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TITLE	RESEARCHING CRUCIAL EDUCATIONAL ISSUES IN NORTHERN NEW ENGLAND. REPORT ON HEW SUMMER INSTITUTE.
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ABSTRACT

A 6-WEEK SUMMER TRAINING PROGRAM IN EDUCATIONAL RESEARCH WAS CONDUCTED FOR 30 PARTICIPANTS (MOST OF THEM SCHOOL ADMINISTRATORS OR SUPERVISORS) FROM NEW HAMPSHIRE, VERMONT, AND MAINE. MORNING CLASSES WERE HELD IN STATISTICAL ANALYSIS, LEARNING AND THE EDUCATIONAL PROCESS, AND EXPERIMENTAL RESEARCH DESIGN. AFTERNOON SESSIONS INVOLVED GROUP DISCUSSIONS AND COMPUTER PROGRAMMING. OTHER ACTIVITIES INCLUDED FIELD TRIPS, GUEST LECTURES, AND THE DEVELOPMENT BY EACH PARTICIPANT OF A RESEARCH PROPOSAL WHICH HAD RELEVANCE AND IMPORTANCE IN HIS HOME SCHOOL DISTRICT OR STATE. THE INSTITUTE WAS CONSIDERED SUCCESSFUL IN ACCOMPLISHING ITS MAJOR OBJECTIVES. THE 30 PROPOSALS SHOW A FAIR DEGREE OF KNOWLEDGE OF STATISTICAL TECHNIQUES BY WHICH HYPOTHESES MAY BE ACCEPTED OR REJECTED, AND TRAINEES WERE INVOLVED EXTENSIVELY IN STUDYING MODERN DATA PROCESSING EQUIPMENT AND READING IN THE LITERATURE OF EDUCATIONAL RESEARCH. (INCLUDED ARE READING LISTS, STUDY MATERIAL ON THE RESEARCH PROPOSAL, THE STATISTICAL EXAM, AND THE 30 PROJECT TITLES.) NOT AVAILABLE IN HARD COPY DUE TO MARGINAL LEGIBILITY OF ORIGINAL DOCUMENT. (JS)

REPORT ON HEW SUMMER INSTITUTE

Researching Crucial Educational Issues in Northern New England

Contract Number: OEG 1-7-070634-1712

Amount of Grant: $39386.00

Gilbert R. Austin, Ph.D., Director

Bureau of Educational Research
and Testing Services

University of New Hampshire

1967

The Bureau of Educational Research and Testing Services, which is a sub-unit of the Department of Education, College of Liberal Arts, University of New Hampshire, ran a training program this summer in educational research. Thirty participants from three northern New England states were selected. There were 14 from New Hampshire, 12 from Vermont, and 4 from Maine.

This research training institute was funded by the Department of Health, Education, and Welfare, Training Research Division.

The Institute had as its major purpose four goals: 1. The development of a piece of personal research which has relevance and importance in the person's home school district or home state. 2. The studies of methods of educational research with attention to statistical analyses by which the hypotheses are either accepted or rejected. 3. The use of modern data processing equipment to facilitate the encoding and capturing of this research data. 4. The identification of present research literature applicable to the research problems of the trainee's home school district.

The Institute had a daily schedule which went from 8:30 in the morning until 4:00 P. M. This was often augmented by evening sessions and sessions in the professors' offices in the late afternoon. Three major professors were associated with this research institute. They were; Dr. Gilbert Austin, the director, Dr. Carl Cooper and Dr. Som Nath Ghei. Dr. Austin is a member of the Department of Education and the Director of the Bureau of Educational Research and Testing Services at the University of New Hampshire. Dr. Cooper is associated with the Department of Education and the counseling center at the University of New Hampshire, and Dr. Ghei teaches statistics in the Department of Psychology at the University of New Hampshire. In addition to these three professors two group leaders were employed; Daniel Turro and Janet Kearney. Both are graduate students at the University of Connecticut.

Also employed was Mr. James Estes, who taught computer programming to the trainees each day. Mr. Estes is an instructor in the Department of Mathematics at the University of New Hampshire. Each day followed this general pattern: From 8:30 to 9:30, Dr. Ghei was responsible for the presentation of Statistics. From 9:30 to 10:30, Dr. Cooper presented material which was relevant to learning theory. From 10:30 to 11:00 the institutees had a morning coffee break. From 11:00 to 12:00, Dr. Austin presented material concerned with educational research. The institutees had a one hour lunch break, and then from 1:00 to 2:30 they met their group leaders. From 2:30 through 4:00 they met with Mr. Estes, who taught them material concerned with running a computer and writing computer programs, including "hands-on" operation of the computer.

In all of the above the major professors were involved on a full-time basis. Because the director was particularly concerned that the program should be meeting the needs and expectations of the trainees the program was evaluated by the trainees every two weeks. It became apparent after the first evaluation that the group sessions in the afternoon were not meeting the group's needs as adequately as they might. It was decided that they would meet less frequently and on a more individualized basis. This was further modified as a result of the fourth week evaluation. A copy of this evaluation will be found in the appendix of this report.

One of the basic statements in the original proposal for this institute was that it would be team taught. The major professors attempted, to the degree that it was possible, to interact among themselves and with the students. They tried to present material that was relevant to each other's presentations each day. Team teaching, however, proved to be very difficult. The major professors were dealing with material which was, in many cases, hard

to interrelate. This was seen by the trainees as one of the institute's weaknesses. We have included in the appendix of this report a summary sheet which shows, for each of the seven questions on the evaluation sheet, how the various professors were rated over the six-week period. It also included the trainees' rating of various areas covered by the institute. In the appendix of this report will also be found a set of chi-square tables which presents the statistical analysis of these particular evaluations. A number of very positive comments were received from the trainees in terms of the fact that we were willing to have ourselves honestly evaluated and that we did in fact modify the program in accordance with their concerns.

Another very general concern voiced by the trainees was the level of expectation that this institute held for them. By the end of the fifth week they felt, almost without exception, that we were expecting far too much of them and that we were in fact requiring abnormally large amounts of reading, writing, and studying. This perhaps is to be expected of this kind of institute which deals with material which in most cases was relatively new to most of these people. By the end of the sixth week, however, when they had really begun to see how much distance they had covered and how much knowledge they had gained, the attitude of most of them changed markedly, and most of them left feeling that they had rarely if ever had such a beneficial and useful summer's experience in an educational institute.

The actual material covered by each of the people working in the institute will now be presented. Dr. Chei used a book written by G.A. Ferguson called Statistical Analysis in Psychology and Education, and the following chapters were covered: One through eleven, thirteen, sixteen, and eighteen. The basic material covered in these chapters is the following: Means, standard deviations, normal curves, binomial distributions,

correlations, ideas of sampling, chi-square, analysis of variance one way, and analysis of variance two ways, and errors of measurement. The trainees were given a mid-term examination in statistics. There was no final examination since the concern in terms of statistics was that they use the proper statistics in the research study that they had to prepare for their final project. A copy of the mid-term examination is enclosed in the appendix.

Dr. Cooper, who taught learning theory, used a book by Krumboltz called Learning and the Educational Process. The institutees were directed to read the first six chapters and they discussed them at length with Dr. Cooper. A final examination was given in this area, a sample of which is included in the appendix of this report.

In the third presentation in the area of educational research, experimental design, a book called An Introduction to Educational Research by Travers, The Second Edition, was used. This was augmented by extensive use of The Handbook on Research in Teaching, edited by Gage, particular use being made of the chapter on experimental and quasi-experimental designs written by Campbell and Stanley. The trainees were given a considerable number of research proposals to look over, plus a large variety of mimeographed material which contained a considerable number of suggestions as to how one might pursue educational research. A very representative sample of these handouts is included in the appendix of this report. In addition to this, a number of written exercises called learning experiences were given to the trainees in which they evaluated the reporting of research results and then corrected and counter-corrected each other's papers in the light of what they had learned when they discussed these particular pieces of research with the major professor. In addition, they were assigned

by Dr. Austin to write a research proposal, really a term project. This was to be in some particular area of their own interest which they felt badly needed to be researched plus having particular relevance to their own home community. These were the thirty crucial issues which were identified by the trainees in this institute. In the appendix of this report we include the titles of each of these thirty proposals.

In the afternoon, the trainees were involved with group discussions and computer programming. In the area of programming, the following took place: During the first four weeks of the research institute, a book called The Auto-Primer in Computer Programming by Doris R. Enwistle was used as a text, and chapters 1-12 were covered. In addition to all exercises in chapters 1-12, the participants had one flow chart assignment, and two laboratory assignments. One exam was given. Each institutee was required to learn how to write a program which would compute a mean and standard deviation, plus a number of other simple statistical programs. Each participant was required to program a problem of his own choice as a course project. The project titles for these problems are listed in the appendix, as well as copies of the assignments and the examination.

During the six weeks of the institute, we made three visits to different facilities at the University of New Hampshire. We made a field trip to the educational television station, WENH-TV, we went to the Audio-Visual Aids Center and we toured the Bureau of Educational Research and Testing Services of the Department of Education. In addition to these three field trips, we had eight guest lecturers. One of them, Dr. Walter Durost, member of the Department of Education faculty at the University of New Hampshire, spoke to the group twice during the six-week period. In addition to Dr. Durost, the group was addressed by Dr. Ellis B. Page, of the University of Connecticut, who spoke on the topic of Simulation of Intelligence

with Computers and Project Essay Grades. Dr. Page's presentation was recorded on a video tape recorder which is owned by the Department of Education at the University of New Hampshire. Following Dr. Page, we had Dr. John Finger from the University of Rhode Island who spoke on the topic, The Difference Between Statistical Significance and Educational Significance and its Relevance to State-Wide Testing. Dr. John Cawley, of the University of Connecticut, spoke on the topic of Mental Retardation and the research that was going on in that area. Dr. John Flynn, of the University of Connecticut, spoke on the topic of Programmed Learning and its Relevance to Anxiety, presenting two papers. He also went into a rather deep discussion of what analysis of variance actually attempts to do. One of our guest lecturers, Dr. Garber, from the University of Connecticut was unable to attend. In his place we had Dr. Victor McGee, from Dartmouth College in Hanover, New Hampshire. Dr. McGee spoke on the topic of Computers and Verbal Language. Dr. McGee's presentation was also video taped. Dr. Daniel Heisey, of the University of New Hampshire, spoke to the group on the Question of Arithmetic and the research that has recently been done in this particular area.

The institute also had two speakers who were not listed in the brochure and who spoke to the institutees in the afternoon because of their own interest in the institute. Dr. Jason Boynton and Dr. Pat Petroski of the University of New Hampshire Department of Education, spoke on the question of Team Administration in School Systems. There was also a presentation by Richard Burroughs of the University of New Hampshire Computation Center Staff, on the subject of high school scheduling and specifically the use of the IBM 360 here at the University of New Hampshire for a process known as Sectioning, which does everything but build the master schedule.

In summary, the institute would seem to have accomplished the four major objectives set for it. It developed thirty topics of educational importance as identified by the trainees. It gave them, as their proposals show, a fair degree of knowledge of statistical techniques by which hypotheses may be accepted or rejected. It involved them intensively in the study of modern data processing equipment, both the programming and the potential of which they studied extensively. They also were required to read extensively in the literature of educational research.

The writer has already acknowledged the fact that there were weaknesses identified by the trainees as well as by the instructors themselves. It is the writer's feeling that the instructors have profited by this experience. On the whole, it seems to have been a worthwhile and educationally sound six-week institute, the real effects of which will not be known for some years. The writer will keep in touch with the trainees in an effort to further evaluate the institute.

PROGRAM REPORTS

1. Application Summary

a.	Approximate number of inquiries from prospective trainees (letter or conversation)	60
b.	Number of completed applications received	52
c.	Number of first rank applications (applicants who are well-qualified whether or not they were offered admission)	40
d.	How many applicants were offered admission	30

2. Trainee Summary

a.	Number of trainees initially accepted in program	30
	Number of trainees enrolled at the beginning of program	30
	Number of trainees who completed program	30
b.	Categorization of trainees	
	(1) Number of trainees who principally are elementary or secondary public school teachers	4
	(2) Number of trainees who are principally local public school administrators or supervisors	21
	(3) Number of trainees from colleges or universities, junior colleges, research bureaus, etc. (specify)	

3 State Department Personnel
1 Research Bureau Director
1 University Professor

3. Program Director's Attendance

a.	What was the number of instructional days for the program?	30
b.	What was the percent of days the director was present?	30

4. Financial Summary--(Note: This summary does not serve as a final financial report so amounts need not be exact.)

		Budgeted	Expended or Commited	Variance
a.	Trainee Support			
	(1) Stipends	$13500.00	$13500.00	$ -0-
	(2) Dependency Allowance 5400.00 + 4680.00 =	10080.00	9990.00	90.00
	(3) Travel	480.00	428.16	51.84
b.	Direct Costs			
	(1) Personnel	10680.00	10680.00	-0-
	(2) Supplies	1315.00	1304.22	10.78
	(3) Equipment	720.00	720.00	-0-
	(4) Travel	40.00	39.82	.18
	(5) Other	-	-	-
c.	Indirect Costs	2571.00	2571.00	-0-
		$39386.00	$39233.20	$152.80

CHI-SQUARE PROBLEM

DATA MATRIX WITH ROW AND COLUMN SUMS

Problem 1:

STRENGTH	NO COMMENT	WEAKNESS	NUMBER OF COMMENTS
29.	0.	3.	32.
26.	1.	8.	35.
28.	0.	10.	38.
83.	1.	21.	105.

