DOCUMENT RESUME

ED 068 500 TM 001 837

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TITLE Model for Instructional Validation.
PUB DATE [72]
NOTE 13p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Evaluation Methods; *Instructional Materials; *Measurement Techniques; Models; *Program Effectiveness; Reliability; Research Methodology; Technical Reports; *Validity
IDENTIFIERS *Instructional Validation

ABSTRACT

Two general areas of instructional validation are discussed: internal validation, which occurs within the framework of a single environment, and external validation, which involves the comparison of two different environmental frameworks. Several sample and basic designs are presented which may be used to validate instructional material. Two studies are then presented wherein data was collected to examine the usefulness of specific instructional procedures. Some comparisons are emphasized regarding internal and external validation procedures, although they both result in important data. Chief among these is the fact that internal validation occurs under strict controls, but the information acquired is only conclusive for the system in which the research occurs; external validity studies offer more generalizable results, but the conclusions cannot be as definite. For internal validation the test may be specifically designed to fit the system, but for external validation the test must be standard for both systems. A combination of designs may be used to validate instructional material both internally and externally in the same process in order to measure the lasting effect of the instruction. (Author/LH)

MODEL FOR INSTRUCTIONAL VALIDATION

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ABSTRACT

This paper discusses two general areas of instructional validation and presents several sample and basic designs that may be used to validate instructional material. Finally, two studies are presented wherein data was collected to examine the usefulness of specific instructional procedures.

MODEL FOR INSTRUCTIONAL VALIDATION

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Validation of instructional material must be effectuated in one of two ways. Internal validation is that which occurs within the framework of a single environment (i.e., specific program, a classroom, a school). External validation involves the comparison of two different programs, classrooms, or schools. Both types of validation have their strengths and weaknesses.

Internal Validation

The purpose of internal validation is to estimate the effectiveness of instructional material in terms of what the material is expected to teach. Internal validation limits the conclusions of the research to that setting wherein the instruction occurred. If a set of instructional tapes are validated in a specific program, there can be no empirical way of claiming that the instruction will work in any other program. However, inference may logically be made that, in all likelihood, the instruction will work in different programs and under different conditions.

Despite the handicap of not being able to generalize results of research to other situations, internal validity studies offer some important advantages. First, these studies are mostly conducted under the auspices of strict control; therefore, conclusive statements can be made about the results.

Second, internal validity is normally possible with a minimal amount of time and effort. The instructional material and evaluation instrument are normally available. The need to standardize an evaluation outside the immediate environment is unnecessary. Students to serve as subjects are readily available, and minimal disruption of their progress in the instructional system is maintained.

Efficient internal validation studies require a minimum of five randomly assigned subjects per group. However, when possible, the total number of subjects in the entire study should be equal to or greater than thirty in order to obtain the maximum amount of information. It is equally important that all subjects be assigned to groups on a completely random basis, and that arbitrary assignment or purposive selection be used only as a last resort.

Finally, internal validation should involve as small a segment of instruction as possible and still retain meaning so that the results of student performances will indicate specifically that the instruction is successful. If large amounts of instruction are tested and shown successful, additional studies are still needed to isolate the exact elements of the instruction which is producing the learning. A useful technique is to test large amounts of instruction and eliminate all the instruction that does not achieve the desired results. When some instruction is successful, the internal validation procedures are employed to isolate the best part of the instruction.

Instructional Level Validation

Instruction is normally designed to produce learning on a specified level (memory, classification, etc.; Gagne, 1965). To validate instruction for a specified level, students are presented the material and then evaluated at the specified level, as well as other levels. For instance, if the instruction teaches a concept classification task, it would be expected that the student would not do as well on an evaluation aimed at another instructional level, such as memory or problem-solving. By testing at several levels the true instructional level may be determined.

If naive subjects are not available, a pretest should be given. When a pretest is used, two groups are needed for each set of instruction. Design No. 1 illustrates the model without a pretest and Design No. 2 with a pretest.

Instructional Adequacy Validation

This type of validation refers to the usefulness or effectiveness of the instruction. Design No. 3 illustrates the model for testing two sets of instruction without a pretest. Another group is added for each additional set of instruction tested. Design No. 4 illustrates the same model, but with a pretest. The additional group (a control) is used to determine how much learning is a function of the pretest.

These two designs are possibly the most useful because they not only test the usefulness of existing instruction, but may be used to test potentially useful alternate instruction. Again, five subjects should be randomly assigned to each group.

External Validation

This type of validation procedure is more cumbersom to control, therefore the results cannot be conclusive. Using external validation allows some conclusions to be made concerning the usefulness of instruction outside the environment for which it was designed. However, specific recommendations are often not possible because of lack of strict control inherent in using large segments of an instructional system.

External validation is normally conducted between entire classes, schools, or programs. The differences in their performances may be attributed, not only to different instructional material, but also to different teachers, more student involvement and other factors.

A third problem with external validation is that measuring instruments are often created along the practical and philosophical lines of a system, and an evaluation specific to one system is inappropriate to measure another. Consequently, standardized independent tests are often needed to collect meaningful data.

Finally, the basic assumption in testing two groups is that they were identical before the instruction and are identical in every other way. However, the fact that students select one class or program and not another indicates that they are not completely identical. It is not appropriate to assume that a group chosen from one class is the same as a group chosen from another class. They may have numerous differences in basic intelligence, motivation, or desire.

