TEST DEVELOPMENT GUIDE

for

the Local Office

Iowa Employment Security Commission
Iowa State Employment Service
Affiliated with
United States Employment Service

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FORWARD

This guide presents a brief review of the Iowa State Employment Service test development program. Included are the basic requirements for a test development study, experimental designs employed, clues that may indicate the need for a study, and other topics related to test development research.

The test development program is a cooperative effort with local office personnel, administrative, and technical service personnel all sharing in the responsibility for its effective operation. All test development studies conducted by the Iowa Agency are designed and set up by technical service personnel employing approved experimental designs.

Most important in test development is the preliminary work of recognition and initial discussion which for the most part, is the task of the local office. The purpose of this guide is to present information in reference form which may aid local office personnel in their responsibility to recognize the need for test development research and to promote such activity.

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INTRODUCTION

A test development program is one of the technical services offered by the Iowa State Employment Service to the employers of the State. This program initially includes the identification and investigation of those employment situations where the need for an aptitude test for selecting workers is indicated and may exist. When such a need is found to exist, and appropriate tests are not available, the activities of this program further include research essential to the development of new specific aptitude tests.

The test development program can be a valuable service to the employers of Iowa. In order for these employers to be aware of this service, and of its value to them, they must be informed of the program. This guide presents a brief, but basic review of the test development program of the Iowa State Employment Service.

METHODS AND DESIGN OF TEST DEVELOPMENT RESEARCH

Any activity which correlates (is mutually related) significantly with a second activity may be used as a test to predict the second activity. For example, if the number of smoke rings that a person could make in a given amount of time were directly related to the number of errors he made in recording numbers, such a 'smoke ring' test could conceivably be used to select individuals who would be accurate number recorders. With such a test, a prediction could be made that individuals who could make a certain number of smoke rings in a given period of time would also be able to record numbers with a certain degree of accuracy. The same principle is applied in the development of specific aptitude tests. A sample of workers,

all doing the same job, is given the complete GATB. A measure of each worker's job performance is obtained by supervisor's rating, production record, reject rate or some other method. The relationship between the scores of each of the nine measured aptitudes of the GATB made by the workers and their job proficiency reported in numerical terms is statistically determined. When the better workers also tend to receive the higher aptitude scores and conversely, when the poorer workers receive the lower scores, a relationship between that aptitude and job proficiency is indicated. Those aptitudes, which are significantly related to job proficiency, are then further considered for inclusion in a new specific test battery.

Further statistical treatment provides minimum scores which, when applied to the workers considered in the study, would tend to separate the good workers from the poorer ones. The significant aptitudes and the minimum scores selected for these aptitudes then become a new specific test battery for selecting new workers for that particular occupation. The minimum scores selected for the new test battery tended to select the good workers and reject the poorer workers who were already on the job. Since aptitudes do not change significantly even with experience the assumption can be made that applicants who also meet the minimum scores of the new test battery will be like the good workers already in the occupation. This kind of prediction of job success is not 100% accurate. However, recent specific test batteries published in the Test Catalog indicate accuracy of prediction ranging from 59% to 93%.

GENERAL REQUIREMENTS FOR A TEST DEVELOPMENT STUDY

Outlined below are the components that made up the design of a test development study. Included in the

outline, and underlined, are certain basic requirements that must be met before a test development study can be undertaken. This information thus underlined, should be considered by local office personnel in evaluating possible studies. The additional outlined material, which is all necessary for a study, is presented primarily for general information and understanding.

A. Sample

1. A group of at lease 50 workers must be initially included for any resultant aptitude test to be given the "B" designation and to be published in the Test Catalog. It is permissible to conduct a study on a sample of fewer than 50 but no less than 30 workers.

2. Workers from several plants or industries may be combined in order to obtain a sample of at least 50 individuals.

3. Workers in the sample must all be performing the same task or tasks in their jobs. Various jobs may be included if each worker participates in all, or most of the jobs during a given period of time. Examples of this may be found in tests B-264, B-382, and B-413.

4. All workers should have had at least a sixth grade education and be between 16 and 54 years of age. However, individuals older may be considered.

5. All workers making up the sample should participate in the study voluntarily.

B. Job Analysis

1. A job analysis schedule will be completed for the occupation under consideration.

2. Job analysis data will be collected and prepared by the test development technician.

3. Job analysis data so prepared will be made available to the cooperating employer.

C. Criterion (Measure of Job Performance)

1. This will consist of an evaluation of the degree to which each individual worker in the sample measures up to what the employer calls acceptable job performance.