EXPECTED VALUE MATRIX

25.295	.304	6.400
27.666	.333	7.000
30.038	.361	7.600

DEGREES OF FREEDOM = 4
CHI-SQUARE = 5.48 N.S.

Problem 2:

STRENGTH	NO COMMENT	WEAKNESS	NUMBER OF COMMENTS
16.	3.	24.	43.
22.	2.	18.	42.
18.	0.	21.	39.
56.	5.	63.	124.

EXPECTED VALUE MATRIX

19.419	1.733	21.846
18.967	1.693	21.338
17.612	1.572	19.814

DEGREES OF FREEDOM = 4
CHI-SQUARE = 4.45 N.S.

Problem 3:

STRENGTH	NO COMMENT	WEAKNESS	NUMBER OF COMMENTS
17.	3.	23.	43.
22.	0.	19.	41.
25.	0.	20.	45.
64.	3.	62.	129.

EXPECTED VALUE MATRIX

21.333	1.000	20.666
20.341	.953	19.705
22.325	1.046	21.627

DEGREES OF FREEDOM = 4
CHI-SQUARE = 7.74 N.S.

Problem 4:

STRENGTH	NO COMMENT	WEAKNESS	NUMBER OF COMMENTS
20.	1.	22.	43.
14.	0.	23.	37.
7.	5.	21.	33.
41.	6.	66.	113.

EXPECTED VALUE MATRIX

15.601	2.283	25.115
13.424	1.964	21.610
11.973	1.752	19.274

DEGREES OF FREEDOM = 4
CHI-SQUARE = 12.66 Sig. at .02

Problem 5:

STRENGTH	NO COMMENT	WEAKNESS	NUMBER OF COMMENTS
26.	1.	17.	44.
25.	0.	16.	41.
23.	2.	18.	43.
74.	3.	51.	128.

EXPECTED VALUE MATRIX

25.437	1.031	17.531
23.703	.960	16.335
24.859	1.007	17.132

DEGREES OF FREEDOM = 4
CHI-SQUARE = 2.22 N.S.

Problem 6

STRENGTH	NO COMMENT	WEAKNESS	NUMBER OF COMMENTS
5.	9.	15.	29.
8.	5.	15.	28.
4.	11.	12.	27.
17.	25.	42.	84.

EXPECTED VALUE MATRIX

5.869	8.630	14.500
5.666	8.333	14.000
5.464	8.035	13.500

DEGREES OF FREEDOM = 4
CHI-SQUARE = 4.17 N.S.

Problem 7:

STRENGTH	NO COMMENT	WEAKNESS	NUMBER OF COMMENTS
18.	3.	21.	42.
15.	2.	23.	40
22.	2.	10.	34.
55.	7.	54.	116.

EXPECTED VALUE MATRIX

19.913	2.534	19.551
18.965	2.413	18.620
16.120	2.051	15.827

DEGREES OF FREEDOM = 4
CHI-SQUARE = 6.59 N.S.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
WASHINGTON, D.C.20202

APPLICATION FOR ADMISSION
TO AN HEW INSTITUTE IN RESEARCHING CRUCIAL EDUCATIONAL ISSUES IN NORTHERN NEW ENGLAND

Type or print in block letters your answers to this form, and other forms supplied by the institution to which you apply, to the Institute or Program Director, NOT to the U.S. Office of Education

1. Your name (Title, first, middle initial, last):

Institution:

University of New Hampshire

2. Home address (Number, street, city, state, ZIP code):

4. Sex:
__Male
__Female

5. Age:
____Yrs.

6. U.S. Citizen
__Yes
__No

3. Home Telephone:

Area Code:_____

Phone:_____

9. Number of dependents (excluding yourself) who are claimable for Federal income tax purposes: (If you file a joint return and are NOT the major earner, you may not claim any dependents.)

10. Your present employment (check one):

__I am employed in a school, system, or college. (Complete the remaining items on this form.)

__I am NOT employed in a school, system, or college. (Omit items 11 through 18 and specify your employment here):

11. Name and address of school:

16. Name, title, and address of your immediate supervisor:

12. School telephone:

Area Code:_____ Phone:_____

17. Title of your position:

13. Level of school (or system):
__Pre-School __Elementary
__Junior High __Senior High
__Jr-Sr High __Elementary & Secondary
__Junior College __Technical Institute
__College or University

18. If you are preparing for employment at a different school or level, or for a different assignment, specify here:

14. Type of school (or system):
__Public __Private, Church - Related
__Private, not Church - Related

19. List your present schedule of courses taught, professional assignments, etc.

15. Number of students enrolled (If you serve a single school):

. Summarize your years of experience in teaching or related work:

BJECTS OR ASSIGNMENTS	LEVEL (ELEM., SECONDARY, ETC.)	YEARS OF EXPERIENCE

. Employment Record---List your places of employment in teaching or related work during the last 5 years.

TES	NAME AND ADDRESS OF EMPLOYER	NATURE OF YOUR WORK

. What colleges and Universities hav you attended?

ME OF INSTITUTION	DATES ATTENDED	DEGREE	MAJOR	MINOR(S)

. Describe any other significant academic experiences you have had in the subject field of this institute or program (such as summer programs, workshops, or seminars):

. What teaching certificates or other credentials do you hold? (Indicate type, level, subjects, etc.)

. Are you applying for Institutes or Fellowships in addition to this one?

_____Yes _____No (If yes, specify them)

. I certify that the statements made by me in this application are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

Date: Signature of applicant:

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF EDUCATION
WASHINGTON, D.C.20202

CONFIDENTIAL EVALUATION FORM
HEW INSTITUTE IN RESEARCHING CRUCIAL EDUCATIONAL ISSUES IN NORTHERN NEW ENGLAND

ame of applicant):

Name of sponsoring institution:

University of New Hampshire

am seeking admission to the HEW Institute in Researching
ucial Educational Issues in Northern New England.

e Selection Committee for the Institute named above has requested that I forward this
nfidential Evaluation Form to my principal, department chairman, or immediate supervisor.
ease complete the form and return it to the Institute Director.

Name of evaluator:

Title of position:

School (or system):

2. How long have you known the applicant and in what capacity?

Considering all the teachers (or specialists) you have worked with or supervised, how would you rank the applicant on the following characteristics?

	Above Excellent	Above Average	Below Average	Below Average	Poor	Can't Judge
Ability as a teacher (or specialist)						
. Knowledge of subject matter						
. Effectiveness in working with students						
. Effectiveness in working with colleagues						
. Leadership potential						
. Scholastic ability; capacity for growth						

. Please provide any comments on the applicant's ability, performance, character, temperament, etc., which you believe will aid the Selection Committee in determining his or her suitability for this Institute.

. In what ways do you believe that the applicant would benefit from attending this Institute? (If the applicant has specific areas of need, please indicate them.)

. Does the applicant have a contract, or the offer of a contract, in your school or school system for next year?

___Yes ___No ___I don't know (If not, please explain.)

. Please comment on ways in which your school or school system may utilize or benefit from he training received by the applicant if he or she is selected for the Institute.

. Signature of evaluator: Date:

NEW INSTITUTE IN EDUCATIONAL RESEARCH
University of New Hampshire

BACKGROUND DATA SHEET

Name_____
(last) (first) (middle)

Position_____ School_____ Grade_____

List all undergraduate and graduate courses in Evaluation and Measurement.

Course Title	Institution	Date	Credits	Level (Graduate or Undergraduate)

Will you pursue the Institute for Credit?_____ Are you a degree candidate at the present time?_____ Institution_____ Degree_____

List professional organizations in which you hold membership.

_____

_____

Applicant's Signature_____

Date_____

On the reverse side of this sheet please describe your professional aspirations and indicate how this Institute might assist you to realize these goals.

MR.
NAME MRS. _____ AGE _____
MISS

HOME ADDRESS _____

PROFESSIONAL RESPONSIBILITY

TITLE _____

LEVEL _____

DUTIES _____

PROFESSIONAL BACKGROUND

TEACHING EXPERIENCE _____

_____

_____

PROFESSIONAL ORGANIZATIONS _____

_____

_____

_____

FAMILY

SPOUSE _____ OCCUPATION _____

CHILDREN _____ AGE ____ _____ AGE ____

_____ AGE ____ _____ AGE ____

_____ AGE ____ _____ AGE ____

MEMBERSHIP (SOCIAL, SCIENTIFIC, CULTURAL, OTHERS) _____

_____

_____

IF YOU WERE TO SHARE A DOUBLE ROOM, WOULD YOU MIND IF THE OTHER PARTY SMOKED? _____

A BRIEF ACCOUNT OF YOU This should be informal and reflect your points of view. Please include information about your career, family, travels, hobbies, etc. Reverse side of the sheet may be used.

_____

_____

_____

RESEARCHING CRUCIAL EDUCATIONAL ISSUES

IN NORTHERN NEW ENGLAND

Summer, 1967

GENERAL INFORMATION HANDBOOK

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

INTRODUCTION

This Handbook has been prepared to provide a ready source of information to guide you in planning and to make your Institute experience professionally rewarding and personally pleasant.

Gilbert R. Austin
Institute Director

THE INSTITUTE PROGRAM

Schedule

The institute will be conducted daily from 8:30 a.m. to 4:00 p.m. for six weeks. The two courses offered daily between the hours of 8:30 a.m.and 11:45 a.m. are:

> Education 881, Methods and Techniques of Educational Research. This course is a critical study of the principal methods employed in the investigation of educational problems and an evluation of the procedures and standards used in reporting the findings.
>
> Education 882, Research Problems in Education. This course will orient the trainees to the variety of educational research. In the later portion, each trainee will be expected to develop a research proposal which will have practical importance and relevance to his home school district, or to evaluate a project presently being studied.

These courses will be team taught by Dr, Gilbert R. Austin, Director of the Institute, Dr. Carl Cooper, and Dr. Som Nath Ghei.

The Institute will meet each afternoon from 1:00 p.m. to 4: p.m. Part of this time will be used for small group discussions of the material presented in the morning.

From 2:30 p.m. to 4:00 p.m. the trainees will be instructed in the use of computers and will be taught a computer language. They will also be given the experience of "hands on" operation of an IBM 1620 computer and each trainee may have one hour for debugging the programs he writes and running any that he successfully completes.

Occasionally there will be guest lecturers who will develop in detail a discussion and analysis of a research activity of current concern.

Lecture Dates

July 7	Walter Durost
July 18	Ellis Page
July 19	Jack Finger
July 24	Jack Cawley
July 27	John Flynn
August 4	Herbert Garber
August 7	Daniel Heisey
August 10	Walter Durost

Special Tour Dates

July 10 Bureau of Educational Research and Testing Services
July 11 WENH-TV
July 17 Audio Visual

Each participant may wish to bring his own favorite reference works and materials but it is likely that they will be available here.

Required Texts

The following texts will be required and may be purchased at the University Bookstore at the beginning of the Institute session.

Entwisle, Doris R., Auto-Primer in Computer Programming. New York: Blaisdell Publishing Company

Ferguson, George A., Statistical Analysis in Psychology and Education. New York: McGraw Hill Book Company, Inc.

