THE DEVELOPMENT OF CAREER EXPLORATION WORK
SIMULATION UNITS FOR CAREER EDUCATION
IN GRADES SEVEN THROUGH NINE
by
Gerald Eldon Manwill
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of the requirements for the degree
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Gary Eldon Manwill
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ABSTRACT

The Development of Career Exploration Work Simulation Units for Career Education in Grades Seven Through Nine

by

Gerald Eldon Manwill
Utah State University, 1974

Major Professor: Dr. E. Wayne Wright
Department: Psychology

The purpose of this study was to (1) select six vocational areas for Career Exploration Work Simulation Units development, hereafter referred to as CEWSU (2) design mock-up sites for CEWSU construction, (3) specify materials to be used in the mock-up, (4) describe tasks to be completed in the simulation exercises, (5) construct six CEWSU simulation units for placement in junior high school career education programs, (6) gather materials and tools to be used in each of the six CEWSU, (7) develop and program cassette tape instructions and flip charts for the CEWSU, (8) field test the CEWSU, (9) revise the CEWSU according to field test results, (10) publish replicable plans for the construction and operation of each CEWSU.
The ultimate goal of this project was to design and develop a product for use in the public school system. For the final product to be considered effective it had to meet various criteria. The criteria were as follows:

1. The CEWSU had to be self-instructional.
2. The CEWSU had to provide a hands-on experience.
3. The CEWSU had to provide the experience in a short period of time.
4. The CEWSU had to be inexpensive to operate.
5. The CEWSU had to be readily available to youth.
6. The CEWSU had to simulate an actual work experience.

The implications from the results indicated that:

1. Not all of the criteria listed above were met by all of the CEWSU.
2. The CEWSU developed in the present study should be reprogrammed for use with the developmentally disabled child.
3. Many more CEWSU, for career exploration, should be designed and developed in other vocational areas than those covered in the present project.

(91 pages)
CHAPTER I

INTRODUCTION

One of the most important decisions that people have to make during their lives is that of choosing an occupation. In a society as highly industrialized as ours few youth have the opportunity for actual work experiences during the years in which they are formulating their vocational attitudes. Today only a small percentage of youth are able to follow their parents to work and learn from firsthand observation. According to Olson (1972), many youth appear to have poor self-concepts, low aspirations, and weak motivation. They are lacking in a knowledge of industry, commerce, and education. Thus, a real chasm is created between the student and the world of work. There are some work experience programs designed to give prevocational training, but they are few in number and they are much more concerned with in-depth experience in a specific occupation. Some degree of exposure to the world of work is attained by youth who find part-time and summer jobs. For the majority of youth information regarding the world of work is not readily available.

Most youth today view occupational choice as a once-in-a-lifetime hit or miss process. Ginzberg (1952) refers to occupational choice as a developmental process that takes place over a period of
years. From a developmental point of view few youth are able to assess their interests and aptitudes fully and realistically without actually working in a variety of vocational areas, i.e., without a hands-on experience. A hands-on experience, as defined by Hooks (1972), should include the following:

1. 100% participation of the student in an activity that produces a visible product;
2. the use of tools and skills as an extension of self;
3. an emphasis on tools and skills as they relate to occupations in the world of work;
4. an emphasis on tools and skills as they relate to job preparation;
5. a conscious effort to relate the activities used to the actual job situation.

In the past, readings, slides, films or combinations of these media have failed to provide a realistic base for work attitudes and expectations. Hansen (1967) reported that traditional methods used to provide career information need serious evaluation and possibly even replacement. His suggestions are based on various changes taking place in the area of vocational education. He mentions three important areas of influence:

1. changes in vocational development theory;
2. the nature of work and its meaning to the individual;
3. new information retrieval technology.

In order to provide a realistic base for work attitudes and expectations it becomes necessary to bridge the gap between school and life. A career education program that includes hands-on
experiences in a variety of vocational areas should provide a more valid base for the individual to develop appropriate attitudes and expectations about work. An effective model must meet the following criteria: (1) provide hands-on experiences in a variety of vocational areas potentially available to the subject; (2) provide the experience in a relatively short period of time; (3) be inexpensive to operate; (4) be readily available to youth.

One approach to career education which meets the requirements of the aforementioned model is that of simulation, i.e., realistic work situations in a classroom or laboratory setting.

Research in the area of simulation has been reported by Wigderson (1968), Krumboltz (1968), Johnson (1968), Twelker (1969), Hanson and Parker (1972), and others. Research results have shown that simulated occupational experiences do in fact generate occupation interest. Also, students in a simulated situation tend to perceive themselves as involved in a real-world problem which makes high motivation possible.

According to Hanson and Parker (1972), simulation meets the challenge of preparing youth to understand and function effectively in the world in which they will be living. It does so via individualized instruction in activities directly related to real work situations.
CEWSU for career education were developed by the writer and a team of co-workers using a variety of source materials. The CEWSU were each field tested and revised, then field tested and revised again several times, according to the research and development model of Borg and Gall (1971). It was suggested that a knowledge of precise simulation techniques may aid or equip teachers to help many children in their own classrooms. It was felt that if an effective simulation program could be developed and implemented into the junior high school setting many young people would have increased opportunity to explore, through the process of simulation, various occupations in the world of work. This is not meant to imply that simulation is seen as a panacea for all of the ills of career education. It is recognized that other educational innovations also have the potential to improve classroom instruction. The present work simulation project was designed to be used only as part of a total program of career education.

The intent of CEWSU, as developed in the present study, is to give youth exposure, through a hands-on experience, to a variety of vocational areas. It is not intended that the student gain specific skills, but that he gain firsthand knowledge of vocational areas, and of some tasks typically performed by field workers in those areas. Primary emphasis in work simulation is on the presentation of hands-on experiences in some specific tasks similar to those
performed by a qualified worker. A mock-up of the work area with appropriate materials and tools attempts to duplicate as closely as possible actual work and working conditions. The student is directed through the problem solving sequence by means of cassette tape recorded instructions and illustrated flip charts.