2. Various methods may be employed to obtain ratings of job proficiency for the workers in the sample.

   a. Supervisors' ratings
   b. Production records
   c. Records of errors or rejects
   d. Training time records
   e. Course grades
   f. Miscellaneous other ratings or methods

3. All rating devices to be constructed by Employment Service Test Development Technician in cooperation with the employer.

4. All ratings to be obtained by the Test Development Technician in person.

5. A subsequent check on all initial subjective ratings usually consisting of a re-rating to be made after a time lapse of two weeks.

6. No such re-check to be made on production or other type objective records or course grades.

D. GATB Testing

1. All workers in the sample will be given the entire General Aptitude Test Battery.

2. All workers may be tested at the same time or may be tested individually or in groups.

3. Workers should be tested on "company time."

4. Test scores of workers will not be made available to company personnel.

E. Personal Data

1. The age, education, and length of experience on the job for each worker in the sample will be obtained.

F. Selection Techniques

1. The procedures used by a company in hiring employees sometimes have an effect upon the test results obtained when a research study is conducted. Thus, it will be necessary to know the company's hiring policies with respect to educational requirements, age requirements, and other selection factors.

G. Data Analysis

1. All data collection and analysis will be done by Employment Service personnel.

2. A copy of the final technical report may be furnished to the cooperating employer.

BASIC DESIGN FOR TEST DEVELOPMENT STUDIES

Two experimental designs have been developed for conducting test development studies. Each design has its advantages and disadvantages. While in many cases either design may be employed with equal merit, the usual case is for one design to be more appropriate.

The following outlines the basic characteristics of each design noting the advantages and disadvantages of each.

A. The Employed Workers Experimental Design

1. Basic Characteristics

Perhaps the basic characteristic of this design is that it uses as the standardization sample a group of workers who are employed on the job at the time the study is undertaken. In general terms, this design involves the following:

a. Administration of the GATB to a group of employed workers.
b. Collection of measures of job proficiency of the sample.
c. Collection of job analysis data.
d. Statistical treatment of the data.

2. Advantages

The advantages of this design are mainly practical ones. Very often a quick result is desired which this design may produce. The criterion and its reliability may also be studied before other time consuming phases are undertaken. It is the more commonly employed design.

3. Disadvantages

On the practical side the key disadvantage of this design is that it takes workers "off the job" for the necessary test administration. In some instances this may be an advantage because it places certain responsibilities on the employer. However, some industries just could not function with a number of machines idled or employees away from their jobs for a period of time. In other cases the plant superintendent or other official in charge is agreeable to

most any arrangement; however, he may be forced by policy to secure permission from his headquarters office to take men off the job for testing--permission which in many cases may not be granted. On the technical side, to include employed workers has the effect of "restricting the range of talent." Most samples of employed workers include only those who have successfully completed any probationary period. While some of the workers may be called poor workers, usually they are not so poor to warrant dismissal. Also, since the workers are asked to volunteer, it is usually those who are among the poorer workers who are most reluctant to cooperate and may refuse to be tested. Thus, the range of talent does not include the bottom most individuals or those who have completely failed and departed. This tends to lower the resulting correlations.

B. The Longitudinal Experimental Design

1. Basic Characteristics

This design uses as the standarization sample applicants who are tested at the point of hire to the job and followed-up with regard to their success on the job. In general terms, this design involves the following:

a. Administration of GATB to a sample of persons prior to or at the point of hire to a job. (This may be done on an individual basis as new workers are hired.)
b. Collection of measures of job proficiency at the point at which it can be said that job or course success has been demonstrated.
c. Collection of job analysis data
d. Statistical treatment of data

2. Advantages

The one main practical advantage is that man hours are not lost from the job. Perhaps more important are the technical advantages.

a. Many of the disadvantages of the employed worker design are overcome. Unsuccessful workers are included.

b. Criterion data may be collected at the same time-point in the worker's career. (In the employed worker design, the less experienced workers tend to be rated lower than experienced ones).

c. Since all new hires must be tested, the local office has an opportunity to demonstrate its applicant referral ability.

d. The conditions surrounding the testing of the sample (having to take a test to get a job) are similar to those that will be encountered when a specific test is completed and is in use.

e. Any possible effect that training or experience could have on GATB scores is eliminated.

3. Disadvantages

The disadvantages of this design are mainly practical in nature. Such studies may take considerable time to complete unless considerable turnover exists or expanded hiring is anticipated. Also, after hiring has taken place, sufficient time must be allowed to permit the worker to demonstrate his job proficiency. In some instances, this may be a matter of a few weeks, but in others a considerable time may have to lapse. Since test development may be regarded as an ongoing process, the time factor may not be too important. However certain other factors may enter the picture due to an extended time period. Job duties may be re-

designed. New administrative personnel may not be as welling to cooperate. Company's anticipated hiring may not materialize or, as was the case with one company, when the local office began to screen applicants and collect test scores, their referral method alone reduced turnover. This turnover reduction was such that the number of new hires was reduced so that a sufficient sample was never reached.