Krumboltz, J. D., Learning and the Educational Process. New York: Rand McNally

Travers, Robert M.W., An Introduction to Educational Research. New York: Crowell, Collier, and Macmillian

FOR YOUR INFORMATION

Staff of the Institute

Gilbert R. Austin, Ph.D., Director
Assistant Professor of Education
Director, Bureau of Educational
Research and Testing Services
University of New Hampshire

Carl J. Cooper, Ph.D.
Assistant Professor of Education
Psychologist in Counceling and
Testing, University of New Hampshire

Som Nath Ghei, Ph.D.,
Associate Professor of Psychology
University of New Hampshire

James Estes
Instructor of Mathematics
University of New Hampshire

Maurice Oliver
Bookeeper, Bureau of Educational
Research and Testing Services
University of New Hampshire

Patricia L. Christie, Institute Secretary
Bureau of Educational Research and
Testing Services
University of New Hampshire

Lecturers

Walter N. Durost, Ph.D.
Consultant, Bureau of Educational
Research and Testing Services,
Associate Professor of Education,
University of New Hampshire

Ellis Page, Ph.D., Director,
Bureau of Educational Research
Professor of Education
University of Connecticut

Herbert Garber, Ph.D., Assistant
Professor of Education
University of Connecticut

John Flynn, Ph.D., Associate
Professor of Education
University of Connecticut

John Cawley, Ph.D., Associate
Professor of Education
University of Connecticut

Jack Finger, Ph.D., Associate
Professor of Education
University of Rhode Island

Daniel Heisey, Ph.D., Assistant
Professor of Education, Assistant
Professor of Math, University of
New Hampshire

Consultants

Mr. John Bardwell
Director, Audio Visual
University of New Hampshire

Mr. Keith Neighbert
Director, WENH-TV
University of New Hampshire

Mr. Alden Lovell
Supervisor, Bureau of Educational
Research and Testing Services
University of New Hampshire

Mr. Robert E. Hart
Data Processing Technician
Bureau of Educational Research
And Testing Services
University of New Hampshire

1-67-SI Anderson, T.W., Introduction to Multivariate Statistical Analysis

2-67-SI Best, J., Research in Education

3-67-SI Chauncey, Testing: Its Place in Education Today

4-67-SI Cooley, W.W., Multivariate Procedures for the Behavioral Sciences

5-67-SI Findley, The Impact and Improvement of Public School Testing Programs

6-67-SI Furst, Constructing Evaluation Instruments

7-67-SI Gage, N.L. Handbook of Research on Teaching

8-67-SI Gage, N.L. Handbook of Research on Teaching

9-67-SI Gage, N.L. Handbook of Research on Teaching

10-67-SI Gage, N.L., Handbook of Research on Teaching

11-67-SI Gage, N.L., Handbook of Research on Teaching

12-67-SI Gage, N.L., Handbook of Research on Teaching

13-67-SI Gage, N.L., Handbook of Research on Teaching

14-67-SI Gage, N.L., Handbook of Research on Teaching

15-67-SI Gage, N.L., Handbook of Research on Teaching

16-67-SI Green,B., Digital Computers in Research

17-67-SI Nunnally, J.C., Tests and Measurements

18-67-SI Plumb, S.C., Introduction to Fortran

19-67-SI Plumb, S.C., Introduction to Fortran

20-67-SI Siegel, S., Non-Parametric Statistics for the Behavioral Sciences

21-67-SI Siegel, S., Non-Parametric Statistics for the Behavioral Sciences

22-67-SI Stilson, D.W., Probability and Statistics

23-67-SI Thorndike, R.L., Measurement and Evaluation in Psychology and Education

24-67-SI Torrance,E.P., Guiding Creative Talent

25-67-SI Underwood, B.J., Elementary Statistics

Current issues of the following periodicals can usually be found in the periodical room of the Dimond Library; if not, an attempt has been made to specify the locations in parentheses after each title. Note: Journals of the American Psychological Association and of the American Personnel and Guidance Association, although not on this list, ARE available in the periodical room. (Abbreviations have been used wherever possible)

A.I.D. Auto-Instructional devices for education (Main)
Acta Psychologica
Adult Education
" " j
" " and the library
American behavioral scientist
" education
" " research j
Applied Psychol. monographs
Art Education
Automated educ. letter (Ref LB 1029 .A85)
British Ed. Index (Ref Z 5813 .B7)
" j. of psychol.
Calif. Educ.
" j. secondary education
" schools
Canadian j. of psychol.
Child Development
Childhood Educ.
Chronicle of Higher Educ.
College board rev.
Education
" Abstracts
" Digest
" Index (Ref o16237)
" Quarterly
" USA
" Admin. & suprv.
" Adm. quarterly
Educational & psychol measmt.
" forum
" leadership
" record
" res. bulletin
" screen and Audio-vis. guide
" theory
Grade teacher
Harvard educ. rev.
High school j.
Higher educ.
" " and national affairs
" " in New England
History of Educ quarterly
Industrial arts and voc. educ
" educ. magazine
Instructor
" 's j.

International j. of psychol.
" rev of educ
j of applied psychol
j of child psych and psychiatry
j educ
j educ and psychol measmt
j educ. measmt
j educ psychol
jj j educ research
j educ sociology
j experimental child psychol
j exp educ
j general educ
j higher educ
j research in science teaching
j school psychol
j secondary educ
j teacher educ
j verbal learning and ver. behavior
Clearinghouse
McGill j. educ
Maine teacher
Math "
Mental retardation abstracts
Modern Schoolman
N.E. res. bulletin
NASSP
Nat. ele. principal
Nations schools
NH educator
Perceptual-cognitive development
Phi Delta Kappan
Psychol in the schools
Rev of educ research
School Administrator
" and society
" councelor
" executive
" management
" rev.
Social educ.
Sociology of educ.
State educ j. index (REF)
Superior student (Main C370.5)
Teacher educ quarterly
Teacher's college j
" " record
Urban educ.
Young children
Research in Education (REF Z5813 .R4 31&2 1966)
Res. relative to children (Ref 75814 V52 # 1-20

FACTORS JEOPARDIZING INTERNAL AND EXTERNAL VALIDITY

1. History, the specific events occurring between the first and second measurement in addition to the experimental variable.

2. Maturation, processes within the respondents operating as a function of the passage of time per se (not specific to the particular events), including growing older, growing hungrier, growing more tired, and the like.

3. Testing, the effects of taking a test upon the scores of a second testing.

4. Instrumentation, in which changes in the calibration of a measuring instrument or changes in the observers or scorers used may produce changes in the obtained measurements.

5. Statistical regression, operating where groups have been selected on the basis of their extreme scores.

6. Biases resulting in differential selection of respondents for the comparison groups.

7. Experimental mortality, or differential loss of respondents from the comparison groups.

8. Selection-maturation interaction, etc., which in certain of the multiple-group quasi-experimental designs, such as Design 10, is confounded with, i.e., might be mistaken for, the effect of the experimental variable.

The factors jeopardizing external validity or representativeness which will be discussed are:

9. The reactive or interaction effect of testing, in which a pretest might increase or decrease the respondent's sensitivity or responsiveness to the experimental variable and thus make the results obtained for a pretested population unrepresentative of the effects of the experimental variable for the unpretested universe from which the experimental respondents were selected.

10. The interaction effects of selection biases and the experimental variable.

11. Reactive effects of experimental arrangements, which would preclude generalization about the effect of the experimental variable upon persons being exposed to it in nonexperimental settings.

12. Multiple-treatment interference, likely to occur whenever multiple treatments are applied to the same respondents, because the effects of prior treatments are not usually erasable.

THE TESTING PROGRAM

The word 'program' has certain important implications, such as order, system, planning. It implies a sequence of events that has been determined after careful thought.

Regardless of its scope, the complete testing program at any particular time will ordinarily consist of the following eight steps, or stages, in chronological order:

1. Determining the purpose of the program
2. Selecting the appropriate test or tests
3. Administering the tests
4. Scoring the tests
5. Analyzing and interpreting the scores
6. Applying the results
7. Retesting to determine the sucess of the program
8. Making suitable records and reports

Determining the Purpose of the Program

It must be recognized at all times that tests are means to an end, never an end itself. Thus, the value of any testing program depends on the use made of results. Merely "giving tests" without rhyme, rule, or reason is money, time and effort wasted. The author once heard an experienced educator say that he had wondered for years what many people did with standard tests after they had been "given". At last he found out. They filed them! A testing program should have a more serious purpose than that. The first step, therefore, in planning a program is to determine its purpose. In so doing, three things should be kept in mind: the program should be cooperative, practical, and definite.

A Cooperative Program

As a rule, the program should not represent the judgment of any one person alone, but that of a group. It should be a truly cooperative enterprise. The teachers and administrators alike should be made to feel that it is "our" program, as indeed it should be. This is not likely to be the case, however, if the principal, superintendent, or research department determines the program and then "hands it down" to the classroom teachers. The entire staff should have a voice in determining the purpose of the program and in formulating the plans, and all should have the opportunity of participating in it in every way possible from beginning to end. If this is not done, the teachers are not likely to understand the program fully or to appreciate what it is attempting to do. Without the hearty cooperation of the entire staff, the program is almost sure to fall short of its highest possibilities. It is suggested, therefore, that in a small school or school system the purpose of the

program be decided upon after discussion in a general teachers' meeting or series of meetings in which everyone has a chance to participate. In the larger school systems, it is better to entrust the responsibility of planning the program to a committee representing all interested groups. Even then it should be brought before the entire staff before final action is taken. It cannot be emphasized too strongly that the success of the program largely depends on cooperative action. An important part of the program, then, is the educating of the staff so that they can participate intelligently in in it. The teacher's attitude is probably the most important singel factor to be considered.

A Practical Program

The general purpose of the testing program is to provide data which will help in the solution of practical school problems. As a rule, this means that the problems whose solutions are sought will have to do with administration, instruction, or research, or with some combination of these three. Even when tests are used primarily for administrative purposes, such as classification, they can also be used by the classroom teachers for diagnostic purposes. Unless the school hasgs had considerable experience with testing, it will be better not to under take a program primarily for research, although under favorable conditions research is a legitimate interest both of classroom teachers and of administrators. Even when a program is undertaken for research purposes, it should ordinarily be one which bears directly on some practical issue in the school, such as determining the relative efficiency of different teaching methods or of administrative organizations.

A Definate Program

It is not enough that the program be cooperative and practical It must also be definite. The scope of the program may vary all the way from a single subject in one grade to measurement involving the entire school system. A common mistake of a staff inexperienced in the use of tests is to undertake too much. The danger then is that the program will drag along until everybody is more or less "fed up" with it. Much of the value of the information sought from the tests will be lost unless the information is made available without delay. It is usually best, particularly with inexperienced teachers, to run the risk of undertaking too small a program rather than one too large.

Another mistake is in stating the purpose of the program in too general terms. "to improve instruction" is too vague and inclusive. "To motivate study" or "to diagnose weaknesses and provide a basis for remedial instruction" would be better. Best of all would be a still more difinite formulation, such as "to motivate study in fifth-grade arithmetic" or "to make a diagnosis of characheristic weaknesses in first-year algebra and to formulate a program of remedial teaching to eliminate them." The purpose should state specifically both the nature and the scope of the program to be undertaken. In a long range program, the purpose for each year will have a definite relationship to the whole. No matter how stated, however, there is really one fundamental purpose

in all measurement: namely, the better understanding of the individual pupil. To accomplish this purpose the information must be as definite and as complete as possible.

Selecting The Appropriate Test or Tests

When the purpose of the testing program has been determined, and not until then, the selection of the test, or tests, is in order. In Chapter Five, attention was called to the fact that a test may be superior for one purpose and worthless for another. Great care must be exercised to obtain the tests most appropriate for the purpose. Three questions require consideration:

1. Who should select the test or tests?
2. What type of tests should be used?
3. What is the best procedure in making the selection?

Who Should Select the Tests?

In larger school systems, the director of research or of pupil personnel services is most often the person best qualified to make the selection. But, even then, in the selection of achievement tests for specific subjects, the teachers of these subjects should be consulted, since their knowledge is essential in judging the curricular validity of the tests. In smaller schools, the major responsibility is usually assumed by the principal or superintendent, or assigned to a guidance councelor. However, in the selection of achievement tests, a committee of teachers will be helpful in judging the content of the tests. In evaluation that involves a subjective element, it is a sound principle to rely, whenever possible, on the combined judgment of a group of competent persons, rather than on the judgment of just one individual.

What Types of Test Should Be Used?

Ordinarily, an adequate testing program will involve the use of more than one type of test. It will be desirable, except in few cases such as in the beginning of kindergarten or first grade, to use both intelligence and avhievement tests. If considerations of time and money make it advisable to limit the testing program to one standard test for determining the present status of the class or school, the best choice will usually be a test battery.

For a general survey of the intellectual status of the class or school, one good group test of intelligence will usually be adequately reliable. However, for comparing pupils with each other, the mean of two test scores is better than just one. In any measurement of intelligence involving group tests, especially if only one test is used, it is desirable to retest with an individual intelligence test, such as the Revised Stanford-Binet Intelligence Scales or one of the Wechsler Scales, pupils who test very low, say an I.Q. of 80, and those whose scores are considerably out of line with the judgment of the teacher.

APPLYING THE RESULTS

The application of the results is the crux of the whole testing program. Everything that has gone before is preliminary. Whatever value the tests are to have depends in the last analysis on the use made of the results.

Just what is to be done, of course, depends on the purpose of the program. In several chapters we have considered in some detail procedures to be followed for several administrative and instructional problems. It will be sufficient at this point to give some idea of how the procedure will vary with the purpose.

Suppose, for example, that the purpose of the tests is to determine the present status of a particular school in order to improve it, and that the test data are before the principal. The question now is, what is to be done? On the basis of the test scores and other pertinent data, such as the teachers' estimates, health reports, age-grade status, and the like, several pupils are given trial promotions to the next higher grades. A small group of pupils, whose achievement and intelligence scores are well below the general tendency of their respective grades, is organized into an ungraded class which is assigned to a specially prepared teacher. Ability groups are also organized in several grades and classes, with appropriate differentiation in curricula and methods.

Similarly, suppose the primary purpose of the testing program is to determine whether or not the teaching emphasis is correct in the various subjects in the grades, and, when the test results are in, it is apparent that most of the grades are strong in arithmetic and spelling, about average in reading, and weak in language and the social studies. Now what is to be done here? The principal calls the teachers together and presents the situation in tables and graphs, with interpretive comment. Then they discuss the findings. One or more committees are appointed to study the situation and to make recommendations at a later meeting. After discussion and deliberation, a course of action is decided upon, looking to the improvement of the situation in the weaker subjects.

The procedure will again be somewhat different in essential respects if the primary purpose is diagnosis and remedial work in reading. Here the test results should be analyzed in some detail in each grade. An analysis of the test papers, item by item, is often very revealing. Special effort should be made to locate the specific nature of the reading difficulties. There may be found some general weaknesses, such as the inability to use the index and table of contents in a book, or possibly to locate the central idea in a paragraph. In addition, there are usually other weaknesses, which appear in some pupils and not in others. Some of these will not be revealed at all by the usual paper-and-pencil reading tests, but will require special tools and techniques. After considering these facts, the staff will try to plan a remedial program to be followed during the year.

