

AN EVALUATION OF THE SPITZ STUDENT RESPONSE SYSTEM IN TEACHING A COURSE IN LOGICAL AND MATHEMATICAL CONCEPTS

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ABSTRACT

The problem of this study was the effect of teaching freshman mathematics with the Spitz Student Response System (SSRS) upon a student's anxiety, attitude, and achievement. Subjects were seventy-three freshman men and women at a liberal arts college in the Southwest. A 2×2 factorial analysis of covariance was used to analyze the data. Several research hypotheses were formulated to be consistent with the purposes of this research problem. It was found that the use of the Spitz Student Response System did not significantly change a student's achievement, anxiety, or attitude in mathematics. The statistical data of this study would tend to support the idea that the effect of attitude on achievement is independent of the method of instruction. Subjective evaluation by the students tends to support the use of the Spitz System.

THE YEARS spent as a college student are filled with many anxious and traumatic moments. It seems that anxiety is significantly increased when an undergraduate student with very little background in mathematics finds himself required to take a freshman mathematics course.

Most of the research dealing with the relationships between anxiety, attitudes, and achievement in mathematics has been done on the elementary school level. Practically no research has been done with non-mathematics majors who are required to take mathematics courses in college.

It is possible that the anxiety felt by the undergraduate students in freshman mathematics is in part caused by their being required to take the course (which poses a real threat since they must pass the course) and by their attitude toward mathematics and mathematically oriented subjects. Norton and Poffenberger (20) have found that the development of attitudes toward mathematics is a summatory phenomenon with each conditioning experience building upon the one that precedes it. The initial attitudes seem to be developed in the home and are affected not only by parents, but by all the teachers of mathematics with whom the student is associated. Pupils who have done poorly or failed mathematics have deflated egos and therefore tend to develop attitudes

of dislike and hostility toward mathematics.

Part of the attitude developed toward mathematics is probably caused by the way in which this course has traditionally been taught. In the past few years, many new devices for teaching mathematics have been developed and some of them have shown to be helpful. One of the newest teaching devices is the Spitz Student Response System (SSRS). The SSRS is an electronic classroom communication system that individualizes group instruction by providing constant interaction between the student and his instructor, as well as allowing the instructor to know exactly how well the entire class—and each student—understands a particular presentation.

A SSRS was installed at Southern Methodist University in a specially designed classroom in 1969. It was installed because of the successful results of some preliminary experiments conducted by Dr. W. J. Millard, of the Pan American Institute for Social Sciences and Educational Research, during the 1967-68 school year.

STATEMENT OF THE PROBLEM

The problem of this study was the effect of teaching freshman mathematics with the SSRS upon a student's anxiety, attitude, and achievement.

PURPOSES OF THE STUDY

The purposes of this study were

- 1.) To compare the achievement levels of students enrolled in a required freshman mathematics course when taught by a.) regular lecture-recitation method, and b.) lecture-recitation method augmented by the SSRS.
- 2.) To ascertain the effect of the SSRS upon a student's anxiety and his attitude toward mathematics.
- 3.) To analyze the effect of attitude on achievement in mathematics when the SSRS was used.
- 4.) To determine whether there was any interaction between student anxiety, attitude, and method of instruction as variables affecting student achievement.

HYPOTHESES

To carry out the purposes of this study, the following hypotheses were formulated:

- 1.) The adjusted mean achievement score of the students taught with the aid of the SSRS would be significantly higher than the adjusted mean achievement score of the students taught by the regular lecture-recitation method.
- 2.) The adjusted mean anxiety score of the students taught with the aid of the SSRS would be significantly lower than the adjusted mean anxiety score of the students taught by the regular lecture-recitation method.
- 3.) The adjusted mean positive attitude score of the students taught with the aid of the SSRS would be significantly higher than the adjusted mean positive attitude score of the students taught by the regular lecture-recitation method.
- 4.) The adjusted mean achievement score of the students with a positive attitude toward mathematics would be significantly higher than the adjusted mean achievement score of the students with a negative attitude toward mathematics.
- 5.) There would be significant interaction between the level of attitude and the method of instruction as variables affecting the achievement in mathematics, when the effects of anxiety were controlled statistically.

