DOCUMENT RESUME

ED 036 470 SP 003 556

AUTHOR	CRUICKSHANK, DONALD R.; BRCADBENT, FRANK W.
TITLE	SIMULATICN IN PREPARING SCHOOL PERSONNEL.
INSTITUTION	ERIC CLEARINGHOUSE ON TEACHER EDUCATION, WASHINGTON, D.C.
SPCNS AGENCY	OFFICE OF EDUCATION (DHEW), WASHINGTCN, D.C. BUREAU OF RESEARCH.
PUB DATE	FEB 70
CONTRACT	OEC-0-080490-3706-(010)
NOTE	51P.
EDRS PRICE	EDRS PRICE MF-$0.25 HC-$2.65
DESCRIPTORS	DESIGN NEEDS, EDUCATIONAL RESEARCH, GAME THEORY, *INSTRUCTIONAL INNOVATION, INSTRUCTIONAL TECHNOLCGY, LEARNING EXPERIENCE, *SCHOOL PERSONNEL, *SIMULATION, *TEACHER EDUCATION, *TRAINING TECHNIQUES

ABSTRACT

THE PURPOSE OF THIS STATE-OF-THE-ART PAPER IS TO PROVIDE AN OVERVIEW OF SIMULATION ("A REPRESENTATICN OF SEVERAL VARIABLES IN THE SAME ARRANGEMENT AS THEY OCCUR IN A PARTICULAR NATURAL OR ARTIFICIAL SYSTEM"), PARTICULARLY AS IT RELATES TO THE PROFESSICNAL PREPARATICN CF SCHOOL PERSCNNEL. AFTER DISTINGUISHING BETWEEN "SIMULATION" AND "SIMULATION GAMES" (THE PRIMARY, ALTHOUGH ADMITTEDLY TENUOUS, DISTINCTICN BEING THAT THE LATTER USUALLY INVOLVES INTERPERSONAL OR TEAM CCMPETITION), THE AUTHORS SUMMARIZE SIMULATION-BASED PRACTICE AND THECRY UNDER THE FOLLCWING HEADINGS: (1) THE DESIGN AND DEVELOPMENT OF INSTRUCTIONAL SIMULATION IN PROFESSIONAL EDUCATION, (2) THE USES OF INSTRUCTIONAL SIMULATICN IN PROFESSICNAL EDUCATICN (WHICH INCLUDES BOTH GENERAL USES AND SPECIFIC EXAMPLES), (3) SOME ISSUES TO BE RESOLVED (WHICH IDENTIFIED 11 CONTROVERSIAL AREAS), (4) ADVANTAGES OF SIMULATION, (5) DISADVANTAGES OF SIMULATION, AND (6) QUESTIONS IN NEED OF RESEARCH. UNDERLYING THE PRESENTATION IS THE RECCGNITICN THAT, ALTHOUGH THE USE OF SIMULATICN AS A TRAINING METHODOLCGY IS BECCMING INCREASINGLY WIDESPREAD AND HAS CONSIDERABLE EDUCATIONAL POTENTIAL IF PROPERLY DESIGNED, UTILIZED, AND EVALUATED, A GREAT DEAL CF RESEARCH REMAINS TO BE DONE IF THE EFFECTIVENESS OF THE TECHNIQUE IS TO BE EMPIRICALLY VALIDATED AND EDUCATIONALLY PROVEN. A 130-ITEM BIBLIOGRAPHY IS INCLUDED. (JES)

ED036470

Brief Title:

Simulation

Cruickshank
Broadbent

SIMULATION IN PREPARING SCHOOL PERSONNEL

Donald R. Cruickshank
Frank W. Broadbent

Published by
ERIC Clearinghouse on Teacher Education
Number One Dupont Circle, N.W.
Washington, D.C. February 1970

Clearinghouse sponsors: American Association of Colleges for Teacher Education (fiscal agent); National Commission on Teacher Education and Professional Standards, National Education Association (NEA); and Association for Student Teaching, a national affiliate of the NEA.

SP 003 556

SP003556

Preface

This state-of-the-art paper and its accompanying bibliography are on the topic of simulation. The authors, Donald Cruickshank and Frank Broadbent, have done extensive research and writing in this area for teacher education, and the Clearinghouse is pleased that they have contributed their abilities to the ERIC system.

The topic of simulation is in a high priority area for information identified by the Clearinghouse's Advisory and Policy Council.

This paper is a valuable source of information for those interested in simulation and should help readers' in their continuing efforts to keep abreast of this important topic.

In the bibliography "ED" or order numbers are included with those citations which have been processed into the ERIC system. Prices also are included. The documents with such numbers may be ordered from the ERIC Document Reproduction Service, 4936 Fairmont Avenue, Bethesda Md. 20014.

Joel L. Burdin
Director

January 1970

About ERIC

The Educational Resources Information Center (ERIC) forms a nationwide information system established by the U.S. Office of Education, designed to serve and advance American education. Its basic objective is to provide ideas and information on significant current documents (e.g., research reports, articles, theoretical papers, program descriptions, published or unpublished conference papers, newsletters, and curriculum guides or studies) and to publicize the availability of such documents. Central ERIC is the term given to the function of the U.S. Office of Education, which provides policy, coordination, training, funds, and general services to the 19 clearinghouses in the information system. Each clearinghouse focuses its activities on a separate subject-matter area; acquires, evaluates, abstracts, and indexes documents; processes many significant documents into the ERIC system; and publicizes available ideas and information to the education community through its own publications, those of Central ERIC, and other educational media.

Teacher Education and ERIC

The ERIC Clearinghouse on Teacher Education, established June 20, 1968, is sponsored by three professional groups--the American Association of Colleges for Teacher Education (fiscal agent); the National Commission on Teacher Education and Professional Standards of the National Education Association (NEA); and the Association for Student Teaching, a national affiliate of NEA. It is located at One Dupont Circle, Washington, D.C. 20036.

Scope of Clearinghouse Activities

Users of this guide are encouraged to send to the ERIC Clearinghouse on Teacher Education documents related to its scope, a statement of which follows:

> *The Clearinghouse is responsible for research reports, curriculum descriptions, theoretical papers, addresses, and other materials relative to the preparation of school personnel (nursery, elementary, secondary, and supporting school personnel); the preparation and development of teacher educators; and the profession of teaching. The scope includes recruitment, selection, lifelong personal and professional development, and teacher placement as well as the profession of teaching. While the major interest of the Clearinghouse is professional preparation and practice in America, it also is interested in international aspects of the field.*

The scope also guides the Clearinghouse's Advisory and Policy Council and staff in decision-making relative to the commissioning of monographs, bibliographies, and directories. The scope is a flexible guide in the idea and information needs of those concerned with pre- and inservice preparation of school personnel and the profession of teaching.

Overview for This Paper

I. Simulations and simulation games: A tenuous distinction

   A. "A simulation is a representation of several variables in the same arrangement as they occur in a particular natural or artificial system."
   B. When there are competitive interactions between or among the participants involved in a simulation, the experience further can be described as a simulation game.
   C. A second possible distinction is that simulations usually give greater attention to lifelike representation of the physical characteristics of the system.

II. Design and development of instructional simulation in professional education

   A. Design and development of simulations is a complex undertaking involving several decisions, including why and how a simulation can be applied to the training system.
   B. Training systems are intended to prepare personnel for specified work in the reference system or real world. In the case of professional education, the training system is intended to prepare teachers, counselors, administrators, or others.
   C. The relationship between a training system and its reference system should be dynamic, i.e., they should affect each other significantly.
   D. A simulation, like any part of the training system, is based upon a model generated from an examination of reality. The simulation will vary in its effectiveness in direct proportion to the validity of the model upon on which it is based.
   E. Other decisions facing the designer include:

      1. Will the simulation contain elements of competition either interpersonal, intrapersonal, or man-machine?
      2. Will the simulation be an open or closed loop system?

   F. Suggested steps in the design and development of simulations include:

      1. Defining the instructional problem.
      2. Specifying what is to be learned in behavioral terms.
      3. Determining the appropriateness of simulation as the instructional technique.
      4. Developing specifications for the simulation.
      5. Developing and trying out the prototype.
      6. Modifying.

III. Uses of instructional simulation in professional education

A. Simulation in professional education has been used largely as an instructional methodology; however, it is also used for

1. Situational testing.
2. Orientation or exposure to reality.
3. Research.
4. Design and operational analysis.

B. Instructional simulations now in use in professional education are used to

1. Make content of instruction more relevant by involving participants in lifelike experiences.
2. Wed theory and practice: provide practice.
3. Modify behavior.
4. Teach principles, procedures, criteria, or other higher cognitive level materials.

C. Instructional simulations can be understood in terms of a theoretical three-dimensional cube with scope, mode, and model as the dimensions.

D. The first instructional simulations in professional education were introduced by professors of educational administration. Such simulations, mostly media-ascendant, include:

1. Elementary principalship.
2. Secondary principalship.
3. Assistant superintendency for business.
4. Superintendency.
5. Community college presidency.
6. Negotiation games.
7. Teacher selection.
8. Research and development managers.

E. Simulations for the preservice or inservice preparation of teachers include:

1. Teaching Problems Laboratory.
2. Problems of Racially Desegregated Schools.
3. Inner-City Simulation Laboratory.
4. Project Insite.
5. Classroom Simulation.
6. Low-Cost Simulation.
7. Simulated Classroom Situations.
8. Science Inquiry Laboratory Simulation.
9. Informal Reading Inventory.
10. Stimulus Films.

F. Simulations for counselor training include:

1. The Counselor's Week.
2. The Elementary School Guidance Specialist.
3. Audio Simulation.

G. Presently role simulations with background models dominate the field.
H. Objections to available simulations are much like those leveled at programming at a comparable stage of development and include:

1. Lack of clearly stated outcomes for use.
2. Failure either to field test or provide field test data.
3. Failure to specify minimum and maximum entry levels (when to use with whom).
4. Failure to prepare instructors for proper utilization.

IV. Some issues to be resolved

A. Feedback: nature, extent, and reliability.
B. Realism: physical vs. psychological.
C. Process vs. content: Is the intention of the simulations to replicate an environment in which the participant practices something learned elsewhere or is the simulation a teaching device itself?
D. Placement of a simulation in the training system.
E. Participation: massed vs. spaced.
F. Size of simulation group.
G. Length of simulation.
H. Role of simulation director.
I. Selection of participants.
J. Evaluation of participant behavior.
K. Transfer.

V. Advantages of simulation

A. Simulations are relevant since they are based on the reference system.
B. Simulations permit the trainee to be himself.
C. Simulations are safe.
D. Simulations permit control of what happens to the trainee.
E. Simulations permit the wedding of theory and practice.
F. Simulations are economical when compared with laboratory experience.
G. Simulations are engaging psychologically.
H. Simulations promote knowledge of and skill in group dynamics.

VI. Disadvantages of simulation

A. Simulations do not fit neatly into the preparation program.
B. Simulations often fail to provide empirically derived feedback.
C. Simulation directors may not be well prepared.
D. Simulations may not be well founded or valid.

VII. Questions in need of research

A. What should be simulated?
B. When should a simulation be used in the training system?
C. What is learned best utilizing simulation? By whom? Under what conditions?
D. Do persons react under simulated conditions in the same way as they do in real life?
E. What can be done to increase feedback capability?
F. What effect does simulation training have on subsequent performance?

VIII. Conclusion

Simulation in Preparing School Personnel

Donald R. Cruickshank, The Ohio State University
Frank W. Broadbent, Syracuse University

In the past decade the often dull educational scene has been stimulated through the adaptation and application of newer technologies and training methodologies.[1] One of the most recent newcomers upstaging and at times outraging the more experienced members of the cast is simulation.[2] A "cute" thing, simulation has yet to prove itself both to professional colleagues and to a sometimes overly avid and non-discriminating audience. While such proof is being attempted backstage by university professors, simulation continues to play to an almost full house.

SIMULATIONS AND SIMULATION GAMES: A TENUOUS DISTINCTION

A variety of definitions exist for the term simulation.[3] In the most general sense, Crawford states, "a simulation is a representation of several variables in the same arrangement as they occur in a particular natural or artificial system."[4] Once such arrangements or conditions are established, the resultant display can be seen as a model of reality which may be amenable to interaction and manipulation. An example of a manipulatable simulation used in training commercial pilots may be useful for illustration:

> American's two-million dollar 727 simulator does everything an actual 727 does except get off the ground. It looks like the sawed-off nose end of that plane, mounted on a cat's-cradle of rockers, beams, and pistons. Inside it is a perfect mockup of

[1]Included would be computer-assisted instruction, individually prescribed instruction, analysis of verbal and nonverbal behavior, mirror teaching, microteaching, systems analysis, and flexible modular scheduling.

[2]Historically, the use of simulation as a training or deceptive device is at least as old as classical war games and the use of fishing lures.