The essential point in all these cases is that <u>something is done about the situation revealed by the test scores.</u> To fail to apply the results in some practical way is to fail in the testing program.

SUMMARY SHEET

TYPES OF RESEARCH STUDIES

VARIABLES

VARIABLE -- Any factor having two or more mutually exclusive properties or values.
For example, sex is a variable because it has two mutually exclusive properties, maleness and femaleness. Reading achievement as indicated by a test score is also a variable because it has several mutually exclusive values (the range of potential test scores).

CRITERION VARIABLE (OR CRITERION) -- The variable that represents a desired educational outcome or objective.
For example, in a study of the relationship between Headstart Training and student achievement, the desired outcome is increased student achievement. Therefore, student achievement is the criterion variable.

VARIATE -- The variable whose relationship to the criterion is being studied.
The variate is a characteristic or experience shared in common by a group of subjects and serves as the basis for classifying students into the group(s) being studied.
For example, in a study of the relationship between sex of student and reading achievement, sex of the student is the variate.

MANIPULABLE VARIABLE -- A variable that the experimenter can control to the extent that he can assign subjects chosen at random with different properties or values of that variable.
For example, type of classroom organization is a manipulable variable because the experimenter can assign different properties (e.g., nongraded primary or graded primary) of this variable to subjects.

NON-MANIPULABLE VARIABLE -- A variable that cannot be controlled by the experimenter to the extent that he can assign subjects chosen at random with different properties or values of the variable.
For example, socio-economic status is a non-manipulable variable because the experimenter cannot assign different properties of socio-economic status to subjects.

TYPES OF STUDIES

STATUS STUDY -- A study in which the variate is not manipulable.

ASSOCIATIONAL STUDY -- A study in which the variate is potentially manipulable, but is not manipulated in the study.

EXPERIMENTAL STUDY -- A study in which the variate is manipulated (i.e., different properties or levels of the related variable are assigned to subjects) by the experimenter.

VARIABLES

INDEPENDENT VARIABLE -- A variable whose properties are manipulated (i.e., different subjects are assigned different properties or values of the variable) by the experimenter. The variate in an experimental study is an independent variable.

DEPENDENT VARIABLE -- The variable which the experimenter examines to see if it is affected by experimental manipulation of the independent variable. The criterion variable in an experimantal study is a dependent variable.

TYPES OF STATEMENTS

STATEMENT OF ASSOCIATION -- A statement of association is a statement indicating that a relationship exists between the variate the criterion variable. It does not indicate that a change in the variate will produce a change in the criterion, but simply that a relationship exists between the two.

Key phrases frequently used in statements of association are:
a (positive) relationship exists between, there is a relationship (or association), more X is associated with more Y, X is related to Y, etc.

Statements of association are permissible from the findings of each of the three types of studies: status, associational, and experimental.

STATEMENT OF CAUSALITY -- A statement of causality is a statement indicating that manipulation of the variate (i.e., an induced change in the properties or value of the variate) will produce a change in the criterion variable.

Key phrases frequently used in statements of causality are:
as a result of, because of, produces, results in, will increase if, etc.

Statements of Causality are permissible only from the findings of an experimental study.

Written learning experience Number 1 - HEW Research Institute

Study of Mathematics

The superintendent of Town X, who is the experimenter, desires to test the hypothesis that it will make no significant difference whether he uses Math Text ABC for his sixth grade students, or Math Text XYZ.

There are six sixth grades. All six sixth grade teachers are instructed by the superintendent to participate in the study. The six sixth grades are approximately matched in terms of ability. Teachers are asked whether they wish to be in the control or experimental group and it works out on a happy three-three choice basis. Through the use of appropriate statistical techniques, it is found that there is a significant difference in favor of text XYZ. As a result of this finding, the superintendent, at the next regional meeting of the superintendents' association, extols the virtues of the XYZ text and convinces many of the school superintendents to consider switching to this series. Several of them follow his advice and not only switch to this text but replicate his study. To their amazement, the findings in some cases show that text ABC seems better than text XYZ, and in other cases there seems to be no difference between the two.

In a series of brief numbered statements, comply with the requests listed below.

1. Suggest specific strengths and weaknesses in the design of this study.
2. Indicate your knowledge of different kinds of variables by indicating what the variables in this study are.
3. Indicate the type of study it is.
4. Suggest further strengths and weaknesses in this proposal in light of the document you received called "The Ingredients of a Research Proposal."

AERA PRESESSION COURSE III
CURRICULUM RESEARCH AND EVALUATION
FEBRUARY 11-15, 1967

THE INGREDIENTS OF THE RESEARCH PROPOSAL

SOUTHWEST REGIONAL LABORATORY
FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

1000 EAST APACHE BLVD.
TEMPE, ARIZONA 85281

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INGLEWOOD, CALIFORNIA 90304

TOPIC: The Ingredients of the Research Proposal

SESSION NUMBER: 18

INSTRUCTOR: Robert L. Baker

OBJECTIVES:

1. Identify the basic components of a sound research proposal, irrespective of variation in proposal format.
2. Describe the conditions that must be met for each component.
3. Distinguish between exemplars and non-exemplars of proposal components based on conditions to be met.
4. Given a problem area, construct a proposal outline including the operational specification of essential ingredients.

CONTENT OUTLINE:

I. Proposal Formulation and Planning

II. Description of Basic Components of a Sound Research Proposal
   A. Differences in labels attached to components in varied proposal formats.
   B. Differences in ways of sequencing and/or organizing components in overall proposal structure.

III. The Conditions That Must Be Met for Each Basic Component of a Sound Proposal

OBJECTIVE 6: Identify the essential components of a sound research proposal and describe operationally the specific conditions that each component must meet.

The increased financial support of educational research activities by government agencies and privately endowed foundations provides wider opportunity for the conduct of sorely needed educational research. The increase in funding, however, has been outpaced by the number of research proposals submitted for consideration by the funding sources. In a competitive research market, the weak, infirm, or poorly stated proposal is quickly cast aside. Thus, the educational researcher to work his trade must, in addition to his other skills, acquire competency in the development of a sound and well-explicated research proposal. Despite the vindications of the rejected researcher, most proposals are rejected not because of the researcher's lack of sophistication regarding the complex subtleties of "grantsmanship", but rather because his proposal lacked one or more of the essential ingredients of a sound research proposal.

The purpose of the sessions related to Objective 6 is to describe the essential ingredients or components of a research proposal and to identify the conditions that must be met for each component. The components can be identified in any good research proposal regardless of the variations of format. They can be easily identified in proposals which attach different labels to the components or specify different ways of sequencing and/or organizing the components in the overall proposal structure.

The basic ingredients described in this session should be regarded as a necessary but not sufficient condition for the development of a sound and well-explicated research proposal.

THE BASIC COMPONENTS OF THE RESEARCH PROPOSAL

I. Proposal Formulation and Planning

A. Formulation of research problem

The first stage in the formulation of a research project is the selection of a fruitful problem that is significant for education. The range of potential problems or situations requiring change is as broad as the range of behaviors related to educational activity. The significance of a problem rests on its probable contribution to knowledge. The following are some of the important criteria which should be carefully considered in the selection and/or formulation of a research problem.

Suggested Criteria for Selection of Research Problems*

1. A concern with basic concepts and relationships of concepts as distinguished from local, particularized, or exclusively applied research, to the end that the knowledge produced may be cumulative with that from other studies.

2. The development, refinement, and testing of theoretical for formulations.

3. Superior research design, including careful specification of the variables involved and use of the most precise and appropriate methods available.

4. A probable contribution to methodology by the discovery, development, or refinement of practicable tools, techniques, or methods.

5. Full utilization of relevant concepts, theories, evidence, and techniques from related disciplines.

6. The integration of any single study in a planned program of related research to the end that the results become meaningful in a broad context.

7. Adequate provision to train additional research scientists.

8. Provision, wherever feasible, to repeat or check related research of other persons in order to provide a check on the generality of conclusions.

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*From Report of the Study for the Ford Foundation on Policy and Program, Detroit, Michigan: Ford Foundation, November, 1949

B. Planning the research proposal

Planning of the research proposal represents the next step in the proposal-writing sequence.

Before such planning begins, it is assumed that the researcher (1) has made the necessary canvass and review of relevant background literature and (2) that he has formulated the research problem and determined the sequence of operations and procedures for solving the problem. He is now ready to describe his research procedure and his findings and to correlate them with the findings of other researchers and with theory in his field.

1. First considerations in planning a research proposal

   a. Determination of appropriate funding agencies for proposal research.

   b. Determination of selected funding agency's research proposal format.

   c. Consideration of length and detail of proposal.

   d. Getting the overall problem clearly in mind (consideration of the major aspects of the problem in light of the hypotheses that will guide the research).

   e. Consideration of what is directly and immediately pertinent (i.e., what should be included in the proposal) and what is of secondary concern and should be omitted or placed in an appendix.

2. Outlining--The Organizational Plan

   a. Outline form

      The outline for the research proposal shows (1) the sequence of topics as they will be covered and (2) relationships between the various topics. A good logical outline aids both the reading and the writing of the research proposal.

      In outlining, logical organization can usually be facilitated by coding the divisions of the outline. The two most frequently employed codes for sections or categories of the outlines are (1) the use of numbers and letters and (2) the use of a decimal system. These are illuminated on the following page.

Numbers and Letters System	Decimal System
I.	1.0
II.	2.0
A.	2.1
B.	2.2
III.	3.0
A.	3.1
1.	3.11
2.	3.12
B.	3.2
1.	3.21
a.	3.211
b.	3.212
2.	3.22
C.	3.3
1.	3.31
a.	3.311
(1)	3.3111
(2)	3.3112
b.	3.312
2.	3.32
IV.	4.0

Either a topic outline or a sentence outline may be employed, but in either case it is important to remember that labels or headings for each section must be clear and meaningful.

b. Logical division

Principles of logical division should be followed in outlining. Chief points to remember are:

(1) Each class or topic included in the outline should be based on a single principle of differentiation.

(2) Each division in the outline should be mutually exclusive.

(3) Each class or division in the outline should be exhaustive.

(4) Each class should be well defined.

(5) There should be no further division of a class unless there are at least two subclasses.

c. A suggestion for outlining a research report

Educational researchers frequently find that the use of a topic card system facilitates the organization and integration of material for the research proposal. Each topic or item that seems suitable for inclusion in the proposal is written down on a separate card.

A topic-card should be prepared for each point that is relevant, regardless of whether it is of major or minor importance. Following the preparation of the topic card, each card should be checked against the criteria for the basic components of the proposal to eliminate cards that are not pertinent and to prepare new cards for topics that may have been omitted or overlooked.

Then, the topic cards may be classified and organized, following the rules of logical division--putting topics together that belong together, arranging the topics that are coordinate and those that are subordinate, and so on. In this process it may be convenient to spread the cards out on the floor and arrange the cards in outline form. New cards may be inserted where they seem to be necessary, or cards may be eliminated if they are not pertinent in the total picture.

After an effective order has been arrived at, the cards may be coded (using either the number and letter code or the decimal code noted before) and the material copied to provide the working outline.

The procedure is a very flexible one, making it convenient to add cards, subtract them, combine topics, revise the order, etc.

II. Basic Components of a Research Proposal

A. Introduction

A well-explicated and technically sound research proposal contains a number of basic components that can be easily identified independent of variations in proposal formats. Different funding sources may require that different labels be attached to these components or they may specify different ways of sequencing and/or organizing the components in the overall proposal structure. The following constitutes a listing of the basic components of sound proposals:

1. Project Identification (Title)

2. Statement of the problem to be solved or situation to be improved.

3. Justification for proposal approach

4. Operational research objectives, hypotheses and/or questions

5. Sequence of operations and procedures to be used in solving problem.

6. Evaluation of data.

B. Description of the basic components of a research proposal

The elements or conditions to be met for each component includes the following:

1. Project Identification (Title)

A good project title consists of a short concise statement containing the following elements:

a. Identification of variables

(1) Experimental study

(a) Independent variable

(b) Dependent variable

(2) Correlational/status study

(a) Related variable

(b) Outcome

b. Identification of target population

c. Specification of type of relationship between variables

(1) Functional = "the effects of"

(2) Non-functional = "the relationship of"

2. Statement of the problem to be solved or the situation to be improved

This component of a sound research proposal contains the following elements:

a. Specification of the problem

(1) Clear, brief statement of the problem with concepts defined where necessary, including:

(a) Identification of manipulable instructional variables for determination of their differential effects. (All relevant variables should be considered. The failure to consider relevant variables is a common and serious error in development of a research proposal.)

(b) Identification of dependent variable

(c) Identification of target population.

(2) Problem is delimited to bounds amenable to treatment or test.

(3) Description of the significance of the problem for education with reference to one or more of the following criteria:

(a) Is timely.

(b) Relates to a practical problem.

(c) Relates to a wide population

(d) Relates to an influential or critical population.

(e) Fills a research gap.

(f) Permits generalization to broader instructional principles or general theory.

(g) Sharpens the definition of an important concept or relationship.

(h) Has many implications for a wide range of practical educational problems.

(i) May create or improve an instrument for observing and analyzing data.

(j) Provides opportunity for gathering data that is restricted by the limited time available for gathering particular data.