RELATED RESEARCH

Many persons report in freshman mathematics classes that they are emotionally disturbed in the presence of mathematics or mathematically orient-

ed material. It has been the experience of the writer that reactions of this nature to mathematical materials constitute a major field of emotionality in academic situations. And yet, as Aiken and Dreger (1) point out, although there have been many studies conducted to determine the effects of anxiety and attitude on arithmetic achievement, there has been essentially no controlled research on emotional problems associated with higher-level mathematics—especially with regard to undergraduate non-mathematics majors in a mathematical situation (such as required freshman mathematics course).

Studies dealing with mathematics (on an elementary level) and anxiety generally fall into two methodological categories. One set of studies has dealt with the somatic (body) expressions which are manifested by individuals when confronted with stimulus situations of a mathematical type. A more commonly used technique utilizes the paper and pencil questionnaire. The subjects' responses to introspective questions are judged to be indications of anxiety level.

Hess (14) presented mental arithmetic problems of varying degree of difficulty to students and then obtained a trace of the size of the pupil of the eye. The size of the pupil tends to increase immediately upon presentation of the problem. The pupil reaches maximum size upon solution of the problem and then decreases in size. Milliken and Spalka (17) found that college freshmen with low mathematics scores on the ACE examination tended to exhibit changes in breathing depth, blood pressure, and heart rate when presented mathematically related task.

Most of the studies which used questionnaires have shown that there is a negative correlation between achievement in arithmetic and anxiety. Biggs (5:59) concluded

In arithmetic and mathematics the inhibition produced by anxiety appears to swamp any motivating effect, particularly where the children concerned are already anxious; or to put it another way, anxiety appears to be more easily aroused in learning mathematics than it is in other subjects.

Aiken and Dreger (1) suggest that what is really involved is "anxieties" not "anxiety." They carried out a study on college freshmen and identified a syndrome of emotional reaction to mathematics which they labeled "Number Anxiety." They found that a negative correlation existed between Number Anxiety and achievement in mathematics.

Morgan (18) found that there is no significant correlation between test anxiety and achievement in mathematics on the high school level. Riggs (23:3927) found that in college freshmen "... anxiety and its adaptation apparently have an effect on learned responses such as adjustments and values, while they do not seemingly influence aptitudes and grade point averages."

In the past few years, anxiety and its effect on learning has played a role of primacy in investigations. In an exhaustive review of the studies of anxiety in children, Ruebush (24) pinpointed the current dilemma in which comparability of findings from

different investigations was not only complicated by differences in theoretical definitions and orientations, but also by differences in operational criteria from study to study within the same theoretical framework.

Most studies dealing with anxiety in school situations assume that it has a debilitating effect on the learning process. White and Aaron (28), Woodworth (30), and Rethlingshafer (22) questioned why anxiety should be avoided or why anxiety should be scorned as an energizing determinant simply because it is unpleasant. Dabrowski (9), in postulating a theory of "positive disintegration," advanced the notion that anxiety could be healthy in certain ways. Alpert and Haber (3) reported two individual scales of facilitating and debilitating anxiety and used them to measure their effect on achievement.

In contrast to the somewhat confused picture in anxiety research, the research in attitudes provides a more stable situation. Fedon (12) found that some students have definite and relatively strong positive attitudes toward elementary school mathematics, while others will have definite and relatively strong negative attitudes about the subject as early as the third grade. Faust (11), in studying more than 2,500 elementary school students, found that of the "skill subjects," they preferred arithmetic first. Bassham (4) found a positive correlation between attitude and achievement.

Poffenberger and Norton (20), in a study of college freshman, distinguished two subgroups, one positively oriented toward mathematics, the other negatively oriented. Both subgroups were comparable in ability, support from parents, and general parental expectation. The analysis of the data dealt with sex differences, parental influence, and teacher influence on the development of attitudes toward mathematics. Sex did not seem to be a strong influence in the development of a positive attitude toward mathematics, but more than twice as many girls as boys had a strong negative attitude. Parents and parental expectation played an important role in attitude formation, but the other influences were not significant.