[3]See Beck, Isabel. Designs for Involvement. Inglewood, Calif.: Southwest Regional Laboratory for Educational Research and Development, 1968. pp. 11-12. (Mimeo.) Twelker, Paul A. "Simulation: What Is It? Why Is It?" Paper presented at Association for Supervision and Curriculum Development conference, San Diego, Calif., April 1968. pp. 41-47.

[4]Crawford, Meredith P. Simulation in Training and Education. Alexandria, Va.: Human Resources Research Office, 1967. p. 2.

the 727 deck; as the student operates the controls, the simulator turns, banks, noses up or down just as the real plane would.[5]

When there are competitive interactions between or among the participants involved in a simulation, the experience can be described as a simulation game. After examining simulation games developed during the sixties, the Foreign Policy Association reported that in the games "students assume the roles of decision-makers in a simulated environment and compete for certain objectives according to specified procedures or rules." For example, in the game "Dangerous Parallel," students learn about foreign policy as they take on roles of ministers of hypothetical states who face a military-economic-political situation similar to that leading to the Korean War.[6]

Although no agreed-upon distinction exists to separate simulations from games, the latter usually are characterized by interpersonal or team competition. A second possible distinction is that simulations usually give greater attention to lifelike representation of the physical characteristics of the system.[7]

DESIGN AND DEVELOPMENT OF INSTRUCTIONAL SIMULATION IN PROFESSIONAL EDUCATION

The design and development of a simulation is a complex undertaking.[8] First, the designer must decide why and how simulation can be applied to the professional education training system. In other words, what part of the training system, if any, is likely to be improved or complemented through the utilization of a simulation? Of course, the simulation can be an addition to the training system and need not modify nor replace existing parts of it.

---

[5] Jennings, Gary. "Empty Seats in the Cockpit." Reader's Digest. June 1967. p. 128.

[6] Foreign Policy Association. Simulation Games for the Social Studies Classroom. New York: the Association, n.d. 56 pp.

[7] For a theoretical treatment of the concept of games, see Coleman, James S. Games as Vehicles for Social Theory. Report No. 21, Center for the Study of Social Organization of Schools. Baltimore: Johns Hopkins University, May 1968.

[8] For an examination of how simulation centers look at simulation design, see Crawford, Jack, and Paul Twelker. "The Design of Instructional Simulation Systems," Instructional Simulation: A Research Development and Dissemination Activity. Monmouth: Oregon State System of Higher Education, 1969.

The training system in professional education is intended to prepare personnel for a particular role in the public schools. For theoretical purposes, the public schools can be referred to as its reference system. In order to ready the trainee for his work in the reference system, the training system must take into account the nature of the work to be performed. Subsequently, after careful analysis of the job, a training system attempts to provide the trainee with selected experiences which are hypothesized to produce desirable on-the-job performance.

The usual components of a professional education training system can be divided into two broad categories. The first category, general education, deals largely with basic and common knowledge, the exposure to which purports to make an educated person. The second category, professional education, provides the trainee with unique experience which is intended to develop the on-the-job knowledge, attitudes, and skills requisite of the teacher, counselor, administrator, or others. More specifically for analytic purposes, professional education may be subdivided into gross components--foundations (history, philosophy, psychology, curriculum), methods (theoretical notions about how to teach), and laboratory experiences intended to acquaint one with the reality of teaching and to provide an initial opportunity to try out one's teaching ability. Figure 1 shows the suggested relationships.

The diagram indicates that the relationship between a training system and its reference system is dynamic, that is, the systems are responsive to one another. Training systems constructed without careful attention to the reference system are not likely to be useful unless the intention is to create a new or different social institution. A simulation, like any part of the training system, is based upon a model generated from an examination of reality. The simulation, therefore, will vary in its effectiveness in direct proportion to the validity of the model upon which it is based.

Once the place of the simulation in the training system has been determined and careful analysis of the reference system has been made, the designer is faced with several decisions, not the least of which is whether the simulation will contain elements of competition either interpersonal, intrapersonal, or man-machine. As suggested earlier, should the simulation be characterized by interpersonal competition it probably will be known as a simulation game.

The designer must determine whether he can or wants to create an open loop or closed loop feedback simulation.[9] In the former the trainee can be subjected to and affected by independent variables produced during the simulation over which he has no control (e.g., heat, light, humidity, or stress).

---

[9]Crawford, Meredith P. "Dimensions of Simulation." American Psychologist 21: 789; August 1966.

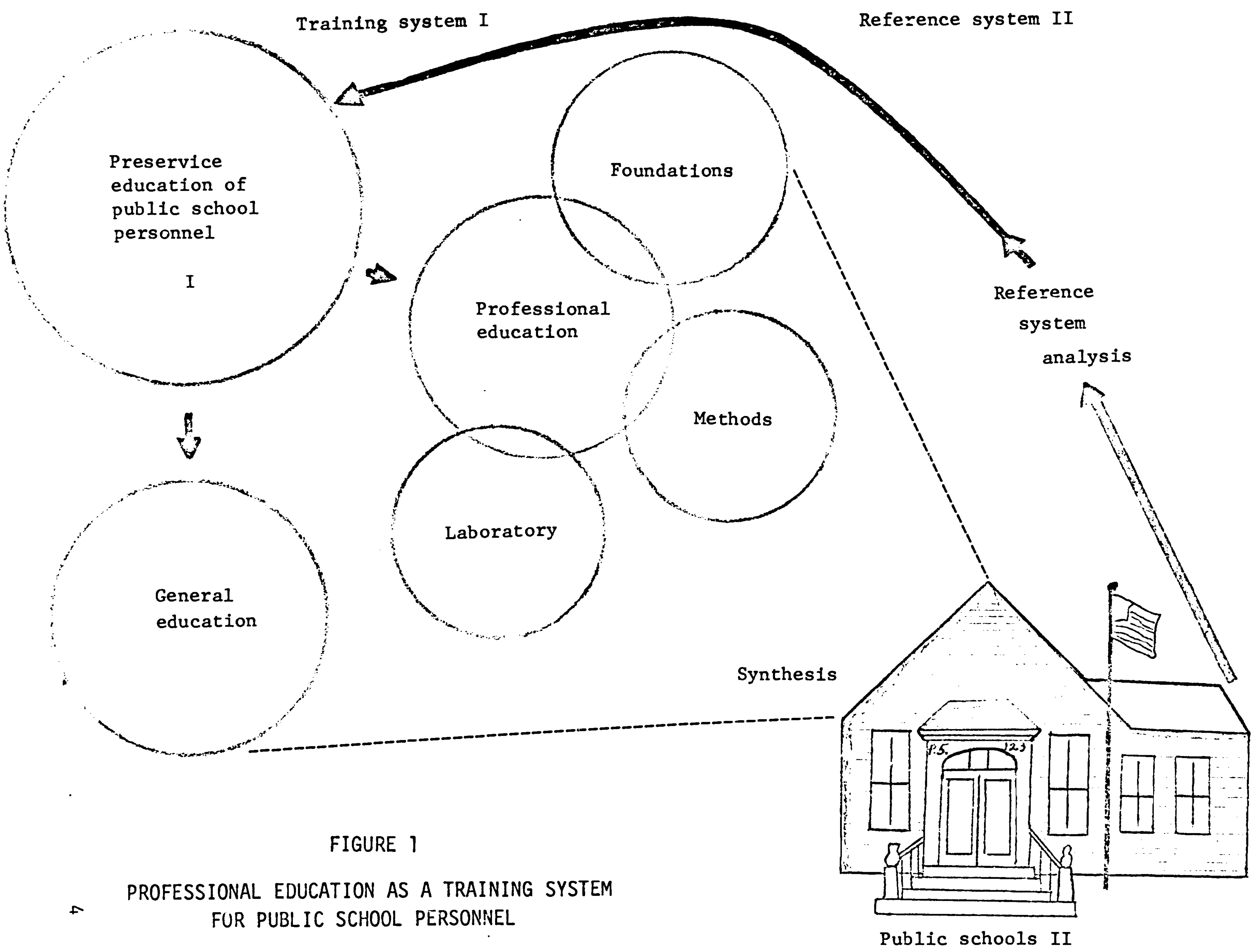

FIGURE 1

PROFESSIONAL EDUCATION AS A TRAINING SYSTEM
FOR PUBLIC SCHOOL PERSONNEL

He can only respond through internal adjustment to the conditions. His response has no effect upon the variables themselves. Open loop simulations are an integral part of astronaut training and are intended to prepare men for conditions they will meet but are not accustomed to.

> Dynamic training gives the astronauts practice in working under the actual conditions of stress they will encounter in space. For example, the centrifuge gives the astronauts experience in working under the high G forces they encounter during blast-off and reentry. The astronauts enter a small gondola (compartment) mounted at the end of a long steel arm. The arm whirls the gondola around fast enough to create G forces like those encountered in space.[10]

In a closed loop system interaction and manipulation of variables are possible. Most simulations in education are closed loop. This form is ubiquitous in computerized games in which performance is assessed through the use of built-in formulas allowing trainees to adjust strategies and performance.

Summarizing, the designer makes at least three early decisions:

1. Why and how should the simulation be a part of the training system?

2. How much, if at all, will the simulation be characterized by some form of competition?

3. Will the simulation be of the open or closed loop variety?

Crawford and Twelker have outlined steps to be taken in designing instructional simulations. They include defining the instructional problem, specifying behavioral objectives for the instructional system, determining the appropriateness of simulation as the potential instructional technique, determining the type of simulation required, developing specifications for the simulation, and developing and trying out the prototype and subsequent modifications.[11] Anyone contemplating the design of a simulation can be guided by the Crawford-Twelker approach.

---

[10]Cromie, William J. "Astronaut." The World Book Encyclopedia. Vol. 1. Chicago: Field Enterprises Educational Corp., 1967. p. 784h.

[11]Crawford and Twelker, op. cit. Also summarized in the Instructional Simulation Newsletter, Vol. 2, No. 1, February 1969, available from Teaching Research, Oregon State System of Higher Education, Monmouth.

USES OF INSTRUCTIONAL SIMULATION IN PROFESSIONAL EDUCATION

So far, simulation has been discussed mostly as a training methodology. It should be noted that simulations have several other uses. As situational tests, they serve as an excellent means of assessing performance.[12] They can also be used to orient new personnel or to provide a taste of what it would be like to assume a certain role. The participant in the simulation not only gains insight into the demands and rewards of the role, but also becomes more aware of his capabilities, limitations, and needs. The Inner-City Simulation Laboratory is used in part as an orientation device to prepare participants for the reality of teaching in a ghetto school.[13]

Quite obviously, simulations can be used in research to determine reactions of teachers or others to stressful problems, to investigate teachers' problem-solving and decision-making behavior, to determine whether subsequent professional success can be predicted from behavior in a simulation, and so forth. The research potential simulations offer is considerable since they standardize the setting and the task, thereby permitting the researcher to concentrate on the participant as the variable. On the other hand, simulations have not been found to be particularly useful in teaching concepts.

In addition to the above uses, simulation techniques have been used for purposes of design and operational analysis. A comprehensive paper on designing instructional systems has been written by Smith.[14] Cogswell and others at the System Development Corporation have applied simulation techniques very effectively to problems of operational analysis.[15] A clear explanation of both

---

[12]Allender, Jerome S. The Teaching of Inquiry Skills to Elementary School Children. U. S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project No. 5-0594. Washington, D.C.: Government Printing Office, 1968. Hemphill, John K., D.E. Griffiths, and N. Frederiksen. Administrative Performance and Personality. New York: Teachers College, Columbia University, 1962.

[13]Cruickshank, Donald R. Inner-City Simulation Laboratory. Chicago: Science Research Associates, 1969.

[14]Smith, Robert G., Jr. The Design of Instructional Systems. Humm RRO Technical Report 66-18. Alexandria, Va.: Human Resources Research Office, June 1965.

[15]Cogswell, J. F., and others. Analysis of Instructional Systems. Final Report, TM-1493/201/00, System Development Corporation and U. S. Department of Health, Education, and Welfare, Office of Education. Washington, D.C.: Government Printing Office, April 1966.

of these uses is given in a short book by Pfeiffer.[16]

The instructional simulations now in use in professional education were developed for a number of general purposes. They are being used to make material relevant to the student teacher by involving him in a decision-making situation using skills and knowledge that would not normally be applicable until his first teaching situation. This motivating effect of simulation serves as stimulation fo further study. Next, simulations are being used to wed theory and practice by providing a setting in which the student practices applying principles and knowledge to complex problems. A few simulations are apparently attempting to mold or shape behavior while others are more interested in assisting the student in sensing problems and developing a rational problem-solving approach. Probably the greatest number teach principles, procedures, criteria, or other higher cognitive level materials.

The cube in Figure 2 illustrates a few dimensions that may be used in describing instructional simulations. The scope of the simulation is smallest when the model is meant to teach functions. An example of a function that could be taught through simulation is making effective classroom tests. The closer a function is to a formula, the easier it is to model. The second category of the scope dimension is the one most used by developers of simulations in professional education. The role of the teacher, principal, and counselor have all been simulated more than once. Simulations of full systems are probably the most common types of instructional simulations in the social studies, but very few of these are to be found in professional education.