(k) Provides possibility for a fruitful exploration with known techniques.

As pointed out by Smith (1965), it is apparent from the Research Advisory Committee's reaction to proposals, that it views some problems as central to the field of education and others as peripheral. Studies which explore the learning process, or which seek to identify factors associated with the retention of students in schools and colleges are regarded as having greater significance than, for example, studies of adjustment problems of young adults. The latter topic may be a valuable one for research in another context such as mental health. The committee, however, must make judgements only about the significance of each problem to the field of education.

b. Specification of relationship to theoretical framework (if pertinent)

(1) Describe the relationship of the problem to a theoretical framework.

(2) Demonstrate the relationship of the problem to previous research.

(3) Present alternate hypotheses considered feasible within the framework of the theory (strong inference).

3. Justification for proposed approach

An important criterion in the evaluation of submitted proposals by funding agencies is the potential cost-effectiveness of a particular proposed research project. Cost-effectiveness indicates that there is a relationship between the cost of the proposed project and the results that are likely to be produced by the study (i.e., the effectiveness of the project). The proposal will be competetive with other proposals to the extent that the results which are likely to be produced are sufficient to justify the cost.

4. Operational research objectives, hypotheses and/or questions

The objectives, questions and/or hypotheses presented in the research proposal represent the researcher's attempt to focus his attention on specific aspects of a problem. As Smith (1963) points out, the sharper the focus, the greater the probability that the experimenter will succeed in his task. A statement of the objectives, hypotheses, or research question which is broad and ambiguous will ultimately lead to conclusions which are also broad and ambiguous.

The following is an example of a statement of a hypothesis included in a proposal submitted to the Cooperative Research Program. "The broad hypothesis is that a procedure can be followed which will lead to the initial formulation, revision, and final development of a broadly conceived theory of education based upon psychological and other relevant research findings." It is apparent that, stated this way, a research objective, question, or hypothesis will have little or no meaning. To assure that the proposal is presented in sharp forms, it is necessary to state the hypothesis, objectives or questions in operational terms--that is, the procedures and/or behavioral outcomes must be clearly specified and observable.

a. Operational definition

The necessity for operational definitions in the formulation of the research objectives, hypotheses and/or questions has

been long emphasized in the literature. An operational definition requires that the observable conditions necessary for a concept's application be stated. The concept is thus defined by the set of operations linking it to the conditions of observation. One should be cautioned, however, against assuming that an operational definition can be taken as final. Willower (1963) points out that, although most psychologists agree that IQ provides an operational definition of intelligence, this argument should not result in a failure to devise newer and better measures of intelligence, not in a moritorium on development of new theories of intelligence.

The researcher must also carefully assess the scope of his operational definitions since narrowness can often be the price of precision in the formulation of a research objective. Without question the property of objectivity, which is afforded by operational definitions, is an essential requirement of scientific research. However, operational measures which omit too much or perhaps something crucial, have limited value. Operational definitions as pointed out by Finan (1962), when properly used are a tool of the efical research. Their purpose is to make concepts unambiguous, not to make it possible to theorize without concepts.

b. Objectives

The objectives component of a proposal provides a frame of reference for the evaluation of the remainder of the proposal. In this section the research objectives must be specified in terms of observable behaviors to be performed by the learner.

The objectives statement should include: (1) an operational specification of what individuals in the target population will be able to do upon attainment of the objectives; (2) a description of the conditions or situations in which the presence or absence of the behaviors can be observed and recorded; and (3) specification of the anticipated or acceptable level of performance for the target group. To minimize a broad ambiguity and conceptual confusion, a non-overlapping, simple taxonomy of behavioral objectives should be used.

c. Hypotheses

(1) Form of hypotheses

Hypotheses are relevant to theoretical research. Thus, when a hypothesis is stated, it is essential to provide a thorough explanation of the theoretical framework or basis that leads to the hypothesis. If the theoretical framework cannot be stated, it is not appropriate to propose hypotheses but rather to pose research questions. This is particularly true in the event that the inquiry is directed in an area in which the experimenter is relatively unsophisticated.

Research hypotheses take either one of two forms: (1) the null or statistical hypothesis· (2) the alternative or experimental hypothesis. The hypotheses can be presented as Guba (1963) points out,in four different kinds of statement including:

(a) Literary null: a "no-difference" or "no-effect" of the hypothesis expressed in terms of theoretical constructs.

(b) Operational null: a "no-difference" form of the hypothesis expressed in terms of the operations required to test the hypothesis.

(c) Literary alternative: a form expressed in terms of theoretical constructs that state the hypothesis that will be accepted if the null hypothesis is rejected.

(d) Operational alternative· a form expressed in terms of operations that state the hypothesis that will be accepted if the null hypothesis is rejected.

The null hypothesis (or the statement of the hypothesis in a "no-difference" form) is the most commonly used mode of phrasing the hypothesis. This form of the hypothesis is semantically difficult, particularly if more than one independent variable is included in the study. Statisticians, however, prefer this form of the hypothesis because it accurately reflects the probablistic models underlying the statistical techniques. The alternative or experimental hypothesis is simply a statement of the hypothesis the researcher proposes to accept if the statistical hypothesis is rejected. The alternative hypothesis specifies the anticipated outcome, i.e., a non-chance occurrence. Either the null or alternative form may be used alone at the experimenter's discretion. However, as a matter of convention, the null hypothesis is customarily given with the accompanying alternative hypothesis.

Whenever there is a basis for prediction in the study, hypotheses should be stated as succinct predictions of the anticipated outcomes and/or findings rather than in the null form.

Both the null and the alternative hypotheses can be expressed in either of two language forms, i.e., literary or operational. If the language is in the literary form, the hypothesis will be expressed in terms of specific theoretical constructs. On the other hand, if the operational form is used, the hypothesis will be defined by the instruments used to measure the variables implied by a theoretical construct. In educational research, the operational form of the null and alternative hypothesis is preferable on two accounts: (1) it exposes the logic of operational techniques and measurement devices used in the study, (2) it minimizes ambiguity and conceptual confusion that frequently results in using the literary form alone without translation into operational terms.

(2) Criteria for evaluation of hypotheses

To assure the formulation of testable and significant hypotheses, the following criteria may be utilized:

(a) The hypotheses must be clearly stated in operational terms.

The null and alternate hypotheses should be clearly stated and include the operational specification of the concepts, independent and dependent variables and measuring devices employed in the study.

(b) The hypotheses must be specific and testable.

All the operations and predictions included in the hypotheses must be thoroughly and unambiguously defined in order to assess the testability of the hypotheses. As indicated by Goode and Hatt (1952), hypotheses are frequently stated in such general terms that they are simply not testable. By operationally specifying the hypotheses, the potential validity of the experimental results is increased. By using broad terms one is able to resort to selective evidence in the interpretation of the results. Although astrologists and palm readers make their living by stating predictions in such a form that almost any occurence can be construed as prophecy fulfillment, such a strategy is not legitimate in educational research. As Goode and Hatt (1952) point out, the more specific the prediction, the smaller the chance that the prediction will actually be borne out as a result of a mere accident. It is imperative, then, that the research hypotheses be as explicit and specific as possible in order to avoid the trap of selective evidence.

(c) The hypotheses should be related to a body of theory.

This criterion is one that is frequently overlooked in educational research. In curriculum research it is valid to select a research problem which does not relate directly to previous curriculum research or theoretical formulations. The researcher should remember, however, that often with careful development, the same research study may not only obtain the desired information related to local needs, but may help to refute, qualify, or support existing instructional theories.

(d) Questions

Questions are relevant to status and correlational studies (i.e., How many are there? Is there a relationship between them?). The questions is also appropriate when, as is often true in educational research, the researcher cannot state the theoretical basis for the study. In this case, it is appropriate to raise questions rather than propose hypotheses. The same criteria of operational specificity apply to the starting of research questions as were mentioned in the discussion of objectives and hypotheses. The experimenter indicates by the specificity of the research questions he raises, how carefully he has thought through his problems. A research question of the form, "What is the relationship of intelligence to reading and arithmetic achievement?" is too broad and ambiguous. A better statement of the question would be, "What is the relationship of Otis Quick Test Intelligence Scores to the SAT Arithmetic and Reading subtest scores of seventh grade public school students?"

5. Sequence of operations and procedures to be used in solving problems

a. Introduction

This component of a research proposal is variously labeled method, procedure, or in one instance method of procedure. The basic function of this component is to describe the operations that will be performed to solve the provelm of concern, including:

(1) Specification of the operational evaluation-revision procedures that will be employed in the experiment. Often this is done by specifying sub-objectives of the overall experiment and indicating the empirical criteria that will be used to determine the attainment of each.

(2) Specify the sequence of steps to be taken toward the solution of the problem and a list of products that will be produced at the end of each step. A "product" may be a new workbook or a film; it may be a method of pupil-grouping, or the specifications of an instructional procedure, or a vocabulary list.

(3) Describe the method and rationale for sampling.

(4) Describe the method and rationale for treatment assignment.

(5) Specify the kinds of data to be collected, the method for collecting, and the rationale for using it.

(6) Describe the experimental design and the rationale for using it.

(7) Tell how the data will be analyzed.

b. Design

A common failing of many proposals is that they neglect or ignore some of the posed research questions or hypotheses. Thus, the first step of the researcher in selecting an appropriate design, is to check every proposed questions or hypothesis to be sure that it is covered by the design under consideration.

The researcher should be aware of all the possible threats to validity and should disclose in this section how and why the design selected constitutes an optimal design under the particular constraints imposed on the experiment (e.g., inability to randomly assign subjects to treatment, limited size of sample, etc.)

Although one should avoid expediency as a justification for a weak design, the researcher must convincingly demonstuate that, if a "true" experimental design is not feasible, the alternative design offered represents an optimal compromise based on (1) the extreme difficulty and/or cost of using a true experimental design for the proposed study; (2) the control of the variables selected; and (3) the control of possible sources of error.

A well-explicated presentation and justification of an experimental deisgn should include most of the following elements:

(1) Specification of how each research question or hypothesis is covered by the proposed design.

(2) Specification of how specific anticipated confounding variables and threats to validity are controlled by the proposed design including:

(a) Identification of variables which design will control and how specifically design will control them.

(b) If specific sources of error cannot be completely controlled by proposed design, submit rationale as to why they are not anticipated to constitute major threats to validity (e.g., if testing-treatment interaction remains as a threat to validity, indicate why such a threat is anticipated to have negligible effects. Cite supporting pilot study data if available. It is imperative that the researcher

demonstrate his awareness of all possible courses of error by pointing them out. If the researcher does not point them out, he can rest assured that very likely the reviewer will do so.

(3) Specification of design in statistical or logical terms.

The use of statistical or logical terms in describing the selected design as Guba (1963) points out, will facilitate communication and the identification of possible sources of error in the experiment.

(4) Types of inferences that may be made using proposed design

As pointed out in earlier sessions, the type of study (i.e., experimental--non-experimental) determines the types of statements of casual inference that may be made from the data. The researcher should verify that the selected design will permit him to make the kinds of statements that he would like to make from the acquired data.

c. Target population and sampling

(1) Sampling plan

The target population and sample must be carefully described so that the reviewer can make an assignment of the generalizability of the experimental findings.

The problem of external validity, as discussed previously in the session on experimental design, relates to the problem of knowing the population to whom the findings are applicable. To validly generalize the experimental results to the target population requires that the sample have been drawn from that population using an appropriate probability sampling plan.

As Guba (1963) points out, two discrete steps are involved:

(a) Random selection of subjects from the target population, i.e., all subjects incorporated in the sample must be selected at random from the same population. This target population must be precisely defined.

(b) Random assignment of subjects to treatment.

The rationale for the selection of a given sampling plan must be carefully specified. If stratefied, area or cluster samples are used, the reason for selecting any of these plans must be made clear and reasonable to the reviewer.

(2) Sample size

The problem of sample size cannot be adequately treated here. It should be mentioned, however, that one can estimate the sample size required to obtain a specified level of power if he has adequate pilot study data or information from previous research using the same measurement devices.

(3) Specification of sampling procedures

It is necessary that the specification of the sampling procedure include at least the following elements:

(a) Description of target population, experimental and control samples

(i) Specification of target population to which the research objectives, hypotheses, or questions are relevant.

(ii) Specification of procedures or rationale for determining size of sample to be used

(b) Specification of method of drawing or selecting sample

(i) Specification of relative costs of the various sizes and types of samples allowed by the theory

(ii) Specification of relative importance of Type I Error and Type II Errors

d. Data to be gathered and measurement devices to be employed

(1) Date to be gathered

At least the following information should be provided in this section:

(a) Specification of plans for collection of required data, including an explicity statement describing field controls to be employed. The major concern here is generally that you will maintain <u>equivalent situations</u> for all groups (Guba, 1963).

(b) Specification of the anticipated time schedule

(2) Measurement devices to be employed

(a) Description of all measurement devices to be used in study. If no adequate instrument currently exists, then it is necessary to specify in detail the procedures that will be used to develop an appropriate psychometric instrument.

(b) Description of measures of qualitative variables including citation of available reliability and validity data.

(c) Specification of rationale for selection of measurement devices including:

(i) Supporting evidence that the selected devices have the appropriate psychometric characteristics.

(ii) Defense of operational definitions used.