Each design has its merit and study of the individual situation is needed to determine which method will provide the better results. The longitudinal design is particularly useful in the case of a new plant just starting or in those cases where considerable expansion is to take place. However, for this expansion to have the benefit of test selected applicants, an employed worker study conducted with present employees must be undertaken in advance of that expansion. The longitudinal design may also be satisfactorily employed in those instances where a test is being developed to reduce turnover. It is the task of the test development technician to choose the more appropriate design for a particular study. In many cases, the appropriate design is obvious. The discussion presented here should serve to point out to local office staff the possible methods of conducting test development research.

THE GOAL OF TEST DEVELOPMENT
(The Selection of Successful Workers)

The prime purpose of any aptitude testing program is to identify and to predict, with some degree of certainty, who will succeed in a given activity. For the Employment Service, it is who will become the better or successful workers. Since test development research must supply the aptitude tests it then must concern itself with the initial definition of "Successful workers". A "successful worker" may mean a number of things, each one different. The following

list presents definitions which may singularly or in combination define a successful worker to a given employer.

A. Workers who stay on the job longer. (Usually this is a by-product of one or a combination of other factors in this list. For example, a person who can perform a job satisfactorily may tend to stay with that job.)

B. Workers who learn a job in the shortest period of time. (Some industries, because of working conditions or other factors beyond their control, traditionally have a great amount of turnover. A worker who can learn his job faster can represent a considerable saving for this kind of an industry.)

C. Workers who are more accurate in their work

D. Workers who can produce more

E. Workers who are more versatile. A worker who can handle several jobs can be shifted more readily and aid production.

F. Workers who can inspect more proficiently

G. Workers with promotional potential. (This is particularly important in instances where all workers are hired at one level and then promoted to higher skill levels.)

H. Workers who need less supervision. (Supervision is costly.)

I. Workers who can assume more responsibility

J. Workers who have a lower accident rate

A better worker need not only be defined in employer's terms. A more proficient worker may well be a happier worker.

The above list indicates that when a test development program is undertaken to provide a selection method for better workers, the definition of those better workers may be considerably varied.

SITUATIONS WHICH MAY INDICATE THE NEED FOR A TEST DEVELOPMENT STUDY

A need may be considered to exist when an employer would like most of his employees to be like those few of his better employees with respect to their ability.

The following list indicates some of the situations which may suggest a need for a test development study. It may be noted that these situations probably could be alleviated by selecting workers who may be described in the terms listed under the last major heading in this guide. It should be noted that factors other than aptitudes may well be responsible for the situations listed below.

A. High Turnover Rate

Turnover can be a costly problem to an industry. While a specific aptitude test used to select new workers may not completely eliminate turnover, it may represent a substantial saving to the employer. The following list notes some of the costs that a high turnover rate may produce.

1. Lost time in production before workers leave (Workers seldom work at capacity before leaving.)
2. Lost production (until replaced)
3. Lost production due to inexperience of new workers
4. Lost time of associate workers

clined" or "good at math." If any of these factors are important to job success objective test development research could verify it and set up specific aptitude tests which could then be used to aid selection.

E. Education Requirements

When an employer sets education requirements higher than usual, it may indicate that he is having difficulty in obtaining people with the aptitudes necessary to learn all assigned jobs. Here it may be noted that a high school diploma of today may or may not indicate the proficiency that it once did. With increased job opportunities, particularly for the top ranking students, an employer may be forced to select only from among the lower ranking students. Thus, a test may now be necessary to select good workers for this employer.

F. Comments of Discharged Workers, Voluntary Quits, or Workers Still on the Job

What the men say about their jobs can give a clue that a better selection method may be needed. A man who says "I just can't keep up with that machine much longer" may be correct. Maybe someone with the necessary aptitudes could. In the case of the discharged worker it may not be the man's fault that he lost the job, but the system that allowed him to be hired for the job in the first place.

G. Employers' Comments

A need for a better selection program may be expressed by an employer in casual conversation. He may comment, for example, that "If you have any more applicants like that person you sent me a month ago, be sure and send them over." This even may be a clue that a possible test selection method may be needed.