The Objectives

The objective of this study was to design and develop various CEWSU for placement in junior high school career education programs. The study included the complete process of planning, constructing and field testing of six CEWSU, covering the vocational areas of automobile brake repair, automobile electrical system, electronic assembly, black and white photography, basic drafting, and basic printing. The construction of each CEWSU involved the development of illustrated flip charts and recorded instructional tapes designed to enable students to proceed through each CEWSU on an individualized basis. Each CEWSU underwent several stages of field testing and modification over a period of four months.

For the developed products to be considered effective, they were expected to meet the criteria outlined above, i.e., (1) they had to be self-instructional; (2) they had to provide a hands-on experience; (3) they had to provide the experience in a relatively short period of time; (4) they had to be inexpensive to operate;
they had to be readily available to youth, and (6) they had to simulate an actual work experience.

Specific questions for which answers were sought were as follows:

(1) Could CEWSU be developed that were totally self-instructional?
(2) Could a hands-on experience be provided in all of the six vocational areas chosen for the study?
(3) Could CEWSU be developed that would require, on the average, only one class period to complete?
(4) Could CEWSU be developed at a relatively inexpensive cost?
(5) Could the CEWSU be made readily available to youth?
(6) Could materials be developed that would simulate an actual work experience in each of the CEWSU?

Format of The Study

Because of the developmental nature of the present study the investigator's purpose was not that of testing specific hypotheses. Rather, the purpose was to design and develop a useable product for a junior high school career education program. The procedures of the present study, which followed the research and development model of Borg and Gall (1971), are felt to be consistent with
current considerations being given to the needs in education for
developmental and formative evaluation studies of this type.

**Definition of Terms**

To aid the reader in analyzing the elements and composition of the study, the following definition of terms is provided to clarify the intent of the author throughout the study:

1. **Career education** -- the systematic effort of increasing the career possibilities available to people by facilitating more rational and realistic career preparation and planning.

2. **Simulation** -- a type of instruction which, to a great extent, duplicates an environmental reality in the classroom situation.

3. **Hands-on** -- the actual use of the hands to perform a task in a simulated situation.

4. **Self-instructional** -- the process whereby a task is completed by an individual without aid from any other person. As used in this study, cassette tape recordings and illustrated flip charts are the students only aids.

5. **Work simulation** -- a mock-up of the work area with appropriate tools and materials which duplicate, as
closely as possible, actual working conditions.

6. Field test -- a testing procedure wherein individuals are subjected to the simulated situation in order to help the developers locate areas or materials of the simulation unit which need modification or improvement.

7. Simulation unit -- the actual mobile machinery that the student works on.

8. Research and development -- a process used to develop and validate educational products.

9. R & D cycle -- consists of studying research findings pertinent to the product to be developed, developing the product based on these findings, field testing it in the setting where it will be used eventually, and revising it to correct the deficiencies found in the field testing stage.

10. Exploration -- refers to a complete examination and expansion of concepts that are relative to the process of career education. In the present study, exploration is used in contrast to skill development or training where ability is developed for greater job proficiency.
CHAPTER II

REVIEW OF THE LITERATURE

**Historical Perspectives as to Instructional Materials**

Many different and varied instructional materials for use in career education programs have been developed in the past decade. At present, many more instructional materials are being developed and many are currently available. For example, Beam and Clary (1967) and Dubato (1968) developed a teacher's guide for use in an occupational exploration course. A handbook developed by Mullen (1968) for school administrators, teachers and counselors, consisted mainly of various volunteer activities in a career exploration program. DesRoches (1965) did essentially the same thing. Impellitteri (1968) devised a computer-assisted occupational guidance program in career exploration. Laramore (1968), Stewart and Kissinger (1970), Cook (1970), and Martin (1970) all were involved in making films dealing with various aspects of different careers. Lawson and Bancroft (1966) developed a program of career education which incorporated video tapes.

At the present time instructional materials dealing with career education are being geared more and more towards simulation techniques.
Research on Career Exploration Programs

In the past at the elementary school level, career education has been limited primarily to a very general introduction to the world of work. In junior high school (grades seven, eight, and nine) career education involves some general form of exploration experiences. Skill development comes more into play during the high school years. While most of the career exploration programs developed in the last decade have reported favorable results, as far as student interest and motivation are concerned, they do tend to conflict at times as to their overall effectiveness.

According to Hoppock (1967) the success or the failure of any program, to a large extent, is dependent upon the instructor, his materials, the ability and/or interest of the students, and the instruments that the instructor uses to measure his results.

Sherman (1967), in evaluating a career exploration program for grades seven through nine, found that curriculum used did produce some positive effects relating to the student's attitude toward self.

According to Hayes (1967) students need accurate occupational information that will help them make sound decisions. Also, in career exploration programs, students and teachers should be concerned with the range of occupations studied more than with the total number of occupations studied.
According to Cochran and Weis (1972), in a study comparing two types of career exploration programs, four specific objectives were sought in relation to career exploration: (1) to help the student develop more appropriate career interest patterns based upon knowledge of himself and the world of work; (2) to help the student develop more appropriate educational and vocational plans and goals based on knowledge of self and the world of work; (3) to help the student develop a positive self-image as a person and as a potential worker; and (4) to provide a program considered worthwhile by parents of students in the program.

Hooks (1972) reported that career orientation and exploration, including some hands-on experiences and some simulation experiences, can be one of the most meaningful educational experiences possible for meeting the needs of young people. Today, career exploration programs are steadily increasing throughout the United States.

Research Related to Simulation

Literature in career education is replete with definitions of simulation, i.e., what it is and how it should be used. For the purposes of this study, the Webster definition, "the representation of a system by a device (as a computer) that imitates the behavior of the system," is the most nearly valid (Webster, 1970).
Criuckshank (1972) speaks of simulation from the behavioral scientists' point of view as being a variety of a model which is distinguishable due to its capability of being manipulated. To the layman, simulation is simply something that gives the appearance of something else.

Though simulation began to appear in the public classroom in the late 1950's, it has received most of its national recognition since 1965 (Hanson and Parker, 1972). Wynn (1964) suggested that while sophisticated forms of simulation techniques have been developed, the basic techniques have been used for centuries. According to Weinberger (1965), war games seem to be the oldest form of simulation recorded.