The second dimension, mode of representation, extends from simulations which are presented almost completely through specially structured human groups, such as T-groups, to simulations which are presented entirely by machines, such as the Link Trainer. Media-ascendant simulations are the most common in the materials presently available in professional education since they provide a good combination of control and flexibility.

The third dimension, the nature of the model, is perhaps the most important one and the most difficult to define. It describes the dynamism of the model. The external model is a static physical model, such as the space simulator in which the astronauts familiarize themselves with a space environment. A background model is similar to the materials used in case studies. It is often a classroom within a school within a community. These are the most common models in professional education, while equilibrium models of

---

[16] Pfeiffer, John. New Look at Education: System Analysis in Our Schools and Colleges. New York: Odyssey Press, 1968.

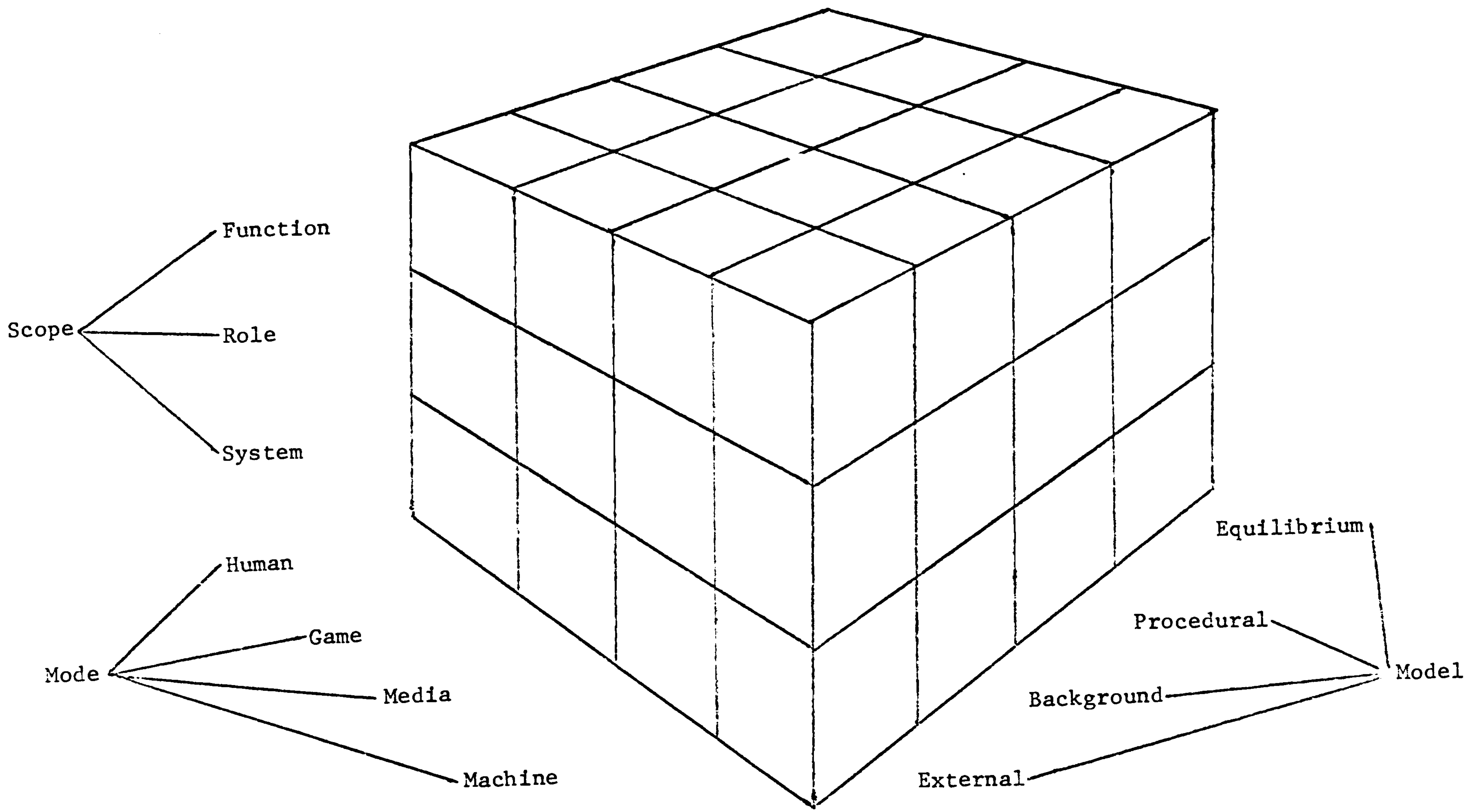

FIGURE 2

STRUCTURAL ASPECTS OF INSTRUCTIONAL SIMULATIONS full systems are most common in other areas. Equilibrium models are economic models that can be easily presented in a game mode. A procedural model is dynamic enough to determine the main features of the simulation, yet not so dynamic as the equilibrium model which allows for the manipulation of many variables. Many machine simulators are procedural trainers teaching one particular function, such as how to operate a machine.

Professional educators, especially those in the area of training administrators, have used techniques that are similar to simulation for many years.[17] Case studies and role playing are two of the most familiar techniques. But even these techniques and the much publicized sensitivity training techniques are employed in only a relatively few courses at any college. A review of these techniques by Foster and Danielian illustrates their effectiveness and points to the advantages of simulation over these techniques when used individually.[18] Roberts contrasts simulation through the in-basket method with the case study method of training managers. He describes advantages of the former method such as providing for close examination of one aspect while keeping the whole system in focus, providing pressure on participants, and emphasizing the problem-solving method rather than the solution.[19]

Professors of educational administration were the first to apply the special advantages that simulation offers to their field of instruction. Frederiksen, Saunders, and Wand reported in 1957 on the use of the executive in-basket as a test of administrative performance.[20] In 1958 the U. S. Office of Education provided considerable impetus for the study and development of simulation through a grant to the University Council on Educational Administration (UCEA) to conduct a research project, the Development of Criteria of Success in School Administration.[21]

---

[17] Andrews, Kenneth R., editor. The Case Method of Teaching Human Relations and Administration. Cambridge: Harvard University Press, 1953.

[18] Foster, Robert J., and Jack Danielian. An Analysis of Human Relations Training and Its Implications for Overseas Performance. Humm RRO Technical Report 66-15. Washington, D.C.: The George Washington University, 1966.

[19] Roberts, Thomas S. "Training Managers To Make Decisions: The In-Basket Method." Personnel 44: 58-66; September-October 1965.

[20] Frederiksen, Norman, D. R. Saunders, and Barbara Wand. "The In-Basket Test." Psychological Monographs 71: 438; 1957.

[21] Hemphill, Griffiths, and Frederiksen, op. cit.

Since then, the UCEA has increased its number of simulations until it now offers simulations in elementary principalship, secondary principalship, assistant superintendency for instructional services, assistant superintendency for business management, superintendency, community college presidency, vocational educator, particip nt in a professional negotiations game, and employer in a laboratory exercise on selection.[22] All but the last two simulations are media-ascendant role simulations using a background model and an in-basket method. Much of the background materials can be used with more than one of the roles.

The Professional Negotiations Game, developed by Horvat, is probably the most advanced game in professional education.[23] It lies between the role and system simulation in scope and is a cross between the procedural and equilibrium models.

McIntyre's Laboratory Exercises on Selection is a media-ascendant functional simulation built around the problems of selecting personnel.[24] Papers for eight prospective administrators are provided so that the trainee can predict their potential success. The materials are developed from a simple background model and can serve as an excellent example of a relatively simple method of developing an effective simulation in other areas.

A less complex set of in-basket materials produced by Pharis, Roberts, and Wynn is entitled Decision-Making and the Elementary School Principal.[25] These appear to be good materials to use for orientation purposes.

Bolton is developing a teacher selection simulation so that administrators can learn to make selection judgments consistent with organizational

---

[22]University Council on Educational Administration, 29 West Woodruff Ave., Columbus, Ohio 43210.

[23]Also available as: Horvat, John J. Professional Negotiation in Education: A Bargaining Game. Columbus, Ohio: Charles E. Merrill Publishing Co., 1968.

[24]McIntyre, Kenneth E. Laboratory Exercises on Selection. Columbus, Ohio: University Council for Educational Administration, n.d.

[25]Pharis, William L., Jack D. Roberts, and Richard Wynn. Decision-Making and the Elementary School Principal. Washington, D.C.: Department of Elementary School Principals, National Education Association, 1966.

norms for teacher behavior that prevail in a particular school system.[26]

Sage has developed a simulation for the role of director of special education on an expanded version of the UCEA model.[27]

In the field of higher education two role simulations using the in-basket method have been developed. White's simulation is for preparing college administrators.[28] Rickard has adapted case study materials in preparing administrators for work in student personnel.[29]

A simulation for training research and development project managers has been recently developed by Dillman and Cook.[30] They also examined principles for the development of simulation. The exercise is interesting in that it uses a team approach requiring the students to make systems models within the simulation's model.

The largest number of simulations concern the preparation of teachers. A group of these media-ascendant role simulations with a background model were based on the UCEA's original Jefferson Township Simulation. The first of these was the Teaching Problems Laboratory for preservice and in-service elementary school teachers.[31] (This simulation is described in more detail

---

[26]Bolton, Dale L. "Feedback in a Selection of Teacher Simulation." Paper presented at American Educational Research Association conference, New York City, February 1967.

[27]Daniel E. Sage, Syracuse University, personal correspondence.

[28]White, Ellis. "Preparing College Administrators Through the 'In-Basket' Technique." Current Issues in Higher Education. Washington, D.C.: Association for Higher Education, a department of the National Education Association, 1963. pp. 278-79.

[29]Rickard, Scott T. "The Application of Audiovisual Materials and Simulation To Modify the Harvard Case Study Method for Preparing Student Personnel Administration." Doctor's thesis. Bloomington: Indiana University, 1966. (Unpublished)

[30]Dillman, Duane H., and Desmond L. Cook. "Simulation in the Training of R and D Project Managers." Paper presented at American Educational Research Association convention, Los Angeles, February 1969.

[31]Cruickshank Donald R., Frank W. Broadbent, and Roy L. Bubb. Teaching Problems Laboratory. Chicago: Science Research Associates, 1967.

in various parts of this paper.) Venditti's Problems of Racially Desegregated Schools is similar to the Teaching Problems Laboratory, as is the Inner-City Simulation Laboratory developed by Cruickshank.[32]

The use of integrated simulation systems is being undertaken by Project Insite at Indiana University.[33] Separate materials are being used for elementary and secondary education students. These materials also apply an approach similar to the Jefferson Township Simulation. The Model Elementary Teacher Education Program developed by Teachers College, Columbia University, describes a teaching game and a simulated school which are to be integrated into the proposed program. These two programs are probably the most ambitious simulation systems in teacher education at this time.

Simulation Exercises for secondary teacher education by Swan and Johnson is a scaled-down version of a role simulation.[34] No background model is developed. The exercises appear to be a few isolated incidents, some workbook exercises, and a few photosituations. It is doubtful that these materials as they are constituted should be considered under the category of simulation materials. A similar criticism can be made of Six Simulated Case Studies published by the Department of Elementary School Principals.[35] These may be effective materials, but they are not simulations.

Pioneering work in the field of simulation was done by Kersh who developed a Classroom Simulation initially based on behavior-shaping principles.[36] Multiple projection techniques are used to present participants with episodes

---

[32] Venditti, Frederick. Handbook for Teaching in Valleybrook Elementary School: A Simulation Game Focusing upon Problems of Racially Desegregated Schools. Knoxville: Equal Opportunities Planning Center, The University of Tennessee, n.d. Cruickshank, Inner-City Simulation Laboratory, op. cit.

[33] "Four Years of Insite." Bloomington: Instructional Systems in Teacher Education, School of Education, Indiana University, n.d. (Mimeo.)

[34] Swan, Howard A., and Jim Johnson. Simulation Exercises. DeKalb, Ill.: Creative Educational Materials, 1968.

[35] National Education Association, Department of Elementary School Principals. Six Simulated Case Studies. Washington, D.C.: the Department, 1968.