Still, the usefulness of external validation is not to be overlooked. Significant amounts of a particular program or process can be identified as causing a trend for the better. Once this is established, the internal validation procedures may be employed to determine which of the instructional materials is most essential and useful to learning.

In this type of validation pretests are very important to eliminate subject differences so that only the instruction is validated. Designs No. 3 and No. 4 are used for this validation, except a control group (Design #4) is used only in rare circumstances. A control group could be employed only if both groups (experimental and control) were drawn from the same population of students. The design is not valid if there is any basic difference between the experimental and the control. Students must be randomly drawn to fill each group, and the evaluation must be the same for each group. A combination of models could be used to validate instructional material internally and externally in the same process.

Conclusions

Although both internal and external validation procedures result in important data, some comparisons need to be emphasized. Internal validation occurs under strict controls, but the information acquired is only conclusive for the system wherein the research occurs. External validity studies offer more generalizable results, but the conclusions cannot be as definite.

In all validation studies the critical prerequisite is an appropriate evaluation instrument. For internal validation the test may be specifically designed to fit the system. For external validation the test must be standard for both systems. This requirement means that the test will be more general, and hence less information can be gleaned. Many studies finally turn to attitude tests, personality tests, anxiety tests and questionnaires. These types of tests give useful information on student attitudes, but in validating instruction, student ability is most important.

The lasting effect of the instruction, either internally or externally, may be measured by administering the posttest (or a parallel form of the posttest) some time after the first posttest was given. A combination of the presented designs may be used to validate instructional material both internally and externally in the same process.

DATA COLLECTION

Two internal validity studies were conducted in an individualized teacher training program (ISTEP) at Brigham Young University to illustrate some of the procedures outlined in this paper.

Study #1

Two sets of instruction were being used in the program to teach students to correctly classify questions as memory, convergent, divergent, or evaluative. Design #4 was used because a pretest was needed to factor out any information prospective subjects would bring to the study and to use a control group to evaluate what effect this pretest would have on a subsequent posttest.

Method

Thirty subjects were randomly selected from all the subjects in the program. These subjects were then randomly assigned to one of two experimental groups or the control group.

All the subjects met together and took the pretest. Each subject was then given one of the sets of instruction or an irrelevant task. After the treatment the subjects took the posttest. The pretest and posttest were the same twenty-four item test. The test contained six items to measure each of the four categories of questions

Results

The scores on the posttest were analyzed with analysis of covariance using the pretest as a covariant. This analysis showed a significant difference between the groups ($F=14.77$, $p<.001$). The means of the treatment groups were almost identical (19.872, 19.648), but the control group was significantly lower (15.479).

Summary

The results of this study show that either of the sets of instruction are useful in teaching the student to classify different types of questions. However, neither of the sets of instruction were completely adequate, as evidenced by the mean score of 19+ correct responses out of a possible 24. The result may also have been a function of the test.

If only one of the sets of instruction is to be used it should be selected because of its length. In this case the shorter set produced a slightly higher mean score.

Finally, some indication is given for an appropriate criterion level of achievement. Since 19+ was the mean score, 19 would be a logical level of achievement.

Study #2

The study validated two types of instruction designed to teach the student to identify examples of the Modified General Model of Instruction. The first was a prepared film/tape and the second was a written discription.

Method

Twenty students had contracted to learn about the Modified General Model of Instruction. These twenty students were randomly assigned to four groups, three experimental groups and one control, using Design #3. This design was selected because none of the subjects had been previously involved with this material, and were therefore considered naive, and it was not feasible to create a separate but parallel pretest in the time available.

All the subjects met to receive their instructions. Group I was told to study the written material. Group II was instructed to study the film/tape presentation, and Group III was instructed to study both the written material and the film/tape presentation. Group IV was the control and the subjects were asked not to study for the test.

The test consisted of twenty-eight items, and a criterion of achievement was set at twenty-two or more correct.

Results

The results showed no subjects in the control group reaching criterion, while 60% (3 out of 5) of the subjects in Group III reached criterion and 20% (1 out of 5) of the subjects in Groups I and II were successful.

Summary

Although no statistical analyses were made, the results indicate that both the film/tape presentation and the written description are most effective in helping students acquire this knowledge. Whether this is due to additional information in the two sets of instruction, or mere repetition, will have to be discovered by experimental research

DISCUSSION

These two studies presented two alternate methods of estimating the validity of instructional material within a specific setting. The options for procedures and types of design make a validation possible. The crucial characteristics are an appropriate evaluation of the instruction and random assignment of subjects to the various groups. The only other concern is to filter out the previous knowledge of subjects.

By following these basic guidelines, estimates of the validity of instruction are not only possible, but practical.

VALIDATION DESIGNS*

R - Random X - Treatment

0 - Pretest Ø - Posttest

Design No. 1	Design No. 2	Design No. 3	Design No. 4
R X $\emptyset_1$	R 0 X $\emptyset_1$	R X_1 Ø	R 0 X_1 Ø
R X $\emptyset_2$	R 0 $\emptyset_1$	R X_2 Ø	R 0 X_2 Ø
R X $\emptyset_3$	R 0 X $\emptyset_2$		R 0 Ø
	R 0 $\emptyset_2$		
	R 0 X $\emptyset_3$		
	R 0 $\emptyset_3$		

* Campbell and Stanley, 1963

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