Recently, simulation has been used as a method of teaching and training in various disciplines. McClelland (1970) reported that the techniques of simulation have proved effective in training military personnel, and he raised the question of whether simulation might also benefit vocational education. He believes that the answer may come about through research with training programs in the armed forces. He sees vocational educators as being overly cautious about accepting simulation techniques for use in their classrooms.

According to Johnson (1968), there has been very little experimental research aimed at stimulating decision-making and vocational exploration.
Resnick (1970) developed a simulation technique which incorporates competition, involvement, and a variety of interest characteristics. His simulation basically teaches students to learn strategies. Krumboltz (1967) developed various occupational simulations with over one thousand students attending high school. His simulations incorporated such occupations as x-ray technicians, laboratory technicians, salesmen, etc. The students were required to perform tasks typically performed by people in these occupations via simulation. Research findings of Krumboltz study demonstrated that the simulations did in fact augment interest in these occupations and promoted learning about them.

The Center for Vocational and Technical Education, at Ohio State University, has designed simulation training packets in "Supervision and Decision-Making Skills in Vocational Education." Since all of the exercises in the Ohio State University's program are similar to actual events, the objective of the training is to provide realistic experiences in a simulated setting, with the simulation techniques utilizing in-basket/out basket exercises as well as role play techniques.

Meckley (1970) feels that simulation is a powerful technique in the training of pre-and in-service staff. He states, "Through simulation, the student not only learns the content and functions of
his field of specialty; he also learns a lot about himself." (Meckley, 1970, p. 40) Guetzkow (1962) suggests that people involved in a simulation game tend to take it quite seriously. Guetzkow, et. al. (1963), p. 13), Drive (1962) and Alschuler (1970) all indicate that the size of a reward has very little effect on the simulation involvement. Pool and Abelson (1962) maintain that in doing research the actual simulation has to be so close to reality that many variables are allowed into the study that become most difficult to control.

Curry and Brooks (1971) found simulation to be more effective than traditional lecturing methods as a means of changing student attitudes. In an experiment where the traditional lecturing method was used with one group and simulated learning used with the other group, Baranyai (1967) concluded that the simulation approach led to both a higher and more realistic level of educational and occupational aspiration. Similarly, Conte (1968), in an experiment measuring the effectiveness of simulated gaming on sixth grade students' knowledge, concluded that those students who took part in the simulation manifested a significant increase in their knowledge of life-career planning.

Simulation is also viewed as being highly motivational (Twelker, 1968). Wigderson (1968) suggests that one of the advantages of simulation may be the fact that students tend to
perceive themselves as being part of a real-world problem, which makes high motivation possible. According to Sobol (1971), an ever increasing number of people, both young and old, are starting to recognize the broad gap which exists between school and life. One apparently valid way to bridge the gap between school and life is through simulated work experiences in the schools. Thus, simulation is felt to be of great value to career education. For example, Johnson (1968) reports that students receiving different types of simulated materials tend to show more interest as to future occupational exploration than do students not provided with such materials. An earlier study by Shires (1966) indicates essentially the same conclusion. Krumboltz (1967) found that problem solving type tasks generate more student interest in the simulation than conventional tasks which do not entail problem solving techniques.

Krumboltz (1969) offers various guidelines for simulation kits. He feels they should be realistic and representative of problems which employees really face.

According to Twelker (1968), teachers involved in career education should focus on three uses of simulation: (1) simulation used to present information; (2) simulation used to elicit responses or exercise the student; (3) simulation used to assess performance.

Though simulation training is new in research dealing with some of the psychological factors in career decision-making, there
does appear to be increasing support for simulation techniques (Twissel, 1968). 1968; Cherryholmes, 1966; Apt Associates, 1966; Appalachian State University, 1968; and Hanson and Parker, 1972).

**Summary**

Through reviewing the literature, it does appear that there is a widespread belief that and career exploration, one becomes aware of the importance of simulation. However, simulation is not a new aspect of teaching methods. According to Wynn (1964), the basic techniques of simulation have been around for centuries, and Weinberger (1965) indicates that were probably used to be the oldest form of simulation recorded. Most of the current emphasis on simulation as a teaching tool, particularly in career education, has come about since 1965 (Hanson and Parker, 1972). At present, simulation techniques are being used by many career education teachers throughout the country in order to bridge the gap which often exists between academic studies and the workplace.

In the past decade many different types of simulation materials have been utilized in career education programs. More recently, however, career education training has moved more towards simulation techniques.
does appear to be increasing support for simulation as a valid process. All of the following studies lend additional support to the motivational value of simulation techniques (Twelker, 1968; Harry, 1968; Johnson, 1968; Cherryholmes, 1966; Apt Associates, 1966; Sprague and Shirts, 1966; and Hanson and Parker, 1972).

**Summary**

Through reviewing the literature in the area of simulation and career exploration, one becomes aware of the fact that although simulation is not a new aspect of teaching methodology, generally, it is relatively new in the area of career education. According to Wynn (1964), the basic techniques of simulation have been used for centuries, and Weinberger (1965) indicates that war games seem to be the oldest form of simulation recorded. Most of the current emphasis on simulation as a teaching tool, particularly in career education, has come about since 1965 (Hanson and Parker, 1972). At present, simulation techniques are being used by many career education teachers throughout the country in order to bridge the gap which often exists between academic studies and the world of work.

In the past decade many different types of instructional materials have been utilized in career education programs. More recently, however, career education training is being geared more and more towards simulation techniques.
CHAPTER III

DEVELOPMENTAL PROCEDURES

This chapter details the procedures used in the development of six Career Exploration Work Simulation Units, hereafter referred to as CEWSU, for placement in junior high school career education programs.

Background Information and Rationale

This study was made possible through a grant from the Utah State Board of Education. The study owes much to the efforts of Jake Ainsworth, who developed previous work simulation prototypes to be used with underachieving high school students.

This study was conducted as a team research project. The philosophy adhered to was that an interdisciplinary approach would lend itself well to the enhancement of the present project. A team effort did, in fact, prove to be most advantageous.