[36] Kersh, Bert Y. Classroom Simulation. U. S. Department of Health, Education and Welfare, Office of Education, NDEA Title VII, Project 886. Washington, D.C.: Government Printing Office, 1963.

occurring in Mr. Land's sixth grade. The participant reacts to each episode on the basis of information gained from the film and from background materials, such as cumulative records. He is then shown a possible consequence of his decision as another short film projects the pupils' predicted reaction. Kersh and his associates at Teaching Research carried out subsequent research on variables associated with the effectiveness of simulation and continued into a low-cost simulation project in the area of classroom management.[37] The latter, an interesting two-step approach to simulation, is discussed more fully under the section on feedback. The report of a workshop, Simulation in College Instruction, conducted by Twelker at Teaching Research during the summer of 1968 contains a number of initial descriptions of games and simulations developed by the participants, including a game simulating didactic teaching.[38]

Simulations have been created for improving the training of teachers in subject areas. Lehman used a structured form of peer teaching which he called Simulated Classroom Situations, to assist preservice science teachers.[39] In many ways, this method is similar to microteaching, but it is truly a human-ascendant role simulation using a background model, while microteaching is considered scaled-down teaching.[40] Combinations of these two methods may prove beneficial for preservice students in any subject area. A second human-ascendant role simulation for preservice science teachers has been developed by Urbach.[41] His Science Inquiry Laboratory Simulation involves science method students in inquiry and pseudo-inquiry laboratory teaching methodology. The instructor acts as the teacher with the students working in pairs within teams of four to six students. This laboratory session is followed by intensive debriefing and student practice teaching exercises. Utsey, Wallen, and Beldin

---

[37] Teaching Research. Low Cost Instructional Simulation Materials for Teacher Education: Phase I and Phase II. Monmouth: Oregon State System of Higher Education, 1968.

[38] Twelker, Paul A. Simulation in College Instruction. Terminal Program Report, U. S. Department of Health, Education, and Welfare, Office of Education, Project No. 8-2041. Monmouth, Oreg.: Teaching Research, 1968.

[39] Lehman, David L. "Simulation in Science--A Preliminary Report on the Use and Evaluation of Role Playing in the Preparation of Secondary School Student Teachers of Science." Paper presented at American Association for the Advancement of Science meeting, Washington, D.C., December 1966.

[40] Bush, Robert N., and Dwight W. Allen. "Micro-Teaching: Controlled Practice in the Training of Teachers." Paper presented at the Santa Barbara Conference on Teacher Education of the Ford Foundation, April 30, 1964.

[41] Floyd Urbach, University of Nebraska, personal correspondence.

produced film simulations to train teachers in the use of the Informal Reading Inventory to assess a child's reading level.[42] They concluded that film simulations may be a powerful tool for establishing referents common to instructors and student teachers.

Incident films, role playing, and case studies have long been part of the educational psychology courses at many teacher education institutions. The special advantages of simulations in these courses were first described by Temp.[43]

The field of counseling is well represented with a variety of simulations at this early stage in the growth of instructional simulation. The Counselor's Week: A Simulation for Counselor Trainees by Dunlop and Hintergardt is a set of materials in book form.[44] This is a media-ascendant role simulation with a background model based on the role of the high school counselor. The book format is exceptionally well done. Tasks are presented day-by-day for a full week.

A simulation for use in an NDEA Counseling and Guidance Institute entitled The Elementary School Guidance Specialist was developed by Munson and Kane.[45] These simulation experiences are planned to expose the players for the first time to various phases of elementary school guidance through a programmed variety of 23 episodes.

While the preceeding two simulations stress familiarization with the role of the counselor in elementary and secondary schools, Beaird and Standish's Audio Simulation, a media-ascendant functional simulation, stresses the development of skills in the interpersonal aspects of counseling.[46] The nature of

---

42 Utsey, J., C. Wallen, and H. O. Beldin. "Simulation: A Breakthrough in the Education of Reading Teachers." Phi Delta Kappan 47: 572-74; June 1966.

43 Temp, George. "Simulation and Teacher Education." Los Angeles: Teacher Education Project, University of California, September 1962. (Mimeo.)

44 Dunlop, Richard S., and Ben C. Hintergardt. The Counselor's Week: A Simulation for Counselor Trainees. Scranton, Pa.: International Textbook Co., 1968.

45 Munson, Harold L., and Gary W. Kane, The University of Rochester, personal correspondence.

46 Beaird, James H., and John T. Standish. Audio Simulation in Counselor Training. U. S. Department of Health, Education, and Welfare, Office of Education, Final Report, Title VII, Project No. 1245. Washington, D.C.: Government Printing Office, 1964.

the counselor's role and the difficulties of teaching trainees through traditional means make this field an excellent one for further application of simulation systems.

Two games developed by personnel from Abt Associates are difficult to categorize into areas of professional preparation. "Fixit"is a simple game designed to focus attention on the problem of deciding to introduce games and simulations into any school system. The effectiveness of games, time and and money costs, teacher preparation, measurement of student achievement, bureaucratic impediments to change, personal or personnel conflicts, conflicts of educational philosophies, and specific characteristics of the school population and community are among the facts that should be considered in any decision to introduce innovation into this school system.[47]

An Education System Planning Game was presented at the Conference on Educational Innovations held at Lake Arrowhead, California, in December 1965.[48] Its purpose is to illuminate some of the major issues of educational planning in order to stimulate discussion of diverse approaches to education.

Although the simulations described above do not include all of the ones available in professional education, it is believed that they represent the field in its present state. It is obvious that role simulations with background models dominate the field. This is due to the need for students to be able to assume their future roles during periods of their training and the fact that a theoretical foundation rarely exists from which to build useful equilibrium models. Games are difficult to build due to the nature of the payoff in most of the situations in professional education. Despite this fact, the feedback possibilities and increased motivation of game participants are attracting more developers to the game mode. The recent emphasis on simulation systems of instruction emphasizing the preparation and debriefing periods and reducing the dependence on the simulation itself to do all of the teaching is likely to increase the trend toward a game mode.

The predominance of role simulation is also accounted for by the need to integrate theory into practice by allowing the student to practice behavior which will be required in the future. Both functional and systemic simulations are needed to provide greater skill and to give the student an understanding of the operation of the whole system and the various roles within

---

[47] Gordon, Alice Kaplan. Educational Games Extension Service, Unit Five: Games and the School System. Chicago: Science Research Associates, 1968. p. 7.

[48] Abt, Clark C. An Education System Planning Game. Cambridge, Mass.: Abt Associates. n.d. (Mimeo.)

the system. If professional educators are to become effective change agents, an understanding of the school system as a subsystem in the larger social system will be important.

Many areas of professional education have not been represented in the above survey. With a change of content and minor modifications, many of the existing simulations can be adapted for use in these other areas. It is also interesting to note the predominance of certain techniques in each area. Simulations in the area of administration are almost totally represented by the in-basket technique, while those in preservice teacher preparation have made use of the same basic structure and used a case-incident or episode approach. Some techniques such as Zoll's variation of the case study, the action maze; the Pigors' Incident Process; computer-assisted simulations; board games; and contrast culture techniques have not been used in any simulations for professional education.[49] Even at this early stage in the development of simulation systems, there are some helpful papers and books for those interested in developing their own simulations.[50]

Most of the criticisms of commercially available simulations are similar to those once leveled against programmed learning. Objectives are either not given or are vague. Minimum and maximum entry levels for participants are not specified, nor is research on the effectiveness of the simulation available. Two of the greatest deterrents to use of commercial materials are lack of proper training of the instructor and lack of a clear presentation of how the simulation should be integrated with the rest of the program. The

---

[49]Zoll, Allen A., III. "The Action Maze." Dynamic Management Education. Seattle, Wash.: Management Education Associates, 1966. Pigors, Paul and Faith. Case Method in Human Relations: The Incident Process. New York: McGraw-Hill, 1963. Wing, Richard L. Use of Technical Media for Simulating Environments To Provide Individualized Instruction. U. S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project No. 1948. Washington, D.C.: Government Printing Office, 1965. Stewart, Edward C. "The Simulation of Cultural Differences." The Journal of Communication 16: 291-304; December 1966.

[50]Twelker, Paul A. "Designing Simulation Systems." Paper presented at American Educational Research Association convention, Los Angeles, February 1969. Greenlaw, Paul S., Lowell W. Herron, and Richard H. Rawdon. Business Simulation in Industrial and University Education. Englewood Cliffs, N.J.: Prentice-Hall, 1962. Gordon, op. cit.

University Council on Educational Administration recognizes the need for training the instructor by not providing materials to those not trained in the use of the materials.

SOME ISSUES TO BE RESOLVED

Numerous fundamental issues surround the development and use of simulations for the preparation of educational personnel. However, they may be subsumed within four overlapping categories: developmental, administrative, instructional, and evaluative. Several issues and decisions facing the designer were discussed earlier. At least three others are worthy of mention: feedback, realism, and the content-process debate.

Feedback is used to refer to the return to the participant by himself or others of perceptions or sensations resulting from his reactions to or interactions with the simulation. Simulated environments, like real environments, provide wide variations in feedback capabilities. Seen on a simple matrix (Figure 3) simulation feedback may be general or specific and received from self or others (either man or machine).

	Self	Other(s)
General		
Specific		

FIGURE 3
FEEDBACK MATRIX

In the most general sense, being in a simulation permits one to consider, "So this is what it is like to be in. . . (reference system)." Such feedback is often vague and usually obtained from personal perceptions while involved in a simulation. On the other hand, a participant responding to a specific incident within the simulation could have his response evaluated by himself or others (man or machine). For example, a participant assuming a teacher's role in a classroom simulation might react to a classroom disturbance by sending an acting-out-child to the principal's office. Feedback of a "specific-other" nature could indicate, "If you send the acting-out-child to the principal's office, the principal will. . . ." Thus, the simulation designer could provide negative feedback to enable the participant to correct or adjust responses.

All feedback systems involving humans are behavior shaping, that is, their intention is to steer the participant onto a correct course. As such, simulations are not neutral. Participant responses are evaluated (rewarded or corrected) according to normative data. The norms can be determined from an analysis of empirical data (e.g., "When an acting-out-child is sent to the office the principal usually . . . but he sometimes . . . and . . . "). Since the variables at play in such a real setting are almost infinite and exact combinations of variables would be required in order to predict administrator and child behavior, the norms provided are at best estimates or at times "guesstimates."

One issue facing the developer, then, is the nature, extent, and reliability of the feedback. Developers have approached the problem in different ways. Kersh's classroom simulator provided "specific-other" feedback to the participant after he responded to each problem sequence. The feedback provided was intended "to communicate to T (student teacher) the most likely consequence of his teaching behavior." Kersh explains how the feedback was determined and used:

> The choice of feedback depended more on E's (experimenter's) judgment. E's judgments, however, were based on pre-established standards developed by a jury of (3) master teachers. . . . It is E's task to evaluate T's responses and to select the most likely consequence of his response . . . according to the jury's criteria.[51]

In general, for each response by T, an alternative feedback (usually selected from two or three predetermined by the jury) was provided. Since no more than three feedback alternatives are available, there is an inherent limitation. Kersh makes no claim that the feedback provided is absolute:

> There is no guarantee that what is projected on the screen is actually how the student would react in the classroom. T is told that the student reactions on the film are representative of what one group of experts believe.[52]

In addition, he notes, "one shortcoming of the . . . technique is that it is tutorial in nature and requires a great deal of skill on the part of (E).[53]

---

[51]Kersh, op. cit., p. 7. For a detailed account of the composition of the jury and how it made decisions see pp. 28-31.

[52]Ibid., p. 20.

[53]Kersh, Bert Y. "Simulation in Teacher Education." Paper presented at the American Psychological Association convention, St. Louis, 1962. p. 10.

Cruickshank, Broadbent, and Bubb's simulation provides a more open-ended vehicle wherein feedback is not limited to specific responses.[54] Rather, participants working in groups value each other's responses by projecting possible consequences of the response for the child, teacher, administrator, or other ("specific-other"). In the case of the acting-out-child sent to the principal's office, fellow participants help the respondent to consider many possible consequences of this action. In so doing participants are encouraged to role play confrontations or differences of opinion.

Although the technique provides for consideration of a greater number of teacher behaviors and student reactions, it is limited by the ability and experience of the group members. Responses of preservice teachers are not those of experienced teachers. Most often they are drawn from personal experience as a student or interpolation of principles learned in professional education. Obviously, this is the same case with a beginning teacher. However, additional feedback can be provided by having professors or school personnel evaluate participant alternatives. Unlike Kersh's work no attempt was made to formulate normative data to shape behavior in a predetermined fashion.

Teaching Research's low-cost simulation is geared toward helping participants "become more effective classroom managers and thus better teachers."[55] The two phases of the simulation are to teach certain principles of classroom management and to exercise the application of the principles in the simulation. The simulation provides a variety of feedback. In Phase I, participants, using an exercise book and a film-tape presentation on an Audascan projector, react to the way a teacher handles classroom management. Seeing two teaching episodes, the participant must choose which teacher behavior is preferable and state why in the exercise book. The participant receives feedback as he compares his written response with one contained on the following page in the book. During the final part of Phase I, feedback a la Kersh is used; that is, participants see a film on how the class would respond to the two teaching strategies employed.

---

[54]Cruickshank, Broadbent, and Bubb, op. cit.

[55]Teaching Research. Low Cost Instructional Simulation Materials for Teacher Education: Phase I Student Manual. Monmouth: Oregon State System of Higher Education, 1968. p. 1.