Other studies (Faust (11), Dutton (10), and Haskell (13)) seem to indicate that grade level and sociometric grouping seem to affect attitude toward mathematics.

As noted before, Poffenberger and Norton (20) found that the development of attitudes toward mathematics is a summatory phenomenon. They also found that initial attitudes are developed in the home with the child's first contact with numerals as symbols. These findings have been verified by Aiken and Dreger (2).

So far as the writer has been able to determine, as yet no published studies have utilized the SSRS. This probably arises from its newness.

PROCEDURES FOR COLLECTING DATA

Subjects for this study were in the two sections of Mathematics 1308 which were assigned to the investigator for the fall of 1970. Mathematics 1308 is a general requirement for all students not major-

ing or minoring in engineering, science, or mathematics. There were thirty-nine students in the control group and thirty-four students in the experimental group. One of the sections met in the specially designed classroom which houses the SSRS. This was designated as the experimental section. The freshmen were registered for their courses through a personal conference with an advisor. The actual scheduling of class sections was done by a corps of schedulers who chose these sections for the student in a random manner. The student had no control over the section of a course in which he was placed.

The investigator taught the same material to each section, but in the experimental section, most class periods started with a series of questions that could be answered on the SSRS. This allowed him to set a baseline of understanding for the previous day's lecture material. This material was then re-discussed or drilled if there was a need. Throughout most of the lectures, the instructor used printed or mimeographed materials to present the instructional concepts and the related questions. In this way, the lesson was a continuous series of individual give and take, telling and asking, informing and inquiring, instructing and questioning. The investigator was able to pace himself by moving faster when the student responses were quick and sure. He stopped to amplify, clarify, or redefine, and explain when the responses indicated the majority of individuals did not understand.

With the SSRS, each student "communicated" with the instructor and could be questioned by the instructor privately. Each student had the reward of reaching his maximum level of achievement and was required to maintain full involvement with the instructor. The SSRS allowed for instant reinforcement of the student for correct responses and an indication of wrong ones, all in a private manner.

The first class meeting was devoted to informing the students in the experimental section about the SSRS. Both classes proceeded at approximately the same rate. The order of procedure for collecting data was as follows:

- 1.) The Cattell Anxiety Questionnaire (7) under the title Self Analysis Form was administered during the first and last weeks of class, to both classes.
- 2.) The Mathematics Attitude Questionnaire by Aiken and Dreger (1,2) was administered during the first and last weeks of class, to both classes.
- 3.) The Mathematics 1308 Placement Test was administered during the first and last weeks of class, to both classes.

PROCEDURES FOR ANALYSIS OF DATA

The tenability of all hypotheses of this study were tested in the null form at the .05 level of significance (2-tailed test).

Hypotheses 1, 4, and 5 were tested by using a 2 x 2 factorial analysis of covariance with the anxiety score as the covariate. This allowed for simultaneous comparisons of the effects of multiple variables and determined whether a combination of these variables used for classification produced effects not attributable to any single variable.

Hypothesis 2 was tested by means of analysis of covariance with the pretest anxiety score being used as the covariate.

Hypothesis 3 was tested by means of analysis of covariance with the pretest attitude score being used as the covariate.

PRESENTATION AND ANALYSIS OF DATA

The following definitions were used to determine the levels for the classification variables as required by the 2 x 2 factorial design.

- 1.) Manifest Anxiety is the level of general stability, security, and mental health as reflected by scores on the IPAT Anxiety Scale Questionnaire.
- 2.) Attitude is a learned predisposition or tendency on the part of an individual to respond positively or negatively to some object, situation, concept, or another person.
- 3.) A Negative Attitude toward mathematics represents a score level less than 60 on the Mathematics Attitude Questionnaire.
- 4.) A Positive Attitude toward mathematics represents a score level greater than or equal to 60 on the Mathematics Attitude Questionnaire.
- 5.) Achievement in mathematics was measured by a score on the Mathematics 1308 Placement Examination.

DATA RELATIVE TO THE HYPOTHESIS

Table 1 indicates the results of the analysis of covariance for a two-way design between levels of attitude and methods of instruction using pre-achievement scores and pre-anxiety scores as the covariates.

ment scores and pre-anxiety scores as the covariates.