The research team consisted of six members. Herbert Miller, the project director, held a Master's Degree in Social Work. The author, a Master's Degree Candidate in Psychology, was in charge of the development of evaluation materials and field testing. Don Walstrom, a college graduate in the area of industrial technology, was involved heavily in the technical development of the CEWSU.
Larry Stevens, an agricultural technology major, was also involved in the development and construction of the CEWSU. Debbie Muller, a special education teacher, became involved in the project as an illustrator and printing consultant. Bill Cottle, a Master's Degree Candidate in Photography, was in charge of developing the Black and White Photography Unit.

Each member of the research team brought diverse knowledge and skills to the research setting. In retrospect, this project would have been literally impossible to complete without implementing a team approach.

In conjunction with a Technical Advisory Board consisting of eight members, the research team selected six vocational areas for CEWSU development. The Advisory Board was comprised of representatives from the following areas of work: (1) qualified workers in trade and industrial areas; (2) staff members from the Department of Vocational Technical Education, Utah State University; (3) staff from the Utah State Board of Education, Vocational Education Division; (4) administrative staff from the participating schools.

Factors considered in determining the six vocations for which the CEWSU were developed were as follows: (1) projected demand for new and replacement workers in the vocation; (2) present availability of training experience for the vocation; (3) coordination
with other similar projects so as to avoid duplication; (4) feasibility
of adequately sampling the vocational field with a CEWSU.

The vocational areas selected were: (1) automobile brake
repair, which consisted of replacing worn brake shoes with new ones
by removing the wheel, rim, and brake drum and then by removing
the worn brake shoes and replacing them with new ones; (2) automobile
electrical system, which consisted of wiring the starting, charging,
and ignition systems of an automobile mock-up; (3) electronic assembly,
which consisted of wiring both a series and a parallel circuit on a
mock-up with buttons and lights; electronic assembly also consisted of
wiring a crystal radio; (4) black and white photography, which consisted
of taking various photographs and then processing the film through
the stages of film development and film printing; (5) basic drafting,
which consisted of making two separate drawings and then making
blueprints from the drawings; (6) basic printing, which consisted
of setting type, inking the press and making letterheads.

Pictures of each of these CEWSU are found in Appendix B.

Procedures Followed in the Construction and Development of Career Exploration Work Simulation Units

The sequential steps in the development of each CEWSU were as follows:

(1) Working plans were completed
a. consultation with representatives of the pinpointed occupation and with staff specialists from The Division of Vocational Education, Utah State Department of Education;
b. site mock-up designed;
c. materials and tools specified;
d. description of task to be completed in the simulation exercise;

(2) Construction of CEWSU
a. mock-up completed;
b. materials and tools gathered;
c. cassette tape recorded instructions and flip charts completed;

(3) Preliminary field test
a. present CEWSU to 4-6 students;
b. collect observational and questionnaire data;

(4) Revise the CEWSU as suggested by field testing

(5) Additional preliminary field testing
a. present CEWSU to 4-6 students;
b. collect observational and questionnaire data;

(6) Revise CEWSU as suggested by the additional preliminary field testing.
(7) Field test and revise CEWSU until they are considered ready for a main field test in selected schools.

(8) Publish replicable plans for the construction and operation of each CEWSU.

Appendix E contains an observation sheet that was used in the preliminary field testing of each CEWSU. As each student was brought to the lab and programmed through a CEWSU an observer used the observation sheet as a problem indicator. This provided the research team with a systematic means of evaluating the developmental problems encountered in each CEWSU. When two or three students became confused or lost on a particular step in the programmed sequence the observation sheet would pinpoint the problem and changes would be implemented by the research team.

**CEWSU Evaluation of Data**

This section contains the results of various data collection procedures.

The following data were obtained from the Student Attitude Survey found in Appendix F. This was an attitude measure that provided feedback to the research team as a means of improving the CEWSU. In this section the CEWSU were taken as a whole.
Figure 1. Results of the Student Attitude Survey found in Appendix F.

The overall consensus was that the experience that the student went through was an enjoyable one. The great majority of students wanted to see more experiences of this type in the schools.

Figure 2 contains pretest and posttest data related to the knowledge that was gained by students as they went through the CEWSU. Data on the printing unit and the photography unit is absent due to the developmental lag of these two units. Some field testing
was done on these units but not enough to warrant any kind of an analysis.

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<td>2.13</td>
<td>4.08</td>
<td>3.17</td>
</tr>
<tr>
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<td>20</td>
<td>3.00</td>
<td>3.00</td>
<td>2.00</td>
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<tr>
<td>Electrical Wiring</td>
<td>17</td>
<td>1.83</td>
<td>2.00</td>
<td>1.83</td>
</tr>
<tr>
<td>Basic Drafting</td>
<td>10</td>
<td>3.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
</tbody>
</table>

Figure 2. Average knowledge gains of students on posttests.
From the data in Figure 2 it can be seen that knowledge gains were realized in all four areas listed. The largest posttest gains came in the Automobile Electrical System CEWSU. It is interesting to note that though the attainment of knowledge was not a primary goal of this study, it nevertheless did take place to a substantial degree. Copies of the questionnaires listed in Figure 2 are located in Appendix C.

Figure 3 contains a chart embodying the total research thrust to date. From this chart it can be seen that various criteria listed were not totally met in the present study. It is important that the reader know this in order to more fully realize the developmental nature of this study. Some CEWSU were developed smoothly and rapidly as evidenced by the chart. Others were more difficult to develop and took more time. No two CEWSU were alike as far as ease and speed of development. It is important to remember that this study was only the beginning of a long sequence of developments that must follow, in order that the CEWSU be improved and perfected. Once the CEWSU have proved themselves in a major field testing in the public schools over an extended period of time, then and only then will they be ready for placement in an ongoing career education program in the schools. This is the only progression to follow if the student is to receive maximum benefit from developmental research.
<table>
<thead>
<tr>
<th>Requirement</th>
<th>CEWSU 1</th>
<th>CEWSU 2</th>
<th>CEWSU 3</th>
<th>CEWSU 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has been field tested in laboratory with at least 12 subjects</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Development does not need further development experience or hands-on</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Developed at a cost of between $175-$225</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Takes between 45-60 minutes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Totally self-instruction</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Figure 3.** Developmental chart pinpointing the stage of development of each of the CEWSU.
Since the study was patterned after a developmental rather than a research model, a description of the "R & D" model followed in the study is presented below.