Phase II "gives the participant an . . . opportunity to practice . . . application of the principles (learned in Phase I)."[56] In this phase participant responses to filmed incidents are compared with responses to the same incident made by "expert teachers." Finally, a third section of the film depicts how children would probably respond to the "expert teacher's" behavior. Ultimately, feedback is obtained as the participant compares his response with that of the "expert."

In all the cases described feedback is limited in some way. Ideally, simulations should be able to elicit or identify an almost infinite number of teacher behaviors and subsequently provide an almost infinite number of student behaviors to each teacher behavior. Probabilities of response could then be calculated and more adequate and accurate feedback provided.

A second issue facing the developer is realism. How lifelike must the simulation be? As Twelker points out:

> Historically, simulation designers have placed . . . emphasis on the physical appearance of the stimulus situation. Designers have often been overly concerned with the realism of the simulation as an important dimension and have designed simulations that resemble as closely as possible the real situation.[57]

Opposed to this approach, Twelker agrees with Gagne[58] that the developer should also concern himself with the response dimension of the simulation, i.e., what the participant must do or demonstrate, and work backward to the problem of what the simulation must be like in order to provide an environment for that demonstration. He says:

> Once the designer knows what operations he wishes to teach or exercise . . . he then considers the appropriate means to bring this learning about, and this brings him to the question of what his simulation will look like . . . . In other words form follows function.[59]

---

[56]Teaching Research. Low Cost Instructional Simulation Materials for Teacher Education: Phase II Student Manual. Monmouth: Oregon State System of Higher Education, 1968. p. 1.

[57]Twelker. "Simulation: What Is It?" p. 15.

[58]Gagne, Robert M. "Simulators." Training Research and Education. (Edited by Robert Glaser.) Pittsburgh: University of Pittsburgh Press, 1962.

[59]Twelker. "Simulation: What Is It?" p. 16.

If real precision of behavior is expected of the participant in an extremely specific environment, then considerable attention to realism is warranted. For this reason simulations employed in training astronauts require painstaking attention to the details of realism.[60] On the other hand, the participant may be expected only to become aware of the gross features of a simulator if the simulator represents many different kinds of environments. For example, using a driver simulator, the participant only needs to know about cars in general and not one particular car; therefore, the simulator is not an exact model.

If the operation to be performed by a participant in professional education is the conduct of a parent conference, it is incumbent upon the developer to provide a setting in which a parent conference can occur. In this illustration the problem is not so much the provision of a realistic physical environment as a psychological one in which the participant "feels" the part and will respond in a lifelike way. Obviously, writing what one would do in a parent conference denies the subject both feedback and dynamic interplay with another person assuming a parent role and further challenges only his intellect rather than his total self. Thus physical realism may be far less important than psychological realism, at least for certain kinds of simulations. A great deal of research potential is inherent in the issue of realism.

Still another issue facing the developer is the dilemma of process versus content. Is the intention of the simulation to replicate an environment in which the participant practices an act learned elsewhere or is the simulation a teaching device itself? In all probability those simulations which function more as testing devices are process or practice simulations. In the sense that one learns from a testing situation via feedback, perhaps no simulation is content void.

Some simulations may have both characteristics. The low-cost simulation material from Teaching Research teaches principles (thus content) and then tests participants on their ability to note the principles and to apply them (thus practice or process).

A second broad category of problems faces administrators of simulation programs. Included under this rubric are considerations relative to the placement of the simulator in the program and the size of the participant group.

Since simulations differ in their purposes, generalizations cannot be expected with regard to placement of a simulation in the total professional education curricula. Depending upon its character and objectives, it could be placed from first to last. For example, if the simulation is intended to pro-

---

[60] Cunningham, Luvern L. "Simulation and the Preparation of Educational Administrators." Paper presented at the International Intervisitation Conference sponsored by the University Council on Educational Administration at The University of Michigan, October 1966. pp. 25-26.

vide an orientation to the reference system ("This is what it will be like."), then early placement is logical so that the experience can be used to assist the participant in making a more informed career choice. Early engagements of this nature can also help to make participants aware of the kinds of training needed in order to function adequately in the reference system. In this sense simulations can serve to make the subsequent teacher education curriculum more relevant. Such simulation should be environment rich--realistic and concrete. On the other hand, placement of the simulation late in the program permits the participant an opportunity to synthesize and apply principles learned in education courses. LaGrone argues for an experience of this nature:

> The professional component of a program of teacher education for the last 25 or 30 years has taken for granted that the teacher education student will put together the talk about education and his teaching. The recent research in teaching and work in theory indicates that an assumption of this magnitude is more likely false than true.[61]

Unfortunately, although simulations have been created for this purpose, teacher education programs often have failed to find an adequate place for them.

Related to the problem of placement is that of whether involvement in a simulation should be massed or spaced. Aside from the usual psychological considerations and research findings which augur for the latter,[62] another consideration must be weighed; that is, if the simulation requires role assumption, which method (massed or spaced) is preferable in getting the participant into the role and maintaining him in it? Some participants in one role assumption simulation conducted intensively over a two-week period preferred to have it spread out over an extended period.[63] This subjective finding seems to add support to the empirical research on results of practice. It is also necessary to consider the advantages of the integrated use of simulations with other parts of the training program.

---

[61]LaGrone, Herbert. A Proposal for the Revision of the Pre-Service Professional Programs of Teacher Education. Washington, D.C.: American Association of Colleges for Teacher Education, a department of the National Education Association, 1964. p. 63.

[62]Summarized in McKeachie, Wilbert J., and C. L. Doyle. Psychology. Reading, Mass.: Addison-Wesley Publishing Co., 1966. pp. 281-82. More scholarly treatment in Deese, James. Psychology of Learning. New York: McGraw-Hill Book Co., 1958. pp. 187-203.

[63]Cruickshank, Donald R., and Frank W. Broadbent. The Simulation and Analysis of Problems of Beginning Teachers. U. S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project No. 5-0789. Washington, D.C.: Government Printing Office, October 1968. p. 89.

Size of the simulation group is another factor of concern to administrators. Since some simulations are designed for use by individuals and are used in a tutorial fashion (Kersh's), they fall outside this discussion. When simulations are developed for use in groups, the question of size is significant not only in terms of learning outcomes, but also in terms of per pupil cost. The Insite Project simulations, Teaching Problems Laboratory and the Inner-City Simulation Laboratory, are examples of simulations requiring group interaction, while Teaching Research's low-cost simulation combines both tutorial and group approaches as discussed earlier.[64]

Some evidence indicates that size may be critical at a point. Inbar makes a subjective analysis of situations which occurred when a community disaster game was played:

> In overcrowded groups the players learn the rules of the games less efficiently, interact less, are less interested in the session and participate less actively in it; as a consequence they tend to play a lesser number of moves and the impact of the game is weaker.[65]

In another study Cohen, too, held that group size was an important variable.[66]

In an experimental study conducted by Cruickshank and Broadbent, participants were asked how large the training group should be; they indicated that a group of six was too small and a group of forty too large.[67] They did not agree that the materials could be used on a one-to-one basis. Since feedback in that simulation was provided by interaction with others, the latter reaction was anticipated.

The question of size seems to be related to features and purposes of the simulation. Depending upon the objectives sought, the group can vary in size up to a critical point. For each simulation the critical point can be a function of space, instructor skill, group characteristics, time, or other. Therefore, it probably would be difficult to predict an optimum number of participants without attention to these variables.

---

64 "Four Years of Insite," op. cit. Cruickshank, Broadbent, and Bubb, op. cit. Cruickshank, op. cit. Teaching Research, op. cit.

65 Inbar, Michael. "The Differential Impact of a Game Simulating Community Disaster." American Behavioral Scientist 10: 26; 1966.

66 Cohen, K. J., and E. Rhenman. "The Role of Management Games in Education and Research." Management Science 7: 131-66; 1961.

67 Cruickshank, and Broadbent op. cit., p. 89.

Size of the simulation group is another factor of concern to administrators. Since some simulations are designed for use by individuals and are used in a tutorial fashion (Kersh's), they fall outside this discussion. When simulations are developed for use in groups, the question of size is significant not only in terms of learning outcomes, but also in terms of per pupil cost. The Insite Project simulations, Teaching Problems Laboratory and the Inner-City Simulation Laboratory, are examples of simulations requiring group interaction, while Teaching Research's low-cost simulation combines both tutorial and group approaches as discussed earlier.[64]

Some evidence indicates that size may be critical at a point. Inbar makes a subjective analysis of situations which occurred when a community disaster game was played:

> In overcrowded groups the players learn the rules of the games less efficiently, interact less, are less interested in the session and participate less actively in it; as a consequence they tend to play a lesser number of moves and the impact of the game is weaker.[65]

In another study Cohen, too, held that group size was an important variable.[66]

In an experimental study conducted by Cruickshank and Broadbent, participants were asked how large the training group should be; they indicated that a group of six was too small and a group of forty too large.[67] They did not agree that the materials could be used on a one-to-one basis. Since feedback in that simulation was provided by interaction with others, the latter reaction was anticipated.

The question of size seems to be related to features and purposes of the simulation. Depending upon the objectives sought, the group can vary in size up to a critical point. For each simulation the critical point can be a function of space, instructor skill, group characteristics, time, or other. Therefore, it probably would be difficult to predict an optimum number of participants without attention to these variables.

---

[64] "Four Years of Insite," op. cit. Cruickshank, Broadbent, and Bubb, op. cit. Cruickshank, op. cit. Teaching Research, op. cit.

[65] Inbar, Michael. "The Differential Impact of a Game Simulating Community Disaster." American Behavioral Scientist 10: 26; 1966.

[66] Cohen, K. J., and E. Rhenman. "The Role of Management Games in Education and Research." Management Science 7: 131-66; 1961.

[67] Cruickshank, and Broadbent op. cit., p. 89.

Length of simulations varies according to the intentions of either the developer or user. Users need to consult instructor's guides and consider or develop specific objectives for using a simulation before a determination of length can be made. In some cases, parts of a multifaceted simulation can be used in isolation. However, in most cases, developers see the whole as being greater than the sum of its parts and caution that selective use of episodes, incidents, or moves will have less impact out of the simulation's context. In some problem-presenting simulations information accumulates while the participant moves through problem-solving activities. Even careful selection of segments cannot completely overcome the cumulative loss of data.

The third set of issues primarily is a concern of the instructor or simulation director. This set relates to the director's role and motivation of participants. In general, most developers of instructional simulations seem to view the director as a facilitator of learning. Such simulations require the director to set the stage by providing orientation and materials and then to keep participants working according to some predetermined schedule. Typical of developers' visions of the director's role are the following statements:

> In doing these exercises the trainee should be left alone as he will be later while serving as a . . . school counselor; except that in the author's view the continued presence of the counselor educator while trainees undergo these simulated experiences is highly desirable.[68]

> Since one of the major objectives in using the materials is to engage the participant and to open his behavior, we suggest the instructor act as a catalyst. Therefore, the instructor's role is more one of guiding activities and causing appropriate engagement of ideas.[69]

> Throughout the simulator (the directors) concentrated on the following tasks: (1) keeping the general schedule . . . (2) providing background material . . . (3) introducing . . . problems, (4) acting as non-participants in problem discussions, and (5) keeping the discussions moving.[70]

---

[68] Dunlop, Richard S., and Ben C. Hintergardt. "The Counselor's Week: A Simulation Program for Counselor Trainees." Kansas City: University of Missouri, n.d. p. 18. (Mimeo.)

[69] Cruickshank, Donald R., "Twenty-One Questions and Answers About the Teaching Problems Laboratory." Knoxville: College of Education, The University of Tennessee. (Mimeo.)

[70] Cruickshank and Broadbent, op. cit., p. 42.

That the role of the director is significant and needs investigation is pointed up by the following remarks:

> It was found that in research on classroom simulation at Teaching Research more variance was contributed by instructor differences than by treatment variables.[71]

> Changes in the materials, placement in the program and in the role of the instructor promise to increase the overall effectiveness of this set of simulation materials.[72]

Unless a participant in a simulation perceives the conditions, physical and/or psychological, as realistic enough operationally, he probably will not accept his role play (if a role-assumption simulator) or behave as himself. Participant motivation, then, may be considered at least partly a responsibility of the developer. On the other hand, the way the simulation is presented, the instructor's behavior, and the content of the simulation itself all are variables capable of manipulation which bear on participant drive or interest.

Several reports seem to indicate that for the majority of participants simulations are extremely motivating.[73] Desire and ability to function in a simulation may be related to participant personality differences. It is conceivable that the participant who readily identifies with his role is a different kind of person than the one who finds it difficult or, in fact, refuses. Characteristics of effective vs. ineffective participants should be determined in order to ensure the use of simulation with students who are adaptable to this learning style. A review of the psychological literature probably would uncover testable hypotheses of this order.