Hypothesis 1 was tested by 2.) in Table 1. Hypothesis 4 was tested by 1.) in Table 1. Hypothesis 5 was tested by the interaction between 1.) and 2.) in Table 1.

As indicated in Table 1, the F-ratio for hypothesis 4 was significant at the .025 level of significance. Since the .025 level of significance is a greater level of precision than the .05 level, research Hypothesis 4 was accepted as tenable. That is, the adjusted mean achievement of the students with a positive attitude toward mathematics was significantly higher than the adjusted mean achievement of the students with a negative attitude toward mathematics when holding pre-anxiety and pre-achievement scores constant.

Since the other two F-ratios in Table 1 failed to be significant at the .05 level, research hypotheses 1 and 5 were rejected. This indicates that the mean achievement of the students taught by the aid of the SSRS was not significantly higher than the adjusted mean achievement of the students taught by the regular lecture-recitation method and also that there was no significant interaction between the level of attitude and the method of instruction as variables affecting achievement in mathematics.

For the two-way design, the subjects were divided into four groups, as follows:

	Control Group	Experimental Group
Negative Attitude	I	II
Positive Attitude	III	IV

In Table 2 is presented the means and adjusted means for the four groups.

In computing the adjusted means, the groups were treated as separate entities using analysis of covariance with pre-achievement and anxiety as covariates.

TABLE 1

ANALYSIS OF COVARIANCE TABLE SHOWING SOURCES OF VARIATION FOR A 2-WAY CLASSIFICATION

Sources of Variation	Degrees of Freedom	Adjusted Sum of Squares	Adjusted Mean Squares	F Ratios	P
1.) Between levels of attitude	1	5487.42	5487.42	9.78	.025
2.) Between methods of Instruction	1	37.94	37.94	.07	NS
Interaction between 1.) and 2.)	1	127.50	127.50	.23	NS
Within replicates	74	41496.75	560.77		

TABLE 2

TABLE OF ADJUSTED MEANS AND STANDARD ERRORS FOR ACHIEVEMENT SCORES

Group	Group Mean	Adjusted Mean	SE Adjusted Mean
I	51.50	47.94	4.74
II	44.70	49.59	4.74
III	66.00	62.63	4.70
IV	63.50	65.54	4.72

ates. In this procedure, the F-ratio of $F = 3.483$ was not significant at the .05 level. This would lend support to the data presented in Table 1 which indicated that there was no significant interaction between level of attitude and method of instruction. An analysis of covariance with the pre-achievement score as the covariate was run on these same four groups and the F-ratio was $F = 2.052$. This would tend to indicate that the anxiety of a student did affect his achievement level, but the effect was not statistically significant at the .05 level.

Hypothesis 2 was tested by means of analysis of covariance with the pretest anxiety score being used as the covariate. Table 3 indicates the results of the analysis of covariance relevant to Hypothesis 2. As the F-ratio indicates in Table 3, there was no significant difference between the adjusted mean anxiety score of the students taught with the aid of the SSRS and the adjusted mean anxiety score of the students taught by the regular lecture-recitation method.

The data presented in Table 4 further substantiates the findings depicted in Table 3 when one notices that the adjusted mean anxiety scores are essentially the same.

TABLE 3

ANALYSIS OF COVARIANCE TABLE FOR ANXIETY SCORES WITH THE PRE-ANXIETY SCORES AS THE COVARIATES

Source	DF	YY	Adjusted Sum-Squares (DUE)	Adjusted Sum-Squares (ABOUT)	Adjusted DF	Adjusted Mean Square	F-Ratio (1, 70)	P
Treatment (Between)	1	233.19	..	..	..	..	..
Error (Within)	71	7717.47	5343.63	2373.85	70	33.9121	..	
Treatment + Error	72	7940.66	5554.42	2386.23	71	..	..
Difference for Testing Adjusted Treatment Means	..	..	..	12.3846	1	12.3846	.365	NS

TABLE 4

TABLE OF ADJUSTED MEANS AND STANDARD ERRORS FOR ANXIETY SCORES USING THE PRE-ANXIETY SCORES AS THE COVARIATE

Group	Group Mean	Adjusted Mean	SE Adjusted Mean
Control	31.56	30.32	.94
Experimental	28.06	29.49	1.01

Hypothesis 3 was tested by means of analysis of covariance with the pretest attitude score being used as the covariate. Table 5 indicates the results of the analysis of covariance relevant to Hypothesis 3.