5. Additional cost of supervision (Extra time spent with new workers)
6. Reduced quality of work
7. Higher unemployment insurance rates
8. Higher insurance rates (new workers generally are more accident prone)
9. Training costs
10. Make-up pay needed to meet minimum wage
11. Production expenses (material spoilage and time used to make up production deficiencies of new workers)
12. Administrative costs (This includes medical examination costs, induction costs such as photos, forms, booklets, and salary and rent needed to hire and place on the payroll an excessive number of workers.)

B. New Methods, Machinery, Operations

If a new method is going to become a part of a general operation of a plant, the proper operation or the learning of the operation may be the criterion of success for future hires. If so, present employees may be tested and rated in terms of how well they do on the new operation so that a test could be developed for selecting subsequent workers.

C. Plant Expansion

Present employees could be used as the sample for a test development study to determine hiring requirements to be used for selecting the additional workers that will be needed. A longitudinal study could also be carried out, in which all new employees would be tested before entry on the job.

D. Employer Orders

What an employer asks for on job orders can give a clue that a need may exist for objective selection. Examples of this may be "mechanically in-

H. Salary Increases and New Contracts

An increase in salary may result in a higher unit cost for production. It may be that, to stay in business, an employer must get the best workers possible.

I. Cut Back in Production or Loss of Contracts

A cut back in production or the loss of a contract may be the result of the inability to produce a product at a given cost. A better selection method could result in lowered production costs.

J. Competition

Competition is said to be the key to the success of the American democratic system. Many of the large companies are able to afford personnel research facilities and have a rather comprehensive employee selection program. In order to compete, many of the smaller firms must utilize a better method of selecting their workers. The Employment Service testing program with test development can enable them to continue to compete effectively with larger firms.

The above list is not necessarily a complete one, but it should serve to point out some of the possible problems that an employer may be experiencing which may be solved by a test development program. While it may well be that factors other than aptitudes contribute the greatest share to a specific problem, the reduction of one of these problems by as little as ten per cent by the use of an aptitude test may represent a considerable saving.

SUGGESTED LOCAL OFFICE PROCEDURES AND ACTIVITIES

A. Review employer orders and listen critically to any comments made by employers, their employees, or former employees for any of the clues suggested in this guide.

B. Discuss the content of this guide with employers. Particularly review the situations which may be helped by test selected applicants. Let employers know about the test development program.

C. Prepare and submit to the administrative office a short narrative report on any suspected need for test development. Do not be concerned about the number of employees involved; however, report the number. This report should be made even in those instances where relations with the company or company policy is such that a study is virtually impossible. Some other state agency may be able to do such a study with one of their employers.

D. Request a Technical Services staff person to accompany local office personnel in those initial contacts where such assistance seems advisable.

E. Request any information or help that may be of benefit. Remember, the test development program is a service which the local office has to offer. Attempt to use it.

F. Report any anticipated substantial employment increase to be made by a local employer or any new firm that may intend to locate in the vicinity.

SUGGESTED TECHNICAL SERVICE RESPONSIBILITY AND ACTIVITIES

A. Review any preliminary reports submitted by the local offices.

B. Request additional information if needed.

C. Prepare a proposed method of study if the project appears feasible outlining the methodology to be employed. This will be a detailed plan

outlining the actions to be taken in a study. It will set out the responsibility of the Employment Service and that of management.

D. Accompany local office personnel and contact the employer when the experimental plan has been completed. Explain the preliminary findings and review the proposed experiment. Possibly secure the commitment of the employer at this time.

E. Make employer visits to secure preliminary information at the request of local office personnel when the situation warrants it.

F. Prepare information for the local office staff to use in discussing test development in general or in discussing a particular study with an employer. This may include a general experimental design, turnover cost report, lists of similar employers using ES aptitude tests, or evaluation of employer's presently utilized tests or other activities.

G. Provide local office staff with any additional assistance they may need in their function of providing test development service to their local employers.

GENERAL COMMENTS AND REVIEW

The following is a list of comments that should be made regarding the local office function in the test development program. Some of the comments are quite obvious; others have been implied in the material presented so far. However, some of the other comments are quite important in a program of test development.

A. It will not be necessary for an employer to be contacted about test development even through a report may be submitted regarding his problems.

B. An Employer may be solicited to determine his interest; however, he should not be asked directly for any sort of commitment to a test development study until the test technician makes his report and sets up a proposed program.

C. No attempt should be made by the local office staff to set up any part of the design of a study.

D. Employers should be advised that all information gathered will be kept in strict confidence.

E. A recognized problem for one employer should not be discussed with others.

F. It must be remembered that personnel problems may be a sore spot for an employer and, as such, require tactful dealings.

G. Any or all parts of this guide may be freely discussed with any employer.

H. Correspondence regarding anything contained in this guide or regarding any possible problems is welcome.