(d) Description of use to be made of pilot study or test run.

5. Analysis and evaluation of the data

The description of the data analysis and evaluation procedures should include the following elements:

a. Indication of consistency of method of analysis with research objectives and design.

b. Specification of method of analysis including:

(1) Use of special analytical tools, computer, card-sorter, etc.

(2) Use of graphic techniques

(3) Specification of types of tables to be constructed

(4) Specification of statistical and/or other analytical procedures to be utilized.

c. Indication of the type of statements that may be validly made from analyzed data.

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THE INGREDIENTS OF A RESEARCH PROPOSAL

Exercise 1

A. Discrimination of Good Proposal Titles

For each of the following project titles, indicate whether:

(1) The variables are clearly specified. If so, identify the variable (independent, dependent, etc.)

(2) The target population is identified.

(3) The type of relationship between the variables is correctly specified.

Examples:

1. The effects of a specially planned mathematics program on pupil anachievement in eighth grade mathematics.

2. Reading comprehension, abstract verbal reasoning, and computation as factors in arithmetic problem solving.

3. An analysis of the relationship of selected factors to the nature of the voluntary reading of adolescents.

4. The dynamics of two variants of classroom alienation.

5. The relationship between achievement and verbal communication of secondary school children.

6. The effects of anxiety and intelligence on concept formation.

7. A study of concept learning and generalization in children.

8. The effects of four instructional procedures on free operant discrimination and discrimination reversal in retardates.

9. An investigation of the effects of two schedules of reading instruction on manifest anxiety and behavior adjustment: A comparison of varied amounts of time devoted to reading instruction and their effects on level of manifest anxiety and school behavior adjustment among fifth and sixth grade children in a public school setting.

10. The relationship of certain administrative factors to the number of academic courses pursued by the academically talented students in the 1960 graduating classes of the public secondary schools of Delaware.

11. The relationship between socio-economic status and problem solving ability: a study of the influence of experience.

12. The relationship between the perceived emotional climate of the home of college students and certain variables in their functioning related to self-concept and academic functioning.

B. Construction of a Proposal Title

For each of the following examples, construct a project title that satisfies the criteria for a good title.

1. A decision regarding the adoption of the PSSC physics course of study will be made from results of an evaluation of the course. Four schools can be involved in the study but no manipulation of enrollment into classes will be allowed. Each school will have at least two classes in Physics. Two of the four teachers can teach both PSSC and traditional but the other two can teach only traditional physics.

2. A retention study is to be made with students who took BSCS Biology. About 750 sophomores (approximately 86 from each of 9 schools) took BSCS and are still in attendance as juniors. Data are available on these students and an equal number of sophomores who took traditional biology.

3. An investigator wishes to determine the effect of reading "My Six Convicts" has upon freshmen Sociology majors at College X in terms of attitudes toward prisoners. He is able to use all the sections of Introductory Sociology offered in the first semester. He has an appropriate measure of attitudes toward prisoners.

4. A community committee wishes to discover what effects double sessions have on the quality of education of children in one of the crowded schools of their district. The bond issue has failed and they know they must have the pupils on double session for at least a year, but would like relevant information for publicity for future bond issue elections. The district has regular achievement and I.Q. testing programs in it's schools. What experimental design might be employed to gather this information.

Exercise 2

Below you will find three sections of a research proposal. Read it.

Project Title

The effects of Use of Sequencing and Mastery Principles in Film Preparation on the Concept of Formation and Procedural Performance of High School Students.

Problem

The potential of 8mm silent cartridged film has captured the imagination of educators and film producers alike. The number of commercially available cartridged films is increasing at an expoential rate, portending the increased utilization of the motion picture as an instructional medium. Since the low cost of 8mm eliminates the most serious obstacles to local production of instructional films, greatly expanded activity in this area may also be anticipated.

To date this technology has developed almost completely independently of previous and concurrent development in the psychology of learning and the technology of instruction. Consider the terminology which has already become standard in 8mm usage. Though nearly all commercially produced 8mm cartridged films are called "single-concept films," the definition of the term concept (as inferred from the characteristics of these films) lacks the precision that the term has achieved in psychological experimentation. Just as film producers might profit from a study of the meaning of the term concept as it is employed by psychologists and educational researchers, so the burgeoning 8mm field can profit from an application of principles of learning and instructional technology to the production of its increasingly popular product.

The present proposal seeks to extend the applicability of two of the dominant principles that have grown out of controlled experimentation in programmed instruction to the production of 8mm silent cartridged films. These are the principles of sequencing and mastery. (Silberman, H., Coulson, J., Melaragno, R., and Newmark, G., 1964; Schutz, R.E., Baker, R.L., and Gerlach, V.S., 1964)

The principle of sequencing has two parts: (1) every skill and subskill included in the program objectives should be explicitly covered by the program unless it exists in the student's entry repertoire; and (2) any materials that do not contribute to the program objectives should be eliminated.

The principle of mastery states that the student should be required to demonstrate mastery of each eomponent subskill before he is allowed to advance to new topics based on the earlier material.

These two principles will be investigated using two distinctive types of films as vehicles: (1) films designed to achieve concept fromation (the development of a new concept as opposed to the use of a concept already within the student's repertoire {Travers, 1963, p. 127}); (2) films designed to develop procidural performance (motor behavior as opposed to cognitive behavior). It would appear that characteristics inherent in the motion picture medium render it uniquely superior to the textual medium in accomplishing both of these types of instructional objectives.

Related Research

Experimental studies have been inconclusive with respect to the variables that influence the instructional effectiveness of motion pictures. The findings do suggest that certain general aspects may have important implications when preparing film sequences. However, a fine-grain analysis of the influencing variables is still necessary to provide the precisions required for effective instructional control via the motion picture.

Maccoby and Sheffield (1958) studied the optimal distribution of demonstration and practice in learning a procedural skill. They found that practice immediately following short segments of demonstration os better than deterring practice until a larger section of demonstration has been completed. The general aspects of the study are compelling; that is, there is some utility in breaking the sequence into segments and in providing periodic practice en route. However, specifications providing for learner response are imprecise from an instructional technology point of view. When one considers that the "segments" of the demonstration film were 5 or 6 minutes long, it is apparent that we are dealing with stimulus conditions which are extremely gross in the light of current instructional technology. A much finer-grain analysis of the skills and subskills included in the objective and the nature and sequence of instructional stimuli is required.

Margolius and Sheffield (1961) studied the effect of different lengths of filmed demonstrations of complex behavior sequences before an active practice response was made. The treatments included: (1) short demonstration, then practice; (2) longer demonstration, then practice; (3) complete demonstration, then practice; and (4) a transition from short demonstration, then practice, to long demonstration, then practice. Although inconclusive with respect to establishing specifications of demonstration length, the aspect of active responses en route appears to warrant more extensive investigation. Again, extending the principles of sequencing and mastery will contribute to the precision necesaary for specifying optimal demonstration lengths and organization.

One method of breaking a lengthy serial mechanical-assembly task into units has been suggested by Margolius, Sheffield, and Maccoby (1961). They define a "natural" unit as being contextually similar, and further emphasize practice on the "natural" units rather than

on the whole. Although procedural cues for specifying contextual homogeneity were not established, the general strategy warrents further, more definitive investigation.

The results of these experiments, as well as other similar studies (Michael and Maccoby, 1961), reflect the potential productivity of greater experimental activity in this area. The general findings of these studies suggest gross definitions of the instructional conditions which accompany effective film instruction. Such findings provide little in the way of generalizable procedures. Greater experimental control in the systematic application of empirically derived principles of learning should help us to get beneath the surface description of instructional conditions and specify the procedural cues for developing instructional strategies related to the development of 8mm films.

Objective

To investigate the application of the principles of sequencing and mastery to the preparation of 8mm silent films designed to achieve concept formation and procedural performance objectives.

Now answer the questions below, using the following procedure. If the answer is yes, state your reason or else underline (in the sections above) the words on which your answer is based and place the number of the question in the left margin, next to the words you have underlined. If your answer is no, either state why or rewrite the pertinent portion of the proposal to meet the criteria implied in the question.

1. Are the variables and type of relationship between the variables described? If yes, identify the variables (e.g., independent, dependent), type of relationship between the variables.

2. Indicate whether this would be a correlational, status or experimental study.

3. Is the situation requiring change described? If yes, specify briefly.

4. Is the target population described? If yes, specify briefly.

5. Specify what, if any, observable criteria will be used to determine when the desired change has taken place.

6. Is the problem related to a theoretical framework? If so, specify.

7. Are big definitions included?

8. Is the objective in the example stated in operational terms? If not, how specifically might it be modified so that it does comprise an operational statement.

9. Is the problem of general, or opposed to local significance?

Exercise 3

Construct Proposal Outline

Using one of the following problem areas or a problem area of special interest to you, construct a proposal outline using all of the criteria for a well-explicated proposal.

1. A doctoral candidate is interested in the Zuni Indican culture. What he would like to do is to make a study of an Indian child of elementary school age. In this study he specifically intends to investigate the child's family background--habits, moree, education, attitudes--as it impinges upon this student. By studying the child and its background, this doctoral candidate hopes to learn a great deal not only about the ways and means for the elementary school to educate the Indian child.

2. Your school district has been using a team teaching approach in ninth grade English for three years in each of eight high schools. The superintendent wished to know whether team teaching results in any greater learning than a traditional approach. He makes the resources of the Research Director available to you to use ninth grade students in a nearby high school. These students are being taught ninth grade English by the traditional approach. The experiment is to run during the school year 1964-65.

3. An investigator wants to see if the development of personality problems in first graders.A large school district with 10 elementary schools, each having the first four grades, is willing to cooperate. Pre-school reading readiness tests are administered each year and first grade classes are made up heterogeneously on the basis of these scores--Investigator free to work within this framework.

4. The senior students in high school were not doing as well as some people thought the students should be doing on their composition tests. It was decided to increase grammar content in the English curriculum. Someone questioned the reason for doing this. Therefore a study was planned to find out if increasing the grammar content would have any effect on composition grades. To aid the teachers engaged in the study all the senior English classes will be offered the same period next year. What design would you use?

UNIVERSITY OF NEW HAMPSHIRE

Statistics — Mid-Semester Examination — Summer 1967

Dr. Ghei

DIRECTIONS: Answers to all questions must be indicated on the answer sheets and not on this examination. Read each question and its answers. Blacken in the space on the answer sheet to indicate your choice of answers. Do NOT make any stray marks. If you change an answer, erase completely the old mark.

1. In order to estimate the ratio of males to females in a college, a professor determines the proportion of males to females in his class. The resulting proportion is:
   (a) a statistic
   (b) a parameter
   (c) a population
   (d) a sample

2. When a student says, "Mary is more beautiful than Susan," which scale of measurement is he employing?
   (a) ratio
   (b) nominal
   (c) interval
   (d) ordinal

3. The lowest level of measurement is:
   (a) ratio
   (b) interval
   (c) nominal
   (d) ordinal

4. It is generally agreed that most data in the behavioral sciences can be accomodated by how many class intervals?
   (a) 5-10
   (b) 5-15
   (c) 10-15
   (d) 10-20

5. Most generally a graph may be considered:
   (a) a substitute for statistical treatment of data
   (b) a visual aid for thinking about data
   (c) a dependable means of avoiding misinterpretations of data
   (d) a last resort of the uninformed

6. The difference between a bar graph and a histogram is that:
   (a) a bar gaaph is less precise.
   (b) a bar graph is readily converted into a frequency polygon.
   (c) the bars on a bar graph are contiguous.
   (d) the histogram is employed with interval- and ratio-scaled variables.

7. Height is measured on what type of scale?
   (a) nominal
   (b) ordinal
   (c) interval
   (d) ratio

8. Given that the distribution of scores on a quiz leads to a mean of 40, a median of 38, a mode of 36. If we added 10 points to each score, what would be the new median?
   (a) 38
   (b) 40
   (c) 48
   (d) 50

9. In what kind of distribution will there <u>not</u> be three standard deviations above <u>and</u> below the mean?
   (a) normal
   (b) leptokurtic
   (c) platykurtic
   (d) skewed

10. A truly quantitative scale with an arbitrary zero point is called:
(a) interval (b) ordinal
(c) ratio (d) nominal

11. In plotting which of the following curves do we use the upper real limit of the interval rather than the mid-point?
(a) frequency polygon (b) histogram
(c) cumulative frequency polygon (d) none of the above

12. For a particular distribution the mode is 68, the median is 62, and the mean is 56. This distribution is:
(a) leptokurtic (b) symmetrical
(c) positively skewed (d) negatively skewed

13. A group of 20 students obtained a mean score of 70 on an examination. A second group of 30 students obtained a mean score of 80 on the same examination. The mean score for the 50 students was:
(a) 70 (b) 75
(c) 76 (d) 80

14. The mean score of 30 students on an examination is 47 and the Standard Deviation is 0. The distribution of scores:
(a) is leptokurtic (b) is normal
(c) containes many negative scores (d(all students scored 47.