According to Borg and Gall (1971), "Educational R & D effectively bridges the gap that has long existed between research and classroom practice." (Borg and Gall, 1971, p. 31)

Educational research and development projects are different than most applied and basic research projects in four respects:

(1) the objective of basic and applied research is the search for new knowledge; the objective of educational R & D is a finished product that can be used in the schools;

(2) basic and applied research are usually small scale enterprises; relatively large teams of researchers are needed to carry out the objectives of a single R & D program;

(3) basic and applied research projects generally do not last more than a half year or so; an educational R & D program will generally extend over a period of years before its objectives are met;

(4) with basic and applied research, the researcher usually begins by developing a hypothesis or problem to be studied. Then the researcher selects a sample of subjects and collects relevant data. These data are analyzed by statistical tools, and subsequently conclusions are reached about the hypothesis or research problem. In educational R & D a quite different sequence is followed. It is called the R & D cycle. (Borg and Gall, 1971, p. 30-31)
The Research and Development Cycle

The research and development cycle mentioned in Borg and Gall (1971) refers to the following: (1) product selection; (2) literature review; (3) planning; (4) development of preliminary form of the product, referred to as the prototype; (5) preliminary field test and product revision; (6) main field test and product revision; (7) operational field test and final product revision.

The present study utilized the research and development cycle through and including step five. Steps six and seven will be carried out in the Logan City Schools, Logan, Utah, during the school year 1973-74. This will be made possible through a grant from the Utah State Board of Education. It was felt by the State Board that preliminary results were encouraging enough to further fund the project.

As a clarification to the reader, the field testing done in this study could be labeled prototype testing, since individuals were brought to the CEWSU rather than the CEWSU being taken out to them. This clarification is added to help the reader understand that the CEWSU, to date, have not been tested outside of the laboratory setting.
CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter contains a summary of the total project effort, some conclusions reached concerning the development of CEWSU, and some preliminary recommendations based on the outcome of this project.

The purpose of this study was to design and develop six CEWSU for placement in junior high school career education programs. The study included planning of the CEWSU, construction of the CEWSU, development of illustrated flip charts for the CEWSU, and development of recorded instructional tapes to help the students proceed through the CEWSU. The project was carried out over a four month period.

A review of books, periodicals, and discussion papers established a background on simulation as it relates to career education. As it was conceived, the intent of simulation at the junior high school level is to give youth exposure, through hands-on experience, to a variety of vocational areas.

The research team, in designing and developing the six CEWSU, designated them for use in an exploratory capacity. Exploration, as opposed to skill development or training, was a primary goal of this study. It was felt that at the junior high school
level exploration takes precedence over skills training. A number of research studies support such a hypothesis (Sherman, 1967; Hayes, 1967; and Cochran and Weis, 1972).

Simulation was used as the modus operandi in the present study because of the favorable research results reported in previous studies which have utilized this technique (Twelker, 1968; Wigderson, 1968; Sobol, 1971; and others).

Conclusions

Six objectives were sought in relation to the development of the project's CEWSU. For the CEWSU to be considered effective, they were expected to meet the following criterion: (1) they had to be self-instructional; (2) they had to provide a hands-on experience; (3) they had to provide the experience in a relatively short period of time; (4) they had to be inexpensive to operate; (5) they had to be readily available to youth; (6) they had to simulate an actual work experience.

As a result of the present project the following conclusions were reached concerning the development of work simulation units and their potential use in the junior high school setting:

1. Some CEWSU, for career exploration, can be programmed so that they are completely self-instructional. This can
be accomplished with the aid of cassette tapes and illustrated flip charts.

2. CEWSU, for career exploration, can be programmed so that they provide a hands-on experience. In the present study the hands-on experiences were derived by studying tasks typically performed in various occupations and duplicating one or more specific tasks in the CEWSU.

3. About half of the CEWSU designed in this study, require an average of fifty minutes to complete from start to finish. Three of the units, the Basic Drafting, the Black and White Photography, and the Printing Press, take about three class periods to complete. One aspect of the Black and White Photography Unit that should be noted here is that it involves two students simultaneously, whereas the other five CEWSU are worked on by only one student at a time.

4. CEWSU can be developed and replicated at a rather inexpensive cost. The average cost per unit was two-hundred dollars, including planning, designing, and constructing the unit. The Black and White Photography Unit cost about three-hundred-and-twenty-five dollars to complete due to the equipment needed for the darkroom.
5. Some CEWSU can be made readily available to youth as evidenced by the short time involved in the planning, designing, and constructing of some CEWSU, other of the CEWSU were more difficult to develop.

6. CEWSU can be developed that simulate actual work experiences. Again, this was made possible through analyzing tasks typically performed by people in the various vocational areas under study and by duplicating some specific tasks in the simulation units.

**Recommendations**

Various implications for future research have come about as a result of this study. If CEWSU for career exploration can be developed for normal youngsters in regular classrooms, why can't these CEWSU be revised and reprogrammed for use with the special child? One recommendation of this study is that these CEWSU be reprogrammed for use with the developmentally disabled child.

Also, based on the experiences of this study, it is hoped that many more CEWSU for career exploration will be designed and developed in other vocational areas than those covered in the present study. This, in essence, will give youth the opportunity for a more meaningful look at the world of work and their relationship to it.
Previous research seems to suggest that the more opportunities youth get to explore various occupations, the greater the possibility that they will find eventual satisfaction in a chosen occupation and thus, increased satisfaction and success in life.
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Sprague, H.T. and Shirts, G.R. 1966. Exploring classroom use of simulation. Western Behavioral Sciences Institute, La Jolla, California.