A final set of issues relates to (1) evaluation or appraisal of participant behavior during the simulation and (2) transfer of training to the reference system. Simulations often are guilty of involving participants with little attention given to the outcomes expected. Outcomes, if designated, usually are described only in the grossest fashion:

---

[71] Twelker. "Simulation: What Is It?" p. 32. Twelker refers to two reports here: Kersh, loc. cit., and Twelker, Paul. "Classroom Simulation and Teacher Preparation." The School Review 75: 197-204; Summer 1967.

[72] Cruickshank and Broadbent, op. cit., p. 110.

[73] Abt Associates. "Examples of Educational Games." Cambridge, Mass.: Abt Associates, June 1966. (Mimeo.) Cruickshank and Broadbent, op. cit., pp. 77-90. Kersh, op. cit., pp.46, 49. Weinberger, Morris J. "The Use of Simulation in the Teaching of School Administration." Doctor's thesis. New York: Teachers College, Columbia University, 1965. p. 175. (Unpublished.)

> Participants will construct a classroom test; hold parent conferences; prepare and teach difficult lessons; locate instructional materials; develop a teaching program; cope with problems of student behavior; learn to use student records; consider techniques of motivation; prepare behavioral objectives for learning; analyze and use sociograms; provide for individual differences . . . .[74]

Somewhat better are objectives such as:

> Participants will increase their skills in the identification of classroom problems, that is, they will be able to define a problem and identify forces and factors contributing to the problem.[75]

> Identify from a series of examples the relative level of force represented in different teacher communications . . . .[76]

Proponents of behavioral outcomes have much to contribute to help developers and instructors fashion specific observable outcomes for participants.

Since little guidance for evaluating participant behavior is offered the simulation instructor, he must often apply his personal judgment to the task. Such subjectivity usually is comparable to that applied in evaluating teaching and at best is a weak substitute for ability to observe agreed-upon behavioral outcomes.[77] Developers probably have given less attention than necessary to the problem of defining outcomes because of the complexity of and resultant aversion to predicting the effects of one human's behavior (the teacher's, counselor's, or administrator's) on that of another (the student, the parent, or colleague).

Where the simulation is well drawn, that is, rooted in a fairly descriptive physical setting involving well drawn characters and events, the problem of stating behavioral outcomes is less difficult than in a simulation which presents few parameters and leaves the participant to develop a specific plan or goals for an unspecified or vaguely defined individual or group appearing

---

[74]Cruickshank, Broadbent, and Bubb, op. cit., p. 13.

[75]Ibid.

[76]Teaching Research, op. cit., p. 23.

[77]That the task of agreement on objectives is a complex one is evidenced by the eight years of confusion surrounding the conduct of the war in Vietnam.

in an obscure setting. Much more research is needed on the outcomes of teacher behavior before real specificity can be demanded or expected.[78]

At any rate, the instructor or the simulation group itself should develop some boundaries which define the limits of acceptable participant behavior if such boundaries are not provided. Available alternatives in evaluating participants include rank ordering by participants themselves or by observers, and self-ratings or self-analysis.[79]

Turning to transfer of training, there is an assumption that students who demonstrate acquisition of knowledge on paper and pencil tests will and do apply (transfer) these learning outcomes to real-life situations. Research on student teachers and first-year teachers does not support this contention.[80]

In an effort to assess the utility of simulation to increase transfer of learning, Ryan investigated the use of varied instructional approaches in combination with a series of simulated situations in order to determine which of four treatments was most likely to increase transfer of classroom knowledge to problem-solving tasks.[81] Comparison of means of the four treatment groups demonstrated that

> . . . The instructional approach, allowing students choice of method for acquiring knowledge, combined with the procedure of practice in simulated problem-solving tasks is an effective way to increase transfer of learning outcomes.[82]

Students who had no choice of method for acquiring information and no practice with simulated problems made the lowest scores on the criterion test. Apparently choice of learning strategy and subsequent practice under simulated conditions of what one learns is a learning strategy which should be investigated further. If substantiated, implications of this finding for the preparation of educational personnel are great.

---

[78]Work done by Edmund Amidon and others investigating the effects of teacher verbal behavior is beginning to provide needed clues.

[79]Where extensive feedback is provided participants may wish merely to compare their behavior to that of an "expert." Problems can arise with this approach since the participant begins to "model the master" rather than develop a unique and perhaps equally effective teaching style.

[80]Curry, J. F. "Evaluation of Reverse Block Plan of Student Teaching at North Texas State University." Doctor's thesis. Denton: North Texas State University, 1964. (Unpublished.)

[81]Ryan, T. Antoinette. "Use of Simulation To Increase Transfer." The School Review 76: 246-52; June 1968.

[82]Ibid., p. 249.

Some self-report evidence exists that participants' behavior on-the-job has significantly been affected by their simulation experience. Weinberger says:

> The substantial agreement between professors and participants on the value of simulation is reinforced by what participants reported as changes in their behavior on-the-job. (These reports of changes were made from one to four years after the participation in simulation.) Participants cited better decision making (considering more alternatives and consequences and involving others in decisions), better group interaction and staff-relationship, and better self-perception.[83]

Thirty of 36 participants in the Cruickshank-Broadbent field tests, when asked to evaluate the effect of the simulation on subsequent student teaching, indicated that the simulation experience "made a difference." When asked to project its value on their first year of teaching, 33 of 36 respondents indicated that it should make a valuable contribution.[84] Unfortunately, most simulations in professional education have not been available long enough to generate research findings about transfer of training.

Little has been said or suggested about the validity of simulations for testing purposes. Research by Gaffga and Schalock offer positive findings.[85]

The issue of transfer and prediction is implicit in the argument given to support the widespread use of simulation by the military, that is, if the combat trainee can perform adequately under simulated combat conditions, it is possible he can perform adequately in real combat. However, if the trainee cannot perform adequately under simulated conditions, there is no reason to believe he can function effectively in combat. Crawford summarizes his feelings about this issue:

> It is assumed that the simulation will result in attitude change, sensitivity training, and a kind of behavioral modification.
>
> The difficult question about the use of simulation which emphasizes interpersonal relations comes in specifying exactly what has been learned. Even if there were adequate demonstration of transfer of

---

[83]Weinberger, op. cit., p. 176.

[84]Cruickshank and Broadbent, op. cit., pp. 87-88, 90.

[85]Gaffga, Robert M. "Simulation: A Method for Observing Student Teacher Behavior." Doctor's thesis. Knoxville: The University of Tennessee, 1967. (Unpublished.) Schalock, H. D., J. H. Beaird, and Helen Simmons. Motion Pictures as Test Stimuli: An Application of New Media to the Prediction of Complex Behavior. U. S. Department of Health, Education, and Welfare, Office of Education, NDEA Title VIII, Project 971. Washington, D. C.: Government Printing Office, 1964.

training from them to operational situations--which are certainly difficult to carry out--it would still not be very clear what has been learned, simply because we do not have very much in the way of identified component variables which make up social competence.[86]

In summary, the issues and variables facing the developer, administrator, and the simulation instructor are complex. A substantial amount of research is required to validate simulation and investigate its many dimensions. Figure 4 summarizes some issues and potential topics for research.

Developer	1. Object of the simulation: Selection and analysis of system to be simulated. 2. Scope of the simulation: Replication of total system or replication of a part. 3. Quality of the system employed: Open or closed loop. 4. Game quality: Competitive or noncompetitive. 5. Feedback: General or specific; self or other; availability of normative date, reliability of normative data, presented by machine or man, presented to individuals or groups. 6. Realism: Realistic or symbolic; degree of physical or psychological fidelity required. 7. Content-Process: To teach or to test, combination of.
Administrator	1. Placement of simulation in training program: Early or late. 2. Practice: Massed or spaced. 3. Group size: A function of objectives, instructor and participant characteristics, space, time, etc. 4. Length of simulation: Use of whole or part.
Instructor	1. Role of simulation director: Participant or facilitator (catalyst). 2. Motivation: Function of content, instructor's behavior, participant characteristics.
Evaluator	1. Specificity of simulation outcomes: General or behavioral. 2. Objectivity or subjectivity in evaluating performance. 3. Transfer of training: Simulation to facilitate transfer; simulation as a situational or predictive test; transfer of what is learned during simulation to real-life situations, i.e., the reference system.

FIGURE 4

SOME ISSUES AND DECISIONS OF CONCERN TO DEVELOPERS, ADMINISTRATORS, INSTRUCTORS, AND EVALUATORS (RESEARCHERS) OF SIMULATION SYSTEMS

[86] Crawford, Meredith P. "Dimensions of Simulation," p. 794.

ADVANTAGES OF SIMULATION

Several advantages of the use of simulations already have been either stated or alluded to. This section will discuss some of the more positive features of using the methodology.

Simulations are relevant. Very often undergraduate students who have just completed student teaching bemoan that what they have learned in their education classes seems to have little or no application to what they must do as teachers. Administrators and other school personnel direct the same kind of criticism toward their preparation programs. Although the extent, exact nature, and causes of this apparent discrepancy are not clear, at least two reasons are the isolation of many professional educators (often the real decision-makers and curriculum builders) from public school classrooms and their heightened interest in specialization which often leads them into obscure areas of writing and research, the results of which may not be readily applicable to classroom practice. As a result, the teaching of teachers, although perhaps done in a more insightful way, may be becoming less useful or relevant than teachers expect. Recently, university personnel are taking a greater interest in the classroom and what is happening in it. However, since professional education curriculums seldom are arrived at on an empirical basis, the present training system for school personnel is not likely to be truly responsive. Hopefully, simulations which are based upon models of reality can serve to provide an element of relevance. Drawn carefully from the real world, they provide a means by which personnel in training can be exposed under controlled conditions to the most critical aspects of their future work or to elements that cannot be reproduced except in laboratory settings.

Simulations permit the trainee to be himself. Student teachers, interns, and others engaged in laboratory experiences undergo considerable and perhaps unnecessary stress. In such settings, prior to the arrival of the novice, children are conditioned to respond to the master teacher's behavior. As a result, the novice usually consciously or unconsciously models the master. In fact, it is not at all unusual for the trainee to be told to observe the master teacher for awhile and do as he does. Unless by chance the novice is matched with a master teacher with similar personal characteristics (attitudes, values, and so forth), a considerable amount of accommodation must take place. That is, the novice must attempt, at least superficially, to take on the characteristics of the master teacher, even to look like him. This phenomenon, which can be called submergence of identity, prohibits the trainee from being himself. As a result, for the duration of the laboratory experience the trainee can have little or no opportunity to be himself and to test his own attitudes, values, and skills in the classroom.

However, suppose that the novice is able to be himself. Since the class is conditioned to behave in rather well defined ways, introduction of another teaching style can cause anxiety among the children and lead to conflict as they unconsciously choose the teacher they like or react negatively toward teacher behaviors dissimilar to those to which they are conditioned. In either case the trainee can be in an approach-avoidance conflict.

On the other hand, simulations are intended (with few exceptions) to permit the participant to be himself--to learn about himself as he tries out his unique behavior. There usually are no prescriptions. Simulations are safe. The first time a professional educator usually encounters critical decisions he is alone in a classroom, counseling cubicle, administrator's office or facing a board of education. Student teaching or forms of internships are intended to protect the novice from hard knocks. If the class should become disruptive, the master teacher intervenes threatening, "Is this how we treat our guest?" Therefore, really learning how to teach, the baptism by fire, occurs during the first year. Since teachers and others are unprepared for such contingencies which have either never occurred or which were previously handled by others, many unnecessary errors occur as poor decisions are made in the heat of emotion or in an effort to maintain the power of the teacher's role.

Simulations permit participants to engage in very serious encounters where they must make decisions and consider the consequences thereof. The opportunity to confront real problems in hypothetical settings permits one to work toward gaining intellectual control over behavior. Errors can be made and studied and situations reenacted until the participant and/or his instructor feel he is confident and able to meet the problem at an intellectual rather than at a visceral level.

Simulations permit control. The usual laboratory experiences provide little or no control over what happens to the trainee. Chance factors alone seem to account for the experiences he has. Simulations permit the instructor to control what happens to the trainee even to the extent that different trainees can be exposed to different conditions.

Simulations permit the wedding of classroom theory and practice. Accepting the definition that theory is an attempt to explain and understand a phenomenon, it should be possible for one theorizing to test the adequacy of hypotheses generated by the theory in the context of reality. Although much of professional education is theoretical in terms of the above definition, the laboratory requisite for contrasting the theory with reality or for testing hypotheses is usually unavailable. Simulations can be used for such purposes. For example, a phenomenon such as classroom management can be observed using a simulation. Consequently, a theory of classroom management can be developed and principles and hypotheses derived and tested. The ability to study phenomenon occurring in schools and to theorize about them should create a more meaningful and scientific approach to training professional educators.

