficulties through the accumulation of individual lists of words that are sources of trouble.

To a large extent remedial procedure in spelling may be undertaken directly in connection with teaching. The words misspelled by pupils in their spelling lessons and tests are obviously the words to which they should give special attention. Each pupil should be encouraged to keep an individual list of such words and should be stimulated to master them. Occasional spelling periods should be put aside for studying and testing these individual lists. If such lists are properly utilized, each pupil will come to regard his/her "demon" list as an effective means for eliminating spelling deficiencies.

Written work in all subjects should be carefully checked for spelling errors. A list of such misspellings should be kept by every pupil, and he/she should realize that he/she is to be held responsible for the mastery of these troublesome words. The important thing is that the learning situation be so manipulated that the pupil will want to learn to spell and to feel the need for learning the meaning and spelling of words that are pertinent to his/her written work.

The discovery from the results of a spelling test that a pupil is below the norm in spelling ability may be of considerable value, but it falls far short of its real function unless it reveals to the pupil the particular weaknesses that resulted in his/her low score. The following items of information procurable through observation and measurement are invaluable in diagnosing individual pupil disabilities and should be used as much as possible in connection with the analysis of the pupil's spelling habits: (1) intelligence quotients, (2) spelling marks, (3) reading marks, (4) writing marks (5) attendance data, (6) visual-defects data, (7) auditory-defects data, (8) speech data, (9) general health data, and (10) personality characteristics – industry, aggressiveness, independence, attentiveness, exactness.

Procedure involved

Tidyman and Butterfield suggested the following procedure for diagnosing and treating problem cases in spelling:

1. Give a standard spelling test to discover the amount of deficiency. Compare with achievement in other subjects. In case of non-availability of a test of intelligence,
Learner's Evaluation

achievement in other subjects may be used as a criterion. Same with personality rating; observation/general impression may be used.

2. Give an intelligence test to discover general mental capacity.
3. Test for defects of hearing and vision.
5. Give test of spelling consciousness to show whether mistakes are due to carelessness or ignorance of the word.
6. Collect misspellings from spelling tests and written work, and classify them according to types of errors.
7. Get as much information as possible about the pupil's pedagogical history, especially methods of beginning reading; knowledge of meanings of words; knowledge of phonics; pronunciation and articulation; motor coordination in writing; and emotional attitude toward spelling.
8. From above, assemble probable causes of difficulty in spelling, and adopt appropriate remedial measures, such as the following:
   a) Systematic word study. Early training may have been inadequate.
   b) Exercises in visualization,
   c) Drill upon particular types of spelling errors.
   d) Phonics drills.
   e) Removal of physical defects like those connected with hearing or vision. Here medical help may be necessary.
   f) Develop confidence through successful effort.

Poor spelling is due to faulty or inadequately formed associations. Basically, all spellers, good or bad, learn in the same way—through association. The main difference between the able and the poor speller lies in the study technique used, his/her personality characteristics, and the emphasis he/she gives to the subject.

Many investigators of spelling disabilities have abandoned the procedure of deducing the causes of spelling difficulties from an analysis of errors and are now devoting their time and energies to studying the work habits of pupils by means of careful observation and tests.

10.12 LET US SUM UP

In this unit we were concerned with diagnosis and diagnostic evaluation. We began by discussing the meaning and importance of educational diagnosis. We went on to reflect upon the purpose and use of diagnostic tests. We learned to distinguish between diagnostic evaluation on the one hand and summative and formative evaluation on the other. We also went into the difference between diagnostic tests and achievement tests.
Diagnosis forms the basis to remedial work. Thus we came to the steps involved in diagnosing and remediying difficulties. Further, we discussed diagnostic testing, the teachers role in it and its areas and content. We then went into the details of remediation - remedial drill, steps in remediation and effective remedial material.

In the end, we talked about diagnostic tests and remediation in two specific areas – Mathematics and Spelling.

10.13 UNIT-END EXERCISE

1. Collect some diagnostic tests and remedial materials in your subject area and assess their utility in the classroom.

10.14 POINTS FOR DISCUSSION

1. Most teachers do not use diagnostic tests in the classroom. Can we do without diagnosis if we want our teaching-learning to be effective?
2. Do teachers in Indian School conditions have time for diagnostic testing or remedial work? What is the way out?

10.15 ANSWERS TO CHECK YOUR PROGRESS

1. Educational diagnosis becomes important as a basis for remedial work and also a basis for preventive work.

2. Uses of diagnostic tests are:
   a) as guides to attainments of pupils
   b) as guides to difficulties of pupils
   c) in isolating individual difficulties
   d) for dividing pupils into groups for special coaching or remedial teaching.

3. The difference in the scope and coverage of achievement tests and diagnostic tests is given in the following table:

<table>
<thead>
<tr>
<th>Achievement Tests</th>
<th>Diagnostic Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Meant for the average</td>
<td>Meant for the below average</td>
</tr>
<tr>
<td>b) Aimed at evaluating the achievement level</td>
<td>Aimed at identifying difficulties and weaknesses</td>
</tr>
<tr>
<td>c) Leads to grading and comparing with others</td>
<td>Leads to remedial work</td>
</tr>
<tr>
<td>d) Cover the whole unit learned</td>
<td>Concentrate on difficult areas</td>
</tr>
</tbody>
</table>

4. The areas connected with diagnostic testing are:
   a) Intelligence,
   b) Personality,
   c) Achievement in specific subjects,
   d) General Educational Achievement.

5. Steps in Remediation are:
   a) Teaching,
   b) Reviewing,
   c) Testing for weaknesses whenever they appear, and
   d) Following up with remedial drill on the specific weaknesses revealed by the tests.

6. Factors responsible for good/bad spelling among pupils are:
   a) Intelligence,
   b) Hearing,
   c) Vision,
   d) Reading ability,
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e) Knowledge of meanings of words,
f) Knowledge of phonics,
g) pronunciation,
h) Articulation,
i) Emotional attitude towards spelling.
j) Study techniques used and personality characteristics.

10.16 SUGGESTED READINGS