Wigderson, H.I. 1968. The name of the game--simulation, research brief, no. 4. Pace Supplementary Educational Center, Vasalia, California.
APPENDIXES
Appendix A

A Sample Representing One of the Six CEWSU Automobile Brake Repair Unit
CONTENTS

1. List of Materials
2. Student Manual
3. Cassette Tape Recorded Instructions
4. Unit Test
Foreward

In today's industrial society few youth have the opportunity for actual work experience while they are forming their vocational attitudes and expectations. Considerable information about the world of work is available via books, films, audio mediated film strips, etc., but this does not give a youth the first hand experience he needs.

Work simulation offers one model for providing actual work experiences to youth. The intent of work simulation is to duplicate as closely as possible work experiences that are typical of the particular vocational area. This provides the youth with "hands-on" experience as a means of exploring his interest in a vocational area.

A major purpose of the grant was the development of work simulation prototypes that are replicable. The enclosed plans and program make it relatively easy and inexpensive for any school district to construct their own units. While exact duplicates are easy to build, you are encouraged to cut costs by using materials already in stock or readily available. When this occurs the dimensions may vary from those given.
FRAME FOR BRAKE ASSEMBLY UNIT
UPPER STEERING KNUCKLE OF WHEEL ASSEMBLY MOUNTS HERE

*DIMENSION WILL VARY WITH WHEEL ASSEMBLY USED

LOWER STEERING KNUCKLE OF WHEEL ASSEMBLY MOUNTS HERE

7/16" HOLES 2 PLACES
5/16" HOLES 4 PLACES

BRAKE ASSEMBLY UNIT
AUTOMOBILE BRAKE REPAIR

Student Manual: Self-instructional "Hands-on" Minicourse

Developed by: Exceptional Child Center
             Utah State University

Developmental Funds:
             Utah State Bocrd of Education
The above drawing is of a hydraulic brake system: All cars use hydraulic brakes to provide safe, sure stops.
The above drawing shows how a hydraulic brake works. The foot pedal is attached to a master cylinder. When the pedal is depressed, it moves a piston within the master cylinder. The movement of this piston forces hydraulic fluid through the brake line and into wheel cylinders at each wheel. Here the pressure pushes the brake shoe against the brake drum.

Take a couple of minutes to examine the cut away master cylinder and wheel cylinder mounted above the fender.
One maintenance job commonly performed on brake systems is that of replacing the brake shoes. In this unit you will change the brake shoes as if you were a mechanic working on a customers car.

You will be working on a real hydraulic brake assembly, and using the same tools used by a mechanic.

For now, you are a mechanic.
The next page tells you how to begin. There will be a sentence telling you what to do and one or more pictures that show you how to do it. Read the sentence and look at the pictures. When you know what to do, go ahead and do it. Then turn the page to the next step.

Try to do everything by yourself, but:

IF YOU NEED HELP ASK THE SUPERVISOR.

When you are ready, turn the page and begin with step No. 1.
Remove lug nuts with lug wrench.

When you are finished go on to the next step.
Step 2

FULL OFF RIM

When you are finished go on to the next step.
Step 3

Pull off brake drum (you may have to pry along edge of drum)

When you are finished go on to the next step.
Step 4

INSPECT THE BRAKE DRUM YOU REMOVED FOR RIDGES AND SCORING. COMPARE THIS DRUM WITH THE ONE MOUNTED TO THE LEFT OF THE FENDER. NOTE THE DIFFERENCE IN THE TWO DRUMS. THE BADLY SCORED DRUM IS THE RESULT OF FAILURE TO INSTALL NEW BRAKE SHOES AT THE PROPER TIME.

WITH THE BRAKE DRUM REMOVED, AND WITH THE BRAKE SHOES IN PLACE—DEPRESS THE BRAKE PEDAL. OBSERVE THE BRAKE SHOES MOVE OUT WHERE THEY WOULD NORMALLY CONTACT THE BRAKE DRUM. (YOU MAY HAVE TO DEPRESS THE PEDAL MORE THAN ONCE)

When you are finished go on to the next step.
A. With pliers in right hand, grasp washer firmly.

B. Locate pin at rear of wheel and hold with left forefinger.
C. Push washer in and turn \( \frac{1}{4} \) turn either direction until washer will come off.

D. Remove second hold down spring in the same way.

When you are finished go on to the next step.
Step 6

PLACE WHEEL CYLINDER-CLAMP IN POSITION.

CAUTION: DO NOT PUSH BRAKE PEDAL UNTIL NEW BRAKE SHOES ARE IN PLACE.

When you are finished go on to the next step.
Step 7

REMOVE RETURN SPRINGS

A. Place socket on handle of pliers over retaining pin.
B. Turn socket in a clockwise motion until end of spring is hooked over the socket. Now pull out and remove spring.

C. Remove the second spring in the same way.

When you are finished go on to the next step.
Step 8

REMOVE GUIDE PLATE.

When you are finished go on to the next step.
Step 9

SPREAD BRAKE SHOES AND REMOVE BOTH FROM WHEEL HUB.

When you are finished go on to the next step.
Step 10

REMOVE ADJUSTING WHEEL SPRING. Cross shoes over until spring can be unhooked.

When you are finished go on to the next step.
Step 11

REMOVE ADJUSTING WHEEL AND ADJUST ALL THE WAY IN.

The old brake shoes are now off. You are ready to begin putting the new shoes in place.

When you are ready go on to the next step.
Put new brake shoes together with the adjusting wheel and adjusting wheel spring.

When you are finished go on to the next step.
Step 13

PLACE BRAKE SHOES BACK ON WHEEL HUB.

When you are finished go on to the next step.
Step 14

REPLACE SHOE HOLD DOWN SPRINGS.

When you are finished go on to the next step.
REPLACE GUIDE PLATE.

When you are finished go on to the next step.
Step 16

REPLACE BRAKE SHOE RETURN SPRINGS.

When you are finished go on to the next step.
Step 17

REMOVE PISTON SPRING CLAMP.

Step 18

PUT ON BRAKE DRUM.

Step 19

PUT ON WHEEL RIM.

Step 20

PUT ON LUG NUTS AND TIGHTEN WITH LUG WRENCH.
The new brake shoes are on, and ready for use.

To check your work, spin the wheel rim and then push on the brake pedal. The wheel should stop immediately!

Congratulations!
You have successfully completed a job usually done by a certified automobile mechanic.