The F-ratio, $F = 2.88$, is not significant at the .05 level, but it is significant at the .10 level. In this study, the tenability of all the research hypotheses was tested at the .05 level. Therefore, research Hypothesis 3 must be rejected. This indicates that at the .05 level, there was no significant difference between the adjusted mean positive attitude scores of the students taught with the aid of the SSRS and the adjusted mean positive attitude scores of the students taught by the regular lecture-recitation method.

As is indicated in Table 6, there is a sizable difference between the means of the two groups, but as has already been indicated, it fails to be significant at the .05 level.

SUBJECTIVE EVALUATION OF THE SSRS

Out of the thirty-four students in the experimental section, only two students made somewhat negative remarks about the SSRS. These remarks were as follows:

TABLE 5

ANALYSIS OF COVARIANCE TABLE FOR ATTITUDE SCORES

Source	DF	YY	Adjusted Sum- Squares (DUE)	Adjusted Sum- Squares (ABOUT)	Adjusted DF	Adjusted Mean Square	F-Ratio (1, 70)	P
Treatment (Between)	1	528.28	..	..	..	..	..
Error (Within)	71	28166.98	18242.45	9924.53	70	141.78	..	
Treatment + Error (Total)	72	28695.26	18362.67	10332.60	71	..	..
Difference for Testing Adjusted Treatment Means	..	..	..	408.06	1	408.06	2.88	.10

TABLE 6

TABLE OF ADJUSTED MEANS AND STANDARD ERRORS FOR ATTITUDE SCORES USING THE PRE-ATTITUDE SCORES AS THE COVARIATE

Group	Group Mean	Adjusted Mean	SE Adjusted Mean
Control	58.87	59.18	1.91
Experi- mental	64.26	63.92	2.05

1.) I can see no reason for its use in the course except for the teacher's own evaluation of the classes' progress.

2.) It was interesting and valuable, but not entirely necessary for the course.

Typical of the remarks of the other thirty-one students are these that follow:

1.) A good educational device. Hope to see it used more in other classes.

2.) More like a game than a quiz—not so frightening.

3.) I think it is excellent; it tests, but is not as frightening as pop tests.

4.) It is O.K. I found it valuable because the student can tell immediately whether he has done a problem correctly.

5.) I don't really know if I benefited from it, but I kind of enjoyed working with it and it helped make the class a little different and more interesting.

6.) Different and interesting and more fun than the usual.

7.) The Spitz System is really great. It gives the student and teacher both a good idea as to where he and the class are going and what the students' weak points are. I think the system is extremely effective and would like to see it continued.

8.) The Spitz System made it possible to effectively direct attention to the areas in which students were experiencing difficulty. It also gave students the opportunity for frequent and valuable practice on problems.

9.) Good for class participation. Could, and should, be used more often.

10.) Helpful—you don't feel as if you're on the spot, especially if afraid of mistakes being obvious to the rest of the class.

Based upon the anonymous remarks of the students, the SSRS was a successful teaching aid. In the opinion of the investigator, its use helped to keep the students studying day by day because of the almost daily question and answer sessions. The experimental class was ahead of the control group in its grasp of essential concepts. This was due to the additional drill and work in class, when in the question and answer session, it was indicated as being necessary. The class seemed to be enthusiastic about the system and its use and it had a very marked effect on their attitudes about mathematics. In the opinion of the investigator, the students in the experimental section seemed to be less anxious about their mathematics class than those students in the control section.

SUMMARY

The problem of this study was the effect of teaching freshmen mathematics with the SSRS upon a student's anxiety, attitude, and achievement. The purposes of the study were to compare the achievement, attitude, and anxiety of students enrolled in a beginning college mathematics course when taught by the

regular lecture-recitation method and the regular lecture-recitation method augmented by the SSRS.