15. Which of the following measures of variability is <u>not</u> dependent on the exact value of each score?
(a) range (b) deviation score
(c) standard deviation (d) variance

16. The mean of a distribution of 50 scores is 35. If one point is added to each score, the mean of the new distribution will be:
(a) 35 (b) 36
(c) 50 (d) 85

17. The S.D. of a distribution of scores is 15. If each score is divided by 5, the new S.D. will be:
(a) 15 (b) 5
(c) 3 (d) 75

18. A z-score of +2.0 is approximately equal to a percentile score of:
(a) +2.0 (b) 68
(c) 96 (d) 98

19. What z-score would you set in order to permit 52 per cent of a group to pass a given test?
(a) 0.0 (b) +0.05
(c) -0.05 (d) 0.60

20. Given scores 3,6,0,4,2, $\Sigma (x-\bar{x})^2 =$ _____.
(a) 8 (b) 0
(c) 9 (d) 20

21. Suppose mean = 100 and Standard Deviation = 10; roughly 34 per cent of the area under the normal curve falls between 90 and:
(a) 80
(b) 110
(c) 100
(d) between 85 and 95

22. Suppose mean = 10 and Standard Deviation = 1, roughly 34 per cent of the area falls between 11 and:
(a) 12
(b) 10.5 to 11.5
(c) 10
(d) 9

23. Ninety-nine per cent of the area under the normal curve is included between _____ Z.
(a) $\pm$ 1.96
(b) $\pm$ 1
(c) $\pm$ 2.58
(d) $\pm$ 3

24. The standard error of the mean is the standard deviation of a large number of:
(a) standard deviations
(b) standard errors
(c) subjects
(d) means

25. Find the square root of 5.9536.
(a) .0244
(b) 24.40
(c) 2.44
(d) .00244

26. Descriptive statistical statements about a population can be made from a sample without special methods of inference.
(a) yes
(b) no
(c) need more information
(d) probably

27. If one wishes to make inferences about the population characteristics, the problem is one of inferring the _____ from the statistics.
(a) parameters
(b) averages and standard deviations
(c) values
(d) variables

28. Characteristics of persons or things which can assume different values are called:
(a) distributions
(b) observations
(c) data
(d) variables

29. The width of the bar in a histogram will always equal:
(a) one frequency
(b) mid-point
(c) class interval
(d) one inch

30. The _____ is defined as the most frequently occurring observation in a set of observations.
(a) median
(b) average
(c) standard deviation
(d) mode

31. A value identical to the mean has a z-score of:
(a) 0
(b) 1
(c) 2
(d) 3

32. When the values are grouped into classes, each value in a particular class is regarded as having the value of the mid-point of the class. Consequently, the mean calculated from grouped values will be:
(a) exact
(b) approximate
(c) the same as when the values are not grouped
(d) can't say

33. The standard deviation of any z-score distribution will always be:
(a) one
(b) equal to standard deviation
(c) zero
(d) equal to the mean of the original scores

34. Which of the following is used to determine the position of an individual in a group?
(a) bar-graph
(b) frequency polygon
(c) cumulative frequency curve
(d) histogram

35. On a test with a mean of 100 and a standard deviation of 10, how many standard deviations from the mean is a score of 115.
(a) 1.15
(b) 1.5
(c) 15
(d) 11.5

36. When a distribution is skewed positively the median will be _____ in value than the mean.
(a) larger
(b) smaller
(c) equal
(d) any of the above

37. Range of a distribution = 48; the number of intervals = 15; What is the size of the interval?
(a) 2
(b) 3
(c) 5
(d) not enough information to decide

38. The apparent limits of class interval 67-69 are:
(a) 66.5 and 68.5
(b) 66.5 and 69.5
(c) 67 and 69
(d) 66 and 68

39. In general, whatever the size of the graph, the length of the vertical axis is _____ per cent of the length of the horizontal axis.
(a) 65 to 70
(b) 60 to 75
(c) 60 to 70
(d) 65 to 75

40. The highest score in a distribution is 75; the lowest score is 27. The standard deviation is equal to:
(a) 7
(b) 5
(c) 8
(d) 17

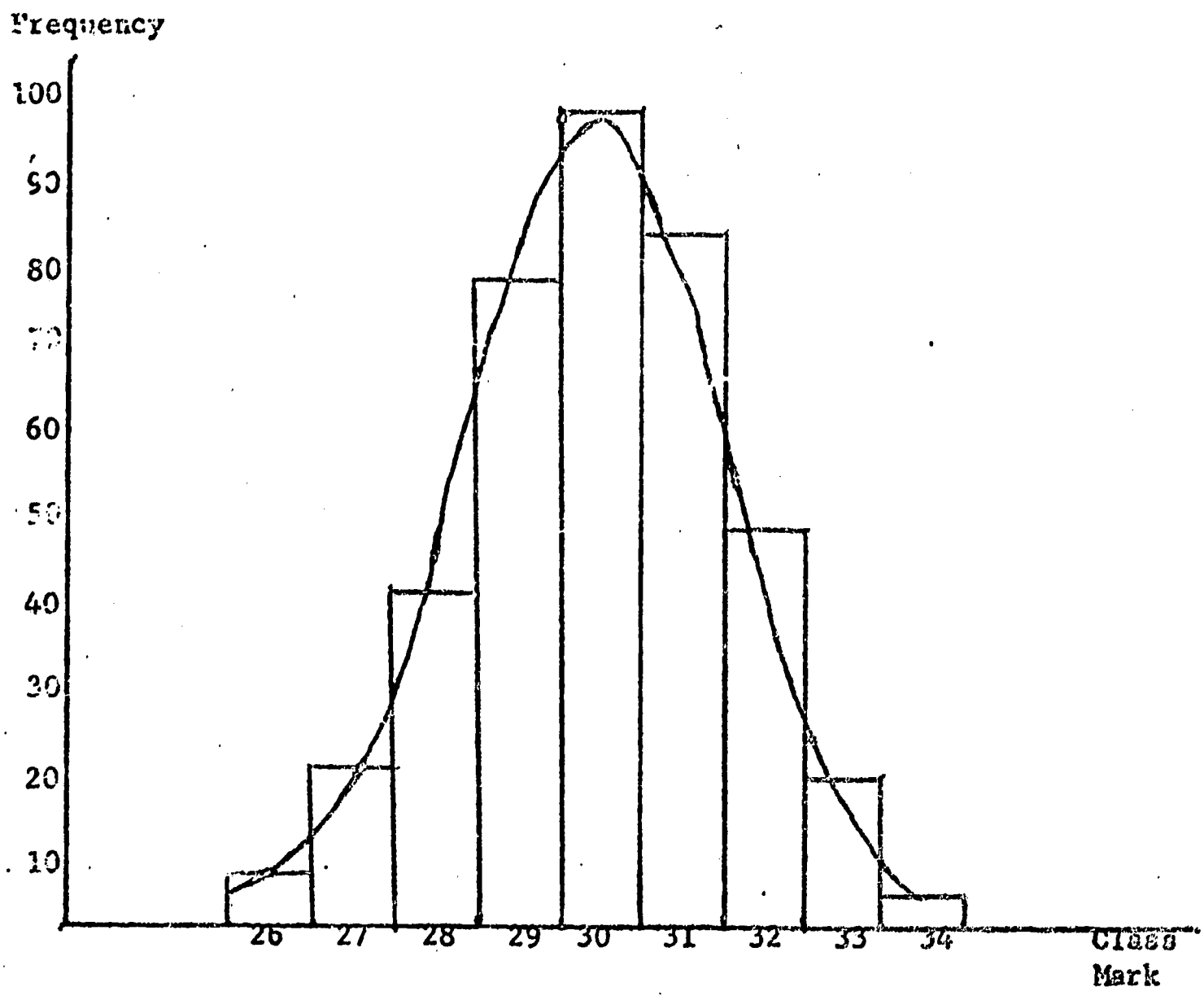


Figure 1. Hostogram and Approximate Fitting of Smooth Curve to Frequency Distribution of Table II.

TABLE I. Array of 100 Normally Distributed Items with Mean 30 and Standard Deviation 5.

17	23	26	27	29	30	31	33	34	36
19	24	26	27	29	30	31	33	34	36
20	24	26	28	29	30	31	33	34	37
21	24	26	28	29	30	32	33	35	37
22	28	26	28	29	30	32	33	35	37
22	28	27	28	29	31	32	33	35	38
22	25	27	28	30	31	32	33	35	38
23	25	27	28	30	31	32	34	35	39
23	25	27	29	30	31	32	34	36	40
23	26	27	29	30	31	33	34	36	44

TABLE II. Frequency Distribution of the Means of 400 Samples of 10 Items Drawn Randomly from Table I.

Class Mark (Mean of 10 Items)	Frequency
34	2
33	18
32	48
31	85
30	99
29	80
28	43
27	20
26	5
	N = 400

KEY FOR MID-SEMESTER EXAM

1. 1	21. 3
2. 4	22. 3
3. 3	23. 3
4. 4	24. 4
5. 2	25. 3
6. 4	26. 2
7. 4	27. 1
8. 3	28. 4
9. 4	29. 3
10. 1	30. 4
11. 3	31. 1
12. 4	32. 2
13. 3	33. 1
14. 4	34. 3
15. 1	35. 2
16. 2	36. 2
17. 3	37. 2
18. 4	38. 3
19. 3	29. 2
20. 4	40. 3

HEW INSTITUTE QUIZ 3 August 1967

PART I - CLOSED BOOK

I. Give complete answers to the following questions: (20 points)

a) Define "compiler program"

b) What is the difference between a conditional and unconditional branch statement? Give examples of each.

c) Define "machine language"

d) Define "computer hardware"

e) Fixed and floating point constants and/or variables may not be mixed in a FORTRAN expression. Why.

f) Define "source desk"

g) What is the function of the FORTRAN statement DIMENSION A(100)? When is it used, and why is it non-executable?

h) Define "fixed point variable"

i i) Define "object deck"

j) Why, during the execution of a FORTRAN II program, do we use the FORTRAN II SUBROUTINE deck?

II. Draw a detailed logical flow chart to solve the following problem: (30 points)

Given a list of scores from a class of students, find the number of scores which lie within one standard deviation of the mean. The flow chart must.....

1) Compute the arithmetic mean.

$$A = \frac{1}{n} \sum_{i=1}^{n} S_i$$

2) Compute the standard deviation, using

$$SD = \sqrt{\frac{\sum_{i=1}^{n} (S_i - A)^2}{n - 1}}$$

3. Set up the limits A-SD and A+SD and count the number of scores between them.

HEW INSTITUTE QUIZ 3 AUGUST 1967

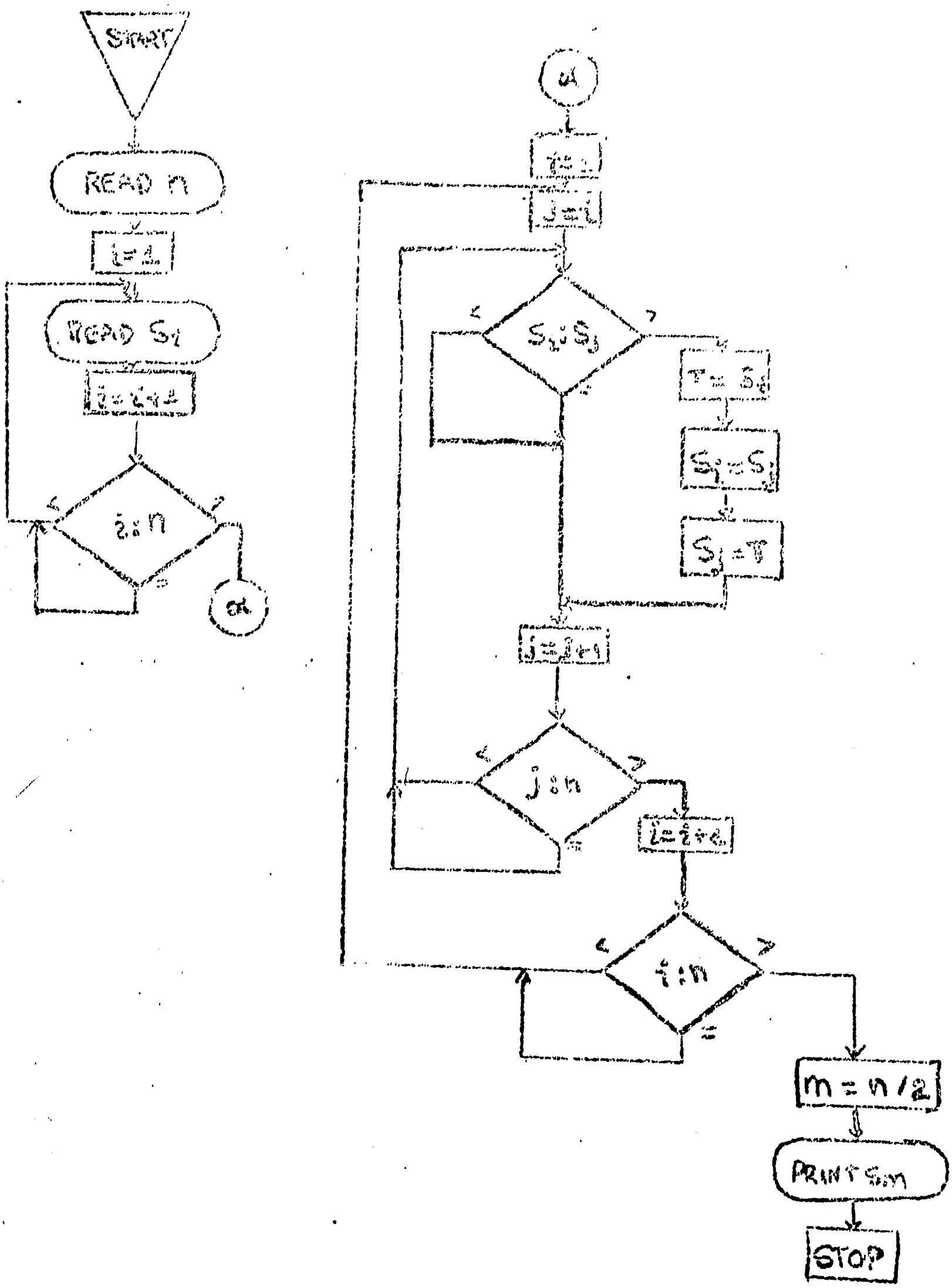
PART II - OPEN BOOK

III. The following FORTRAN II program for determining the mode of a list of scores is logically correct; however, there are 20 FORTRAN errors in the program. Find the errors and make the necessary corrections. (20 points)