STOP!
Appendix B

Pictures of the Completed Career Exploration

Work Simulation Units
Pictures of Completed CEWSU

Automobile Brake Repair

Automobile Electrical System

Electrical Wiring System

Basic Drafting

Black and White Photography

Basic Printing
Appendix C

Brake Shoe Repair Questionnaire

Automobile Electrical System Questionnaire

Electrical Wiring Questionnaire

Basic Drafting Questionnaire
From the list at the right choose the correct answer for each numbered part. Put your answers in the blanks at the left.

Answer

1. ________________________
2. ________________________
3. ________________________
4. ________________________
5. ________________________
6. ________________________
7. ________________________
8. ________________________
9. ________________________
10. ________________________
11. ________________________

a. wheel cylinder
b. check valve
c. primary brake shoe
d. hold down spring
e. wheel cylinder piston
f. secondary brake shoe
g. adjusting wheel spring
h. adjusting wheel
i. filler cap
j. rotor spike
k. anchor pin
l. master cylinder
m. brake shoe lining
n. brake shoe return spring
o. anchor plate...
Pick the answer from the list at the right which fills in the blank best.

12. This is a _________
   a. monkey wrench
   b. brake cartridge
   c. lug wrench
   d. cylinder nut
   e. brake spring pliers
   f. lug nuts
   g. piston spring clamp
   h. wheel rim

13. These are _________

14. This is a _________

15. These are _________

16. This is a _________
The following are multiple choice questions. Circle the letter of the answer that you think is the best.

17. In a hydraulic brake system the foot pedal is attached to a:
   a. drive washer
   b. balance rivet
   c. master cylinder
   d. crank shaft

18. The foot pedal moves a _______________ within the master cylinder.
   a. step pin
   b. drive gear
   c. pressure plate
   d. piston

19. The movement of the pistons forces _______________ throughout the system and into the wheel cylinders.
   a. hydraulic fluid
   b. a pressure spring
   c. compressed air
   d. excess gasoline

20. As the wheel cylinder pistons move out what happens to the brake shoes?
   a. they are freed from any pressure
   b. they are forced to rub against the brake drum
   c. they burn up
   d. none of the above
The following are multiple choice questions. Circle the letter of the answer that you think is the best.

1. Some of the uses of electricity in cars include:
   a. starting
   b. ignition
   c. horns
   d. all of the above

2. What are the three most important functions of an automobile electrical system?
   a. the brake, differential, and exhaust functions.
   b. the steering, braking, and acceleration functions.
   c. the starting, charging, and ignition functions.
   d. none of the above.

3. What is the main job of the starting system?
   a. to crank the engine at a speed which will permit starting.
   b. to store energy.
   c. to get rid of excess pollution.
   d. all of the above are correct.

4. Which of the following is not a part of the starting circuit?
   a. battery
   b. ignition switch
   c. distributor
   d. starting motor

5. The generator, amp meter, and voltage regulator make up which system?
   a. combustible system
   b. charging system
   c. transmission system
   d. none of the above

6. What does the amp meter do?
   a. it delivers gasoline to the carburetor.
   b. it acts as a slow down valve in the air filter.
   c. it regulates the pressure that travels through the axle.
   d. it indicates when the generator is charging.
7. What does the generator do?
   a. it circulates oil throughout the car.
   b. it supplies all of the electricity for recharging the battery.
   c. it works to keep the engine from over heating.
   d. none of the above.

8. Which of the following is not a function of the voltage regulator?
   a. controls the output of the generator
   b. prevents high voltage and resultant damage
   c. helps to keep the engine tuned up
   d. keeps the battery fully charged

9. What is the main job of the ignition system?
   a. to ignite the fuel in each cylinder at the proper time
   b. to move the brake fluid to all four brakes
   c. to start the hydraulic armature that regulates gas flow
   d. none of the above

10. What does the ignition coil do?
    a. it supports the amp system
    b. it transforms the low battery voltage into high voltage
    c. both a and b
    d. none of the above

11. Which part of the automobile electrical system times the spark and distributes the high voltage to the correct spark plug?
    a. coil
    b. generator
    c. distributor
    d. starter motor

12. Which device makes a spark to ignite the fuel inside the cylinders?
    a. idler arm
    b. spark plug
    c. carburetor
    d. none of the above
From the list at the right choose the correct answer for each part shown. Put your answer in the blanks under each part.

14. ____________
   a. amp guage
   b. generator
   c. transformer
   d. coil
   e. voltage regulator
   f. distributor
   g. spark plugs
   h. starter motor
   i. starter relay

15. ____________

16. ____________

18. ____________

19. ____________

20. ____________
The following are multiple choice questions. Circle the letter of the answer that you think is the best.

1. How many basic types of electrical circuits are there?
   a. 1  
   b. 2  
   c. 3  
   d. 4

2. Why is it important for all people who work in electrical work to know about the different basic circuits?
   a. because every electrical device contains circuits.  
   b. because this is the only thing that electricians do.  
   c. because some electrical devices contain circuits.  
   d. none of the above.

3. What is a circuit?
   a. a circuit is a type of electrode  
   b. a circuit is a resistor  
   c. a circuit is a pathway that electricity flows through  
   d. none of the above

4. Electricity wants to flow:
   a. uphill if at all possible  
   b. from one terminal to another terminal  
   c. both a and b are correct  
   d. none of the above are correct

5. In figure #1 what kind of a circuit do we have?
   a. parallel  
   b. convex  
   c. lateral  
   d. series
6. In Figure #2 what kind of a circuit do we have?
   a. convex
   b. lateral
   c. series
   d. parallel

USE ABOVE DIAGRAM TO ANSWER QUESTIONS 7, 8, 9.