Simulations are economical. Providing laboratory experiences either massed as in student teaching or incidentally as in the case of observations is unusually time-consuming for staff, discounting the interruptions to public school activities. In some instances colleges either do not have access to laboratories or do not have enough teaching stations to provide quality experiences. Although it is not likely that simulations can substitute for all laboratory experience, sufficient evidence exists that they can replace some of it. As Cruickshank and Broadbent report:

Simulation training when tested under the most stringent conditions was an unqualified success as a teaching device. . . it was at least as effective as an equal amount of student teaching.[87]

Should this finding be substantiated, fewer public school classrooms would be needed for teacher training purposes and/or shorter student teaching experiences could be established. This finding is consistent with similar results reported by air carriers training commercial pilots.

Simulations are psychologically engaging. The most important reason for interest in simulation is the overwhelming excitement and involvement it creates in participants. The requirements of laying one's skills "on-the-line" in competition with colleagues is the ultimate professional test. In addition the experience requires moving toward acceptable alternatives or solutions. Carl Rogers describes what happens during this process:

What are the types of learning that would follow upon this simulation? First, each student would turn to factual resources to develop his own stance on the issue or to justify his point of view. There would be a degree of self-discipline involved in searching for this factual material. The student would find it necessary to make a personal decision based on his informed stand. He would be involved in handling the interpersonal relationships with those who hold different points of view. He would find himself bearing the responsibility for the consequences of his decisions and actions. Throughout the experience, there would be a disciplined commitment to learning, decision, action.[88]

Another advantage of simulations is that they are:

Effective in promoting knowledge of group dynamics, in providing opportunity for improvement of personal skills in group work, and in aiding self-evaluation. . . .[89]

---

[87]Cruickshank, Donald R., and Frank W. Broadbent. "An Investigation To Determine Effects of Simulation Training on Student Teaching Behavior." Paper presented at American Educational Research Association convention, Los Angeles, February 1969. p. 12.

[88]Rogers, Carl. "Significant Learnings." Instruction: Some Contemporary Views. San Francisco: Chandler Publishing Co., 1967. p. 49.

[89]Weinberger, op. cit., p. 178.

DISADVANTAGES OF SIMULATION

There are difficulties surrounding the utilization of simulations. Simulations do not fit neatly into the program. Since they are departures from the textbook, they are difficult to introduce into the traditional patterns of teaching load, student credit, schedules, classroom space, and equipment.

Simulations often fail to provide empirically derived feedback. Even those simulations that are closed-ended, that is, those that provide feedback to selected participant responses, fail to provide anywhere near the range of possible responses to the many different teacher, administrator, or counselor behaviors. Simulations that are open-ended depend upon the wisdom and training of the participants. In such instances a great deal of attention needs to be given to developing and providing participants with some criteria upon which they can evaluate their strategies.

Instructors are not well enough acquainted with or trained to utilize simulations fully. Only the University Council on Educational Administration requires that users be trained before they are eligible to receive and use its materials. Publishers generally do not feel that training persons in the utilization of commercial products is their responsibility, although limited assistance usually is available.

Simulations may not be well founded or valid. Simulations and simulation games are often developed which have little relationship to real training needs. Each simulation should be based upon careful study of the reference system and how simulation can meet specific training needs which cannot be met more efficiently using traditional methodology. Even when simulations result from study of the reference system, the resultant selection of problems to be solved, operations to be performed, and so forth may arise from intuition rather than empiricism.

QUESTIONS IN NEED OF RESEARCH

The educational community can be of great service to designers and developers by trying out simulations in a variety of settings and providing suggestions for change and improvement. Important and, as yet, unanswered questions include:

- What should be simulated?
- When should a simulation be used in the training system?
- What is learned best utilizing simulation? By whom? Under what conditions?

Among other questions researchers can address themselves to are:

- Do persons react under simulated conditions in the same way as they do in real life? Are simulators useful for prediction?

- What is learned during a simulation?
- What can be done to increase feedback capabilities?
- What effect does simulation training have on subsequent performance?

CONCLUSION

A new and exciting training methodology has moved into the educational field. Properly designed, utilized, and evaluated, simulations will add a new dimension to programs intended to prepare educational professionals. Although much time and research will have to be devoted to these tasks, the potential is almost limitless.

Bibliography

Abt Associates. "Examples of Educational Games." Cambridge, Mass.: Abt Associates, June 1966. (Mimeo.)

Abt, Clark C. An Education System Planning Game. Cambridge, Mass.: Abt Associates. (Mimeo.)

Allender, Jerome S. The Teaching of Inquiry Skills to Elementary School Children. U. S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project No. 5-0594. Washington, D. C.: Government Printing Office, 1968. ED 020 805. EDRS Price: MF-$0.75; HC-$7.16.

American Management Association. Simulation and Gaming: A Symposium. Report No. 55. New York: the Association, 1961.

Andrews, Kenneth R., editor. The Case Method of Teaching Human Relations and Administration. Cambridge: Harvard University Press, 1953.

Beaird, J. H. "Film Tests as Predictors of Teaching Behavior." Paper presented at the American Educational Research Association (AERA) symposium, The [illegible]iction of Teaching Behavior, New York, 1967.

---. "[illegible] Simulation in Counselor Training." Paper presented at AERA convention, C[illegible] February 1966.

---, and John T. Standish. Audio Simulation in Counselor Training. U. S. Department of Health, Education, and Welfare, Office of Education, Final Report, Title VII, Project No. 1245. Washington, D. C.: Government Printing Office, 1964.

Beal, Karen. "A Comparison of Oral and Written Responses to a Classroom Simulation Test." Master's thesis. Corvallis: Oregon State University, 1964. (Unpublished.)

Beck, Isabel. Designs for Involvement. Inglewood, Calif.: Southwest Regional Laboratory for Educational Research and Development, 1968. (Mimeo.)

Berkum, M. M. "Psychological and Physiological Criteria for Stress Simulation Research." Paper presented at third annual symposium, Human Factors Society of Los Angeles, June 1963.

Bessent, Wailand. "A Feedback Procedure for Simulation of Administrative In-Basket Problems." Paper presented at AERA symposium, Feedback in Simulation Techniques, New York, 1967.

Bitzer, Maryann. Self-Directed Inquiry in Clinical Nursing Instructions by Means of the Plato Simulated Laboratory. Report No. R-184. Urbana: University of Illinois Coordinated Science Laboratory, 1963.

Bogdanoff, E., and others. Simulation: An Introduction to a New Technology. TM-499. Santa Monica, Calif.: System Development Corporation, March 1960.

Bolton, Dale L. "Feedback in a Selection of Teacher Simulation." Paper presented at AERA conference, New York City, February 1967.

Bond, J. H. Using Simulation Techniques To Change Attitudes of Education Majors Toward Professional Course Objectives. NDEA OE-7-47-0000-239, Project No. 1247. Monmouth: Oregon State System of Higher Education, 1965. 33 pp.

Boocock, Sarane S. "The Effects of Games with Simulated Environments upon Student Learning." Doctor's thesis. Baltimore: Johns Hopkins University, 1966. (Unpublished.)

---. "An Experimental Study of the Learning Effects of Two Games with Simulated Environments." American Behavioral Scientist 10: 8-17; 1966.

Broadbent, Frank W. "Simulation Problems of Beginning Teachers." The Elementary School Journal 68: 39-43; October 1967.

Buchin, Stanley I., and others, editors. "The Harbets Simulation Exercise and Management Control." Management Controls: New Directions in Basic Research. New York: McGraw-Hill Book Co., 1964.

Bush, Robert N., and Dwight W. Allen. "Micro-Teaching: Controlled Practice in the Training of Teachers." Paper presented at the Santa Barbara Conference on Teacher Education of the Ford Foundation, April 30, 1964.

Bushnell, Donald D. "Computer-Based Simulation: A New Technology For Education." AV Communication Review 11: 45-55; 1963.

Carlson, E. "Games in the Classroom." Saturday Review 50: 62-65, 82-83; April 1967.

Cherryholmes, Cleo H. "Some Current Research on Effectiveness of Educational Simulations: Implications for Alternative Strategies." American Behavioral Scientist 10: 4-7; October 1966.

Cogswell, J. F., and others. Analysis of Instructional Systems. Final Report, TM-1493/201/00, System Development Corporation and U. S. Department of Health, Education, and Welfare, Office of Education. Washington, D. C.: Government Printing Office, April 1966. ED 010 577. EDRS Price: MF-$1.25; HC-$10.88.

---. Clinical Diagnostic Models via Computer Simulation. Report No. Sp-976. Santa Monica, Calif.: System Development Corporation, September 1962.

---. "Systems Analysis and Computer Simulation in the Implementation of Media." Audio-Visual Instructor 10: 384-86; 1965.

Cohen, K. J., and E. Rhenman. "The Role of Management Games in Education and Research." Management Science 7: 131-66; 1961. (Behavioral theory of the firm working paper 22, Graduate School of Industrial Administration, Carnegie Institute of Technology, September 1960.)

Coleman, James S. Games as Vehicles for Social Theory. Report No. 21, Center for the Study of Social Organization of Schools. Baltimore: Johns Hopkins University, May 1968. (A theoretical treatment of the concept of games.)

---, Sarane S. Boocock, and E. O. Schild, editors. "Simulation Games and Learning Behavior" (Part I). American Behavioral Scientist 10: 1-32; November 1966.

---, Sarane S. Boocock, and E. O. Schild, editors. "Simulation Games and Learning Behavior" (Part II). American Behavioral Scientist 10: 1-36; November 1966.

Crawford, Jack, and Paul Twelker. "The Design of Instructional Simulation Systems." Instructional Simulation: A Research Development and Dissemination Activity. Monmouth: Oregon State System of Higher Education, 1969.

Crawford, Meredith P. "Dimensions of Simulation." American Psychologist 21: 788-96; August 1966.

---. Simulation in Training and Education. Alexandria, Va.: Human Resources Research Office, 1967.

Cromie, William J. "Astronaut." The World Book Encyclopedia. Chicago: Field Enterprises Educational Corp., 1967. Vol. 1.

Cruickshank, Donald R. "Building a Simulated Laboratory for Teacher Preparation." Television and Related Media in Teacher Education. Baltimore, Md.: Multi-State Teacher Education Project, 1967.

---. Inner-City Simulation Laboratory. Chicago: Science Research Associates, 1969.

---. "Simulation." Theory Into Practice 7: 190-93; December 1968.

---. "Related Readings on Simulation - A Bibliography." Knoxville: College of Education, The University of Tennessee, n.d. (Mimeo.)

---. "Simulation: New Direction in Teacher Preparation." Phi Delta Kappan 48: 23-24; September 1966.

---. "Twenty-One Questions and Answers About the Teaching Problems Laboratory." Knoxville: College of Education, The University of Tennessee. (Mimeo.)

---. "The Use of Simulation in Teacher Education: A Developing Phenomenon." The Journal of Teacher Education 20: 23-26; Spring 1969.

---, and Frank W. Broadbent. "An Investigation To Determine Effects of Simulation Training on Student Teacher Behavior." Paper presented at AERA convention, Los Angeles, February 1969.

---, and Frank W. Broadbent. The Simulation and Analysis of Problems of Beginning Teachers. U. S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project. No. 5-0789. Washington, D. C.: Government Printing Office, October 1968. ED 024 637. EDRS Price: MF-$1.00; HC-$12.40.

---, Frank W. Broadbent, and Roy L. Bubb. Teaching Problems Laboratory. Chicago: Science Research Associates, 1967.

Cunningham, Luvern L. "Simulation and the Preparation of Educational Administrators." Paper presented at the International Intervisitation Conference sponsored by the University Council on Educational Administration at The University of Michigan, October 1966.

Curry, J. F. "Evaluation of Reverse Block Plan of Student Teaching at North Texas State University." Doctor's thesis. Denton: North Texas State University, 1964. (Unpublished.)

Deese, James. Psychology of Learning. New York: McGraw-Hill Book Co., 1958.

Dillman, Duane H., and Desmond L. Cook. "Simulation in the Training of R and D Project Managers." Paper presented at AERA convention, Los Angeles, February 1969.

Druckman, Daniel. "Dogmatism, Pre-Negotiation Experience, and Simulated Group Representation as Determinants of Dyadic Behavior in a Bargaining Situation." Dissertation Abstracts 27: 2194-95; No. 7-A, 1967.

Dryman, I. A. "The Relationship Between Personality and Orientation in an Interpersonal Game Situation." Dissertation Abstracts 27, 323-24; No. 3-A, 1966.

Dunlop, Richard S., and Ben C. Hintergardt. The Counselor's Week: A Simulation for Counselor Trainees. Scranton, Pa.: International Textbook Co., 1968.

---, and Ben C. Hintergardt. "The Counselor's Week: A Simulation Program for Counselor Trainees." Kansas City: University of Missouri, n.d. (Mimeo.)

Egbert, Robert L. Simulation: A Vehicle for Facilitating Innovation and System Design in Education. Santa Monica, Calif.: System Development Corporation, September 1962.