The subjects participating in this investigation consisted of seventy-three students enrolled in the investigator's two sections of An Introduction to Logical and Mathematical Concepts, Mathematics 1308, during the fall of 1970. An Introduction to Logical and Mathematical Concepts is a required course for all non-mathematics, non-engineering, and non-science majors. The experimental group consisted of thirty-four students and met in the specially designed classroom which housed the SSRS. The control group consisted of thirty-nine students and met in a different room earlier in the day. The investigator taught both sections.

Five hypotheses consistent with the stated purposes were formulated. Following are restatements of the hypotheses with a summary of the findings. The tenability of all hypotheses of this study was tested in the null form at the .05 level of significance (2-tailed test).

Hypotheses 1, 4, and 5 were tested by a 2 x 2 factorial analysis of covariance with the anxiety and pre-achievement scores as covariates. Hypotheses 2 and 3 were tested by analysis of covariance.

Research Hypothesis 1, that the adjusted mean achievement of the students taught with the aid of the SSRS would be significantly higher than the adjusted mean achievement of the students taught by the regular lecture-recitation method, was not confirmed at the .05 level.

Research Hypothesis 2, that the adjusted mean anxiety score of the students taught with the aid of the SSRS would be significantly lower than the adjusted mean anxiety score of the students taught by the regular lecture-recitation method, was not confirmed at the .05 level.

Research Hypothesis 3, that the adjusted mean positive attitude score of the students taught with the aid of the SSRS would be significantly higher than the adjusted mean positive attitude score of the students taught by the regular lecture-recitation method was not confirmed at the .05 level. However, the hypothesis was confirmed at the .10 level of significance.

Research Hypothesis 4, that the adjusted mean achievement of the students with a positive attitude toward mathematics would be significantly higher than the adjusted mean achievement of the students with a negative attitude toward mathematics, was confirmed at the .05 level of significance.

Research Hypothesis 5, that there would be significant interaction between the level of attitude and the method of instruction as variables affecting achievement in mathematics, was not confirmed.

CONCLUSIONS

Consistent with the purposes of this study and based on the analysis of the experiment, certain conclusions are offered with reference to the population studied.

1.) Even though differences existed in student achievement in a beginning college mathematics course taught with the aid of the SSRS and one taught by the lecture-recitation method, the differences were not statistically significant. It appears that students learn as well using the SSRS as by using more conventional methods. The daily review and drill of the previous day's work and the question and answer sessions in class did not significantly improve the level of achievement of students taught with the aid of the SSRS.

2.) Even though differences existed in student anxiety in a beginning college mathematics course taught with the aid of the SSRS and one taught by the lecture-recitation method, the differences were not significant. Based upon the subjective evaluation of the SSRS by the students, one would have to conclude that the use of the system lessened anxiety in class by reinforcing the students' responses without putting them on the spot, as it were. This latter conclusion would be a big factor in the continued use of this teaching device. Even though the use of the system does not statistically lower anxiety, it does tend to lessen the trauma associated with a mathematics class for a non-mathematics major.

3.) Students taught by the lecture-recitation method augmented by the SSRS definitely had a better attitude toward a required mathematics course than students taught the course by the regular lecture-recitation method. This conclusion is not only substantiated by the statistical results but also by the daily observation of the two classes by this investigator. The use of the SSRS tended to remove some of the fear from mathematics class and it added an element of interest and fun. The students seemed to thoroughly enjoy the use of the system and were especially delighted with the private reinforcement they received on each of their responses.

4.) Students who had a positive attitude toward mathematics had significantly higher achievement than those students who had a negative attitude. Even so, those students who were taught with the aid of the SSRS and who had a positive attitude toward mathematics did not significantly achieve better than their counterparts in the control group. The statistical data of this study would tend to support the idea that the effect of attitude on achievement is independent of the method of instruction. The SSRS tended to significantly raise the students' attitude, but did not concomitantly raise their achievement significantly.