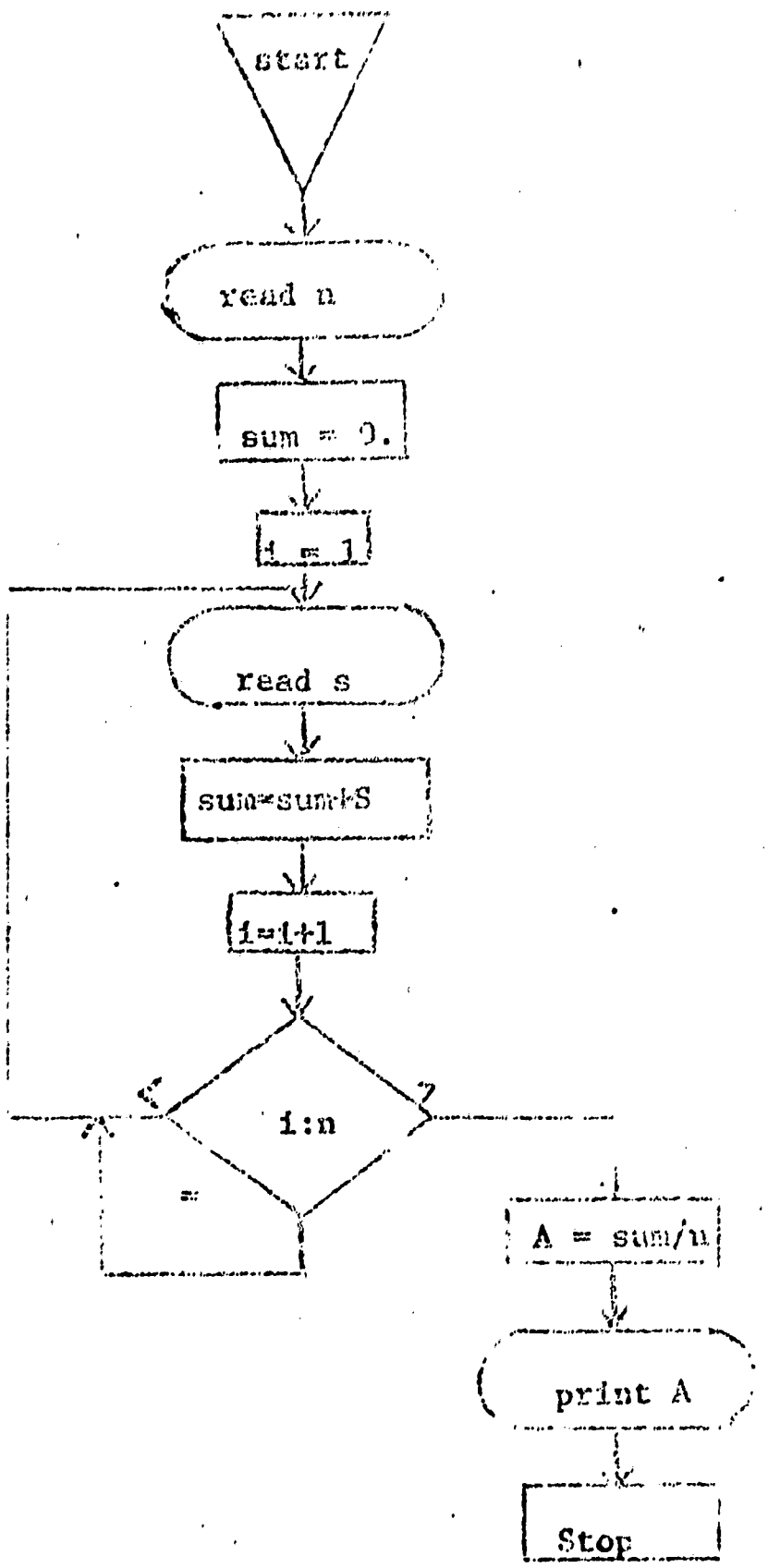
```
    READ 2, N,XMIN, XMAX
  2 FORMAT(F5.0,2F5.2)
    DO 10, J=1,M
  7 FORMAT(F7.3)
 10 READ 7 S(I)
    M=XMIN
 20 K=0
    1 = I
 22 IF(S(I) - XM.),30,25,30
 25 K+1 = K
 30 I = I+1
    IF(I - N) 22,22,35
 35 IF(K-J(40,40,38
 38 MODE = XM
    J = K
 40 XM = XM + 1
    IF(XM - MAX) 20,20,50
    PRINT 7 XMIN,XMAX,XMODE
  7 FORMAT(3I10)
    STOP
```

IV. The MEDIAN is a measure of central tendency, and is defined as the "middle" value after a list of scores have been put in numerical order. The flow chart on the next page demonstrates a method for determining the median value of a list of scores. Using this flow chart, write a complete FORTRAN II program for finding the median of a list of scores. (Do not use FORMAT specifications 7F10.3 and 7I6) (30 points)

IV: Flow Chart for finding the median of a list of scores.



IBM Institute laboratory problem 1: Given the following flow chart for finding the average of a list of scores, write a complete FORTRAN II program including data.



HEW Institute Laboratory problem II: Rewrite the program for Lab I in such a way that the standard deviation may be calculated and the list of scores printed as part of your output.

HEW Institute: Flow charting problem.

Draw detailed logical flow charts for the following problems:

1. The ages of university faculty members are recorded on 400 punch cards with one value per card. Dteremine from these 400 cards the following information:

    1) How many are 30 years old or less?
    2) How many are over 30, but less than 40 years old?
    3) How many are from 40 to 60 years old?
    4) How many are over 60 years old?

2. Given a list of exam scores, put them in numerical order (from smallest to largest).

Bache-Wiig, Carl:	Checks the birthplace of a teacher in relationship to the school she or he is presently teaching in.
Braley, Carlton:	Develops a mean and standard deviation and arranges students in a frequency distribution according to score.
Brunelle, Earl:	Item Analysis.
Callaghan, John:	Correlation.
Caron, Thomas:	Mean Standard Deviation, Z score.
Carr, James:	T Tests for three distributions of scores.
Constantine, Francis:	Significance of difference of means.
Eno, Carroll:	Mean, standard deviation, standard score.
Hammond, Frank:	Finding mode age of institute members.
Harkness, Harvey:	Program computes means and standard deviation for two groups of student scores and prints out separate rosters.
Idiculla, Muttaniyil:	Correlation Coefficent. Second program turned in: Analysis of Variance.
Jacobs, Edwin:	Computes number and percent of N values equal to or above 90, from 80 to 89, from 70 to 79, from 60 to 69 less than 60.
Lark Bert:	Analysis of Variance.
Miles, Arthur:	Computing the cost of fencing a yard when the dimensions are given in feet, yard, inches--converting all units to feet--using A format and printing out the cost in dollars using H format.
Milne, William:	Calculation of correlation coefficient using raw scores.
Mitchell, Charles:	Finding the average response to each of 29 questions.
Neilsen, Richard:	Mean, standard deviation and printing scores falling between plus and minus standard deviation.
Nye, Graham:	Pearson Product moment correlation coefficient.
Parker, John:	Program is designed to determine the average and and standard deviation of scores after removing all extremely low scores in this case all scores

Pope, Gardner:	Calculate Correlation Coefficient given two sets of scores
Porter, William:	C Solution of Right Triangles---Pythagorean Theorem
Sawyer, Jeremy:	Program computes mean and standard deviation and changes all scores to Z scores.
Severson, Kenneth:	Given the raw scores, this program computes cumulative frequencies plus the percentile rank in which each score falls.
Spasyk, John:	Application of T Test to pretest-posttest scores.
Stevens, John:	Computes mean and standard deviation and builds frequency distribution.
Tardy, Richard:	Computes local stanines for "n" number of students for teacher-made tests or standardized tests.
Wallace, Roger:	C T-score, means, and standard deviations for post-tests and pretests.
Williams, Herbert:	Participants' Age
Wilson, Francis:	Volume of Cone Program
Youngerman, Stephenson:	Program finds the mean and standard deviation, It lists the standard deviation as the scores fall.

RESEARCHING CRUCIAL EDUCATIONAL ISSUES IN NORTHERN NEW ENGLAND
Project Titles

1. Methods of Assigning Incoming Students to Orientation Counseling in Regionalized Junior-Senior High Schools and its Effect on Classroom Achievement and School Adjustment.

2. A Pilot Study of the Relationship of Quality of Education Produced by Three Selected High Schools in Maine. One each in the Small, Medium, and Large Category (Enrollment) to the Success of the Students (Graduates and Non-Graduates)

3. A Study of Teacher Attitude Toward the Different Roles of the Elementary School Counselor.

4. A Comparative Study of Actual and Ideal Roles of Senior High School Counselor as Perceived by Principals, Counselors, Teachers, and Students in the Public Schools of New Hampshire.

5. The Effects of Multi-Media Method of Instruction upon the Achievement of Average History Students in a New Hampshire Cooperative High School.

6. The Effects of "BSCS vs Traditional" Biology on High School Sophomores in Relation to Retention of Facts, Principles, and Concepts in Biology.

7. The Effects of the Senesh Program on the Achievement in Language Arts of Second Grade.

8. The Relationship of School Entrance Age to Scholastic Success in Grades One Through Twelve.

9. An Evaluation of the Impact of the Outward Bound Program on Attitudes and Behavior in Unmotivated and Financially Deprived High School Boys.

10. The Influence of Current Literature on the Teaching of Sex in the Public Secondary Schools of New Hampshire.

11. The Effect of Site Visitations, on the Instructional Program, by Teachers in a Rural School District.

12. A Study of the Effects of Multi-Media Approach om Arithmetic Achievement on Intermediate Grade Students.

13. The Relationship of the Type of Library Provision to the Amount of Reading done by Sixth Grade Students in the Union School, Northfield, New Hampshire.

14. A Comparison of the Predictive Values of the Metropolitan Readiness Test with the Gesell Developmental Examination for First Grade Placement of Seventy-Two Students in the Raymond Consolidated School.

15. A Study of the Effects of Multi-Media Study Packets on the Achievement in Social Study Skills of Fourth Grade Students.

16. A Study of the Relationship Between Age at Entrance to Grade One and Reading Achievement.

17. An Exploratory Study of Required Student Attendance in Study Halls, and Its Effect on the Academic Achievement, Attendance, and Attitude of Students at Middlebury Union High School, Middlebury, Vermont.

18. The Effects of Integration of the Arts and Humanities Upon Curriculum Enrichment in a Maine Secondary School.

19. A Comparative Study of Achievement as Effected by the Use of Programmed English Materials and Conventional Methods of Instruction With Slow Learning Grade Eight Students in Six Northern New England Communities.

20. Comparison of the Effects of Vocational Education on Those Students in the State of Vermont Attending an Area Vocational Center on a Shared Time Basis as Compared to Those Students Attending Such Schools on a Full Time Basis.

21. Teacher Perception of the Role of the Elementary School Councelor in Concord, New Hampshire: A Study of Teacher Reaction to Contrasting Methods of Guidance Work.

22. A Study of the Effect of an Individualized Work-Study Program on the Incidence of Drop-outs Among Senior High School Students in The Windsor South-East Supervisory Union.

23. Survey of Crucial Factors (adjustment, attitudes toward school, motivation, family life) Which Affect High School Underachievers at the High School Level and Are Amenable to Change as a Result of Counseling.

24. A Special Study Institute Program in the Area of Mental Retardation.

25. The Effects of "Open" vs. "Closed" Book Teachermade Tests and the Frequency of Use of Both Types of Tests on Pupil Achievement in Seventh Grade Mathematics.

26. A Study of the Effects of Three Group Guidance Approaches Upon Changes and Self-concept and Academic Performance Among Grade Ten and Eleven Public High School Underachievers in Northern New England.

27. The Effects of an Attendance Improvement Program on the Achievement and Retention of Students in Grades Seven, Eight, and Nine.

28. A Study of a Multi-Media Approach to Teaching American History to Eighth Grade Low Ability Pupils in Relation to Achievement.

29. The Effect of Kindergarten on the Learning Readiness Level for First Graders in Rural Vermont.

30. A Study of Perceptions of the Role of Teacher Aides as Held by Teachers, Teacher Aides and Superintendents of New Hampshire.