7. In which of the following does button #1 operate both lights #1 and #2?
   a. 
   b. 
   c. 
   d. none of the above

8. In which of the following does either of the buttons operate light #1?
   a. 
   b. 
   c. 
   d. both a and b

9. In which of the following does button #1 operate light #1 and button #2 operate light #2?
   a. 
   b. 
   c. 
   d. both a and b
10. Which frequencies can your ear hear?
   a. lunar frequency
   b. high frequency
   c. audio frequency
   d. none of the above

11. Which part of your radio picks up the signal sent by the station?
   a. crystal
   b. transistor
   c. antenna
   d. batteries

12. What is the job of the diode?
   a. the diode acts to reactivate the capacitor
   b. the diode rejects the radio frequency and passes just the audio frequency
   c. the diode amplifies the transistor pitch
   d. none of the above

13. What happens to sound frequencies when they go to the first transistor?
   a. they are converted into ohms
   b. they are amplified
   c. they are muted out
   d. none of the above

Identify the symbols listed below: choose your answers from the list at the right.

14. [Symbol]
15. [Symbol]
16. [Symbol]
17. [Symbol]

   ohms
   diode
   transistor
   coil
   capacitor
   resistor
   amplifier
BASIC DRAFTING QUESTIONNAIRE

Name: __________________________

Date: __________________________

Age: ______________

1. Drafting has been defined as:
   a. the language of art
   b. the language of the humanities
   c. the language of industry
   d. none of the above

2. How does the engineer usually communicate with the draftsman?
   a. verbally
   b. by preparing "drawings"
   c. by mail
   d. none of the above

3. The basic function of drafting is to:
   a. provide the technical information necessary for the actual production of something
   b. draw artistic pictures
   c. all of the above
   d. none of the above

4. Engineering drafting deals with:
   a. clay and chalk
   b. the army specifically
   c. both a and d
   d. designing such things as machines, appliances, engines, autos, and airplanes.

5. Architectural drafting involves:
   a. much undersea exploration
   b. medical technology to a great extent
   c. planning of buildings, their function, location, materials processes, and beauty
6. The engineer's job is that of:
   a. hiring personnel
   b. designing a product
   c. making whatever product the craftsman designs
   d. none of the above

7. The craftsman's job is that of:
   a. designing a product
   b. making sure the artist does a good job
   c. carrying tools for the engineer
   d. making whatever product the engineer designs

8. How many specialized types of drafting are there?
   a. 1
   b. 2
   c. 3
   d. many

9. Why is a blueprint made of a drawing?
   a. so that the blue dye will last for a long time
   b. because drawings are valuable objects and require much planning
   c. both a and b
   d. none of the above

10. Projection drawings and pictorial drawings:
    a. both give the same information but in a different way
    b. both deal with abstract art
    c. both use clay and chalk
    d. none of the above
Appendix D

Technical Advisory Board
### Exceptional Child Center
Utah State University

#### Work Simulation Project

**Technical Advisory Board**

<table>
<thead>
<tr>
<th>Members</th>
<th>Position</th>
<th>Telephone</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Jed Wasden</td>
<td>State Board of Vocational-Technical Ed.</td>
<td>328-5371</td>
<td>1400 University Club Bldg., 136 E. So. Temple Salt Lake City, Utah 84111</td>
</tr>
<tr>
<td>2. Craig Kennington</td>
<td>&quot;</td>
<td>&quot;</td>
<td>&quot;</td>
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<tr>
<td>3. Joel Luke</td>
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</tr>
<tr>
<td>6. Larry Peterson</td>
<td>Director, Vocational Education Logan, Utah</td>
<td>752-1811</td>
<td>101 W. Center Logan, Utah</td>
</tr>
<tr>
<td>7. Weldon Shellie</td>
<td>Director, Occupational Life Training Riverton, Wyo.</td>
<td>307-856-6526</td>
<td></td>
</tr>
<tr>
<td>8. Ken Despain</td>
<td>Industrial Arts Instructor, Mt. Ogden Jr. High Ogden</td>
<td>399-3456</td>
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</table>
Appendix E

Student Observation Sheet
OBSERVATION SHEET

Name: ____________________________
Date: ____________________________
Age: ____________________________
Location: ____________________________
Supervisor: ____________________________
Unit: ____________________________

<table>
<thead>
<tr>
<th>Step</th>
<th>1</th>
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<th>3</th>
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<tr>
<td>Difficulty per step</td>
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(H-high, A-average, L-low)  
| Number of questions per step | | | | | | | | | | | | | | | | | | | |

1. Time required for completion of entire unit: ____________________________
2. Overall interest in the unit: H A L  
3. Location of the unit (physical characteristics): ____________________________  
   ____________________________  
   ____________________________  
   ____________________________  
4. List questions asked by students about tasks: ____________________________  
   ____________________________  
   ____________________________
Appendix F

Student Attitude Survey
Student Attitude Survey

Name: ____________________________

Unit: ____________________________

1. Did you enjoy the experience you just had?

________________________________________________________________________

________________________________________________________________________

2. Do you feel that you know anymore about this occupation now than you did before you went through the unit?

________________________________________________________________________

________________________________________________________________________

3. Would you like to observe someone working in this occupation?

________________________________________________________________________

________________________________________________________________________

4. Has this experience influenced your attitude about the occupation that you explored?

________________________________________________________________________

________________________________________________________________________

5. Would you like to see more experiences of this type given in the schools?

________________________________________________________________________

________________________________________________________________________
VITA

GERALD ELDON MANWILL

Candidate for the Degree of

Master of Science

Thesis: The Development of Career Exploration Work Simulation Units for Career Education in Grades Seven Through Nine

Major Field: Psychology

Biographical Information:


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Professional Experience: Psychometric examiner; University Affiliated Exceptional Child Center, Utah State University under Dr. Glendon Casto, 1972-73; Psychometric examiner; Laboratory For The Diagnosis and Treatment of Learning Disabilities, College of Education, Idaho State University under Dr. Evyln Thirkill, 1972-73; Coordinator of the "Advocacy of College Aged Handicapped Youth Program" under Dr. Marvin Fifield, University Affiliated Exceptional Child Center, Utah State University, 1973; Vocational education counselor, Logan High School, Logan, Utah under Ms. Rhea Wallentine, 1973; Research team member, University Affiliated Exceptional Child Center, "Project Work Simulation Development," Utah State University under Mr. Herbert Miller, 1973; Graduate research assistant under Dr. Michael Bertoch Ed.D., Dept. of Psychology, Utah State University, 1973-74;

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