Fattu, N. A. "An Introduction to Simulation." Simulation Models for Education. Fourth Annual Phi Delta Kappa Symposium on Educational Research. Phi Delta Kappan 1-27; 1965.

Foreign Policy Association. Simulation Games for the Social Studies Classroom. New York: the Association, n.d.

Foster, Robert J., and Jack Danielian. An Analysis of Human Relations Training and Its Implications for Overseas Performance. Humm RRO Technical Report 66-15. Washington, D. C.: The George Washington University, 1966.

"Four Years of Insite." Bloomington: Instructional Systems in Teacher Education, School of Education, Indiana University, n.d. (Mimeo.)

Frederiksen, Norman, D. R. Saunders, and Barbara Wand. "The In-Basket Test." Psychological Monographs 71: 438; 1957.

Gaffga, Robert M. "Simulation. A Method for Observing Student Teacher Behavior." Doctor's thesis. Knoxville: The University of Tennessee, 1967. (Unpublished.)

Gagne, Robert M., editor. Psychological Principles in System Development. New York: Holt, Rinehart, and Winston, 1962.

---. "Simulators." Training Research and Education. (Edited by Robert Glaser.) Pittsburgh: University of Pittsburgh Press, 1962.

---. "Training Devices and Simulators: Some Research Issues." American Psychologist 9: 95-107; 1954.

---, and R. Glaser, editors. "Simulators, Training Research and Education." Science Editions. New York: John Wiley & Sons, 1965.

Garvey, Dale M., and William H. Seiler. A Study of Effectiveness of Different Methods of Teaching International Relations to High School Students. U. S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project. No. S-270. Emporia: Kansas State Teachers College, February 28, 1966. ED 010 007. EDRS Price: MF-$0.75; HC-$6.48.

Gordon, Alice Kaplan. Educational Games Extenstion Service, Unit Five: Games and the School System. Chicago: Science Research Associates, 1968.

Greenlaw, Paul S., Lowell W. Herron, and Richard H. Rawdon. Business Simulation in Industrial and University Education. Englewood Cliffs, N. J.: Prentice-Hall, 1962.

Guetzkow, Harold, editor. Simulation in Social Science: Readings. Englewood Cliffs, N. J.: Prentice-Hall, 1962.

Gumbrell, Arthur J. "Simulation as a Teaching Tool." California Teachers Association Journal 63: 11-13; 1967.

Hammerton, M. "Measures for the Efficiency of Simulators as Training Devices." Ergonomics 10: 63-65; 1967.

---, and A. H. Tickner. "Visual Factors Affecting Transfer of Training from a Simulated to a Real Control Situation." Journal of Applied Psychology 51: 46-49; 1967.

Hemphill, John K., D. E. Griffiths, and N. Frederiksen. Administrative Performance and Personality: A Study of the Principal in a Simulated Elementary School. New York: Teachers College, Columbia University, 1962.

Hershey, Gerald L., Loraine V. Shepard, and John D. Krumboltz. "Effectiveness of Classroom Observation and Simulated Teaching in an Introductory Educational Psychology Course." Journal of Educational Research 58: 233-36; 1965.

Hickok, W. H. A Bibliography of Research Studies on Games and Simulations. Portland, Oreg.: Northwest Regional Educational Laboratory, March 1967.

Horvat, John J. "Feedback in the Negotiations Game." Paper presented at AERA symposium, Feedback in Simulation Techniques, February 18, 1967. ED 017 065. EDRS Price: Not available from EDRS.

---. Professional Negotiation in Education: A Bargaining Game. Columbus, Ohio: Charles E. Merrill Publishing Co., 1968.

Hovland, Carl I., and Bernard Berelson, editors. "Computer Simulation in the Behavioral Sciences." The Behavioral Sciences Today. New York: Harper, 1963. pp. 77-98.

Inbar, Michael. "The Differential Impact of a Game Simulating a Community Disaster." American Behavioral Scientist 10: 26; 1966.

Jennings, Gary. "Empty Seats in the Cockpit." Reader's Digest June 1967. p. 128.

Kersh, Bert Y. Classroom Simulation. U. S. Department of Health, Education, and Welfare, Office of Education, NDEA Title VII, Project 886. Washington, D. C.: Government Printing Office, 1963

---. Classroom Simulation: A New Dimension in Teacher Education. Final Report, Title VII, Project No. 886. Monmouth, Oreg.: Teaching Research Division, June 1963.

---. Classroom Simulation: Further Studies on Dimensions of Realism. Final Report, Title VII, Project No. 5-0848. Monmouth, Oreg.: Teaching Research Division, December 1965. ED 010 176. EDRS Price: MF-$0.50; HC-$3.48.

---. "Simulation in Teacher Education." Paper presented at the American Psychological Association convention, St. Louis, 1962.

LaGrone, Herbert. A Proposal for the Revision of the Pre-Service Professional Programs of Teacher Education. Washington, D. C.: American Association of Colleges for Teacher Education, a department of the National Education Association, 1964.

Lehman, David. L. "Simulation in Science - A Preliminary Report on the Use and Evaluation of Role Playing in the Preparation of Secondary School Student Teachers of Science." Paper presented at American Association for the Advancement of Science meeting, Washington, D. C., December 1966.

Macdonald, James B. "Gamesmanship in the Classroom." National Association of Secondary School Principals Bulletin 50: 51-68; 1966.

McIntyre, Kenneth E. Laboratory Exercises on Selection. Columbus, Ohio: University Council for Educational Administration, n.d.

McKeachie, Wilbert J., and C. L. Doyle. Psychology. Reading, Mass.: Addison-Wesley Publishing Co., 1966.

McKnight, A. James, and Harold G. Hunter. An Experimental Evaluation of a Driver Simulator for Safety Training. Alexandria, Va.: Human Resources Research Office, The George Washington University, June 1966.

National Education Association, Department of Elementary School Principals. Six Simulated Case Studies. Washington, D. C.: the Department, 1968.

Ohm, Robert E. "A Game Theory Derived Rationale for Constructing Feedback to In-Basket Items Used in the Madison School System Simulation." Norman: University of Oklahoma, 1967. (Mimeo.)

Pfeiffer, John. New Look at Education: System Analysis in Our Schools and Colleges. New York: Odyssey Press, 1968.

Pharis, William L., Jack D. Roberts, and Richard Wynn. Decision-Making and the Elementary School Principal. Washington, D. C.: Department of Elementary School Principals, National Education Association, 1966.

Pigors, Paul and Faith. Case Method in Human Relations: The Incident Process. New York: McGraw-Hill Book Co., 1963.

Reed, L. R. "A Study of the Feasibility of Using Operational Simulation Techniques for Evaluating Administrative Skills Possessed by Instructional Communications Specialist." Doctor's thesis. Syracuse, N. Y.: Syracuse University, 1966. (Unpublished.)

Rice, A. H. "Educators Will Hear a Lot About Simulation Techniques." Nation's Schools 78: 10+; October 1966.

Richards, W. T. "Simulation: What Is it and What Does It Offer?" Wisconsin Journal of Education 96: 12-13; April 1964.

Rickard, Scott T. "The Application of Audiovisual Materials and Simulation To Modify the Harvard Case Study Method for Preparing Student Personnel Administration." Doctor's thesis. Bloomington: Indiana University, 1966. (Unpublished.) ED 010 253. EDRS Price: MF-$0.75; HC-$6.60.

Roberts, Thomas S. "Training Managers To Make Decisions: The In-Basket Method." Personnel 44: 58-66; September-October 1965.

Rogers, Carl. "Significant Learnings." Instruction: Some Contemporary Views. San Francisco: Chandler Publishing Co., 1967.

Ryan, T. Antoinette. "Use of Simulation To Increase Transfer." The School Review 76: 246-52; June 1968.

---. "Using Simulated Simulated Situation Problem-Solving Tasks To Increase Ability To Apply Principles in Realistic Settings." Paper presented at AERA convention, Chicago, February 1965.

Schalock, H. D., J. H. Beaird, and Helen Simmons. Motion Pictures as Test Stimuli: An Application of New Media to the Prediction of Complex Behavior. U. S. Department of Health, Education, and Welfare, Office of Education, NDEA Title VII, Project 971. Washington, D. C.: Government Printing Office, 1964.

---, James H. Beaird, and Helen Simmons. Motion Pictures as Test Stimuli: An Application of New Media to the Prediction of Complex Behavior. U. S. Department of Health, Education, and Welfare, Office of Education, Final Report, Title VII, Project No. 971. Monmouth Oreg.: Teaching Research Division, December 1964.

Simmons, P. L. and R. F. "The Simulation of Cognitive Processes: An Annotated Bibliography." IRE Transactions on Electronic Computers, EC-10, 462-483. September 1961.

Smith, Robert G., Jr. The Design of Instructional Systems. Humm RRO Technical Report 66-18. Alexandria, Va.: Human Resources Research Office, June 1965.

Stewart, Edward C. "The Simulation of Cultural Differences." The Journal of Communication 16: 291-304; December 1966.

Swan, Howard A., and Jim Johnson. Simulation Exercises. DeKalb, Ill.: Creative Educational Materials, 1968.

Tansey, P. J., and Derick Unwin. Simulation and Gaming in Education. London: Metheun Ltd., 1969.

Teaching Research. Instructional Uses of Simulation: A Selected Bibliography. Portland, Oreg.: Northwest Regional Educational Laboratory, 1967.

---. Low Cost Instructional Simulation Materials for Teacher Education: Phase I Student Manual. Monmouth: Oregon State System of Higher Education, 1968.

---. Low Cost Instructional Simulation Materials for Teacher Education: Phase II Student Manual. Monmouth: Oregon State System of Higher Education, 1968.

Temp, George. "Simulation and Teacher Education." Los Angeles: Teacher Education Project, University of California, September 1962. (Mimeo.)

Twelker, Paul A. "Classroom Simulation and Teacher Preparation." The School Review 75: 197-204; Summer 1967.

---. "Designing Simulation Systems." Paper presented at AERA convention, Los Angeles, February 1969. ED 028 964. EDRS Price: MF-$0.25; HC-$0.65.

---. Prompting as an Instructional Variable in Classroom Simulation. U. S. Department of Health, Education, and Welfare, Office of Education, Final Report, Title VII, Project No. 5-0950. Monmouth, Oreg.: Teaching Research Division, December 1965. ED 010 199. EDRS Price: MF-$0.50; HC-$2.96.

---. Simulation in College Instruction. U. S. Department of Health, Education, and Welfare, Office of Education, Terminal Program report, Project No. 8-2041. Monmouth, Oreg.: Teaching Research, 1968.

---. "Simulation: What Is It? Why Is It?" Paper presented at Association for Supervision and Curriculum Development Conference, San Diego, Calif., April 1968.

Utsey, J. "Simulation in Reading." Paper presented at National Reading conference, Miami, Fla., December 1966.

---, C. Wallen, and H.O. Beldin. "Simulation: A Breakthrough in the Education of Reading Teachers." Phi Delta Kappan 47: 572-74; June 1966.

Venditti, Frederick. Handbook for Teaching in Valleybrook Elementary School: A Simulation Game Focusing upon Problems of Racially Desegregated Schools. Knoxville: Equal Opportunities Planning Center, The University of Tennessee.

Vlcek, C. "Classroom Simulation in Teacher Education." Audiovisual Instruction, February 1966.

---. "Assessing the Effect and Transfer Value of a Classroom Simulator Technique." Doctor's thesis. East Lansing: Michigan State University, 1965. (Unpublished.)

Wagner, Guy, and Max Hosier. Reading Games: Strengthening Reading Skills with Instruction Games. Darien, Conn.: Educational Publishing Corp., 1960.

Wallen, C. J. "Developing Referential Categories with Instructional Simulation." Paper presented at AERA convention, Chicago, February 1966.

Weinberger, Morris J. "The Use of Simulation in the Teaching of School Administration." Doctor's thesis. New York: Teachers College, Columbia University, 1965. (Unpublished.)

White, Ellis. "Preparing College Administrators Through the 'In-Basket' Technique." Current Issues in Higher Education. Washington, D. C.: Association for Higher Education, a department of the National Education Association, 1963.

Wing, Richard L. Use of Technical Media for Simulating Environments To Provide Individualized Instruction. U. S. Department of Health, Education, and Welfare, Office of Education, Cooperative Research Project, No. 1948. Washington, D. C.: Government Printing Office, 1965.

Wynn, Richard. "Simulation: Terrible Reality in the Preparation of School Administrators." Phi Delta Kappan 46: 170-73; 1964.

Zoll, Allen A., III. "The Action Maze." Dynamic Management Education. Seattle, Wash.: Management Education Associates, 1966.

This publication was prepared pursuant to a contract with the U.S. Department of Health, Education, and Welfare, Office of Education; Contract number OEC-0-8-080490-3706-(010). Contractors undertaking such projects under Government sponsorship are encouraged to express their judgment in professional and technical matters. Points of view or opinions do not, therefore, necessarily represent official Office of Education position or policy.