RECOMMENDATIONS

Further research is recommended in several areas relative to the effectiveness of teaching beginning college mathematics with the aid of the SSRS. Further testing in the area of levels of student achievement is urged. Even though no statistically significant differences were found to exist in this study, there were differences. Perhaps one could design a course to make better use of the SSRS by using the best features of programmed lessons combined with the best features of the lecture-recitation method. Then, problem areas in the course could be more quickly discovered and more effectively handled in a personal way by the teacher through this combination of

programmed and teacher-led instruction. The lessons would have the feature of small-step learning combined with expanded explanation of the teacher for troublesome points.

A second area of research indicated by the present study involves the measurement of change in a student's anxiety in mathematics courses taught by a variety of techniques. According to the subjective evaluation of the SSRS by the students, the system did tend to lessen the situational anxiety caused by being in a mathematics course. Perhaps, if an instrument could be designed to measure situational anxiety as it pertains to a mathematics class, it would demonstrate a significant change in the student's anxiety in a course in which a device such as the SSRS was used. The investigator was unable to locate such an instrument and had to settle for the IPAT test which, according to all the authorities, is the best in existence.

Because of the favorable subjective evaluation of the SSRS by the students, it is the opinion of this investigator that further research should be done using the SSRS before it is discounted as a teaching device for beginning mathematics courses.

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Book Reviews

(Continued from page 11.)

In the opinion of this reviewer Curtis is right and has cast a leading light along our future path. Unfortunately he never simplified his procedures to the point where they could come into common use. In his nineties he confessed to this reviewer his disappointment that others had not followed his trail. He and this reviewer have been close for half a century. The reviewer's last letter has not been answered. He has probably joined Thorndike wherever geniuses gather, if they do. Karmel disregarded the contributions of Curtis.

Test lessons and standard test lessons. All too often teachers give standard tests, score them laboriously, extract a little value from the data, and put them on a shelf to gather dust. The full value of tests cannot be realized until tests and teaching are intimately integrated. Furthermore the best method yet devised for developing a student's skill is the test lesson method.

Curtis led the way with his test lessons in the fundamentals of arithmetic. Studebaker followed. McCall-Crabbs went a step further with Standard Test Lessons in Reading, of which millions of copies have been used. The McCall-Smith recently published Test Lessons in Reading-Reasoning show how it is possible to integrate tests and teaching of such a complex trait as reasoning ability. Karmel does not even mention the test-lesson procedure even when the chief help tests can give to teachers will be in the form of test lessons or standard test lessons.

Projective tests and personality inventories. Karmel's discussion of these instruments is the best this reviewer has seen.

Comprehensive testing. Any comprehensive measurement and evaluation of a student's educational status should involve at least three measures: comprehensive achievement, verbal-mathematical intelligence, and comprehensive educativeness of student's home and community. McCall and Herring created these three instruments, and developed a formula using intelligence and background scores to determine a student's capacity to achieve. The comprehensive achievement test went beyond the common educational test batteries in including attitude and personality measures. Karmel has an admirable discussion of intelligence testing and educativeness of home and community, but he did not mention the most comprehensive achievement test built to date or the instrument for measuring the educativeness of home and background.

Total evaluation. There are numerous excellencies and topics treated in this book besides those indicated in this review, so many in fact that the reviewer compliments Karmel with the reviewer's envy. The reviewer derived more delight from the book than any book on measurement published in many years. The book is somewhat more strongly recommended as a text for testers and educational leaders than for teachers.

William A. McCall, Reviewer
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CLASSROOM MANAGEMENT (THEORY AND SKILL TRAINING)

Johnson, Lois V.; Bany, Mary A., (The Macmillan Company, New York, 1970), ix+453 pp., \$4.95.

In Classroom Management, Johnson and Bany have undertaken an intensive rather than comprehensive study of classroom management, a topic to which most authors on the subject of teaching devote a mere chapter or two. In a book of four hundred fifty-three pages, the authors have presented a thorough scientific study of classroom management.

The authors present an action-based program designed to help both pre-service and in-service teachers cope effectively with classroom management problems. The book is organized to develop both conceptual and operational skills and to provide a means for improving skill competence in classroom management by means of incident-simulation training. The authors have drawn from their own teaching and consulting experience, from observation in classrooms, and from study, in developing the concepts that explain what happens in class-

(Continued on page 32.)