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Visual-Motor Skill Development in Learning Disabled Diagnosed Students Utilizing Industrial Arts Methods

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ABSTR

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Visual-Motor Skill Development in Learning Disabled Diagnoised Students Utilizing Industrial Arts Methods

The purpose of this study was to determine the worth of an industrial arts unit of instruction in improving visual-motor development in Learning Disabled students. The Marianne Frostig Developmental Test of Visual Perception was chosen as the measuring instrument. Experimental and control groups were pre-tested, after which the experimental group was given instruction using industrial arts methods stressing hand-eye coordination. Both groups were then post tested and the scores analyzed using the "t" test method of comparison at the .05 level of confidence. A significant difference in the mean score indicated that this unit of industrial arts instruction aided these students in the development of visual-motor skills as tested by the Frostig Test.

VISUAL-MOTOR SKILL DEVELOPMENT IN LEARNING DISABLED DIAGNOSED STUDENTS UTILIZING INDUSTRIAL ARTS METHODS

BY

VERNON M. FUESTON JR.

A research problem submitted in partial fulfilment
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Darden School of Education
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Chapter 1

INTRODUCTION

> Children with special learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written languages. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling or arithmetic. They include conditions which may have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, ect. They do not include learning problems which are due to mental retardation, emotional disturbance, or to environmental disadvantage.[1]

BACKGROUND

According to the National Advisory Committee on Handicapped Children (1968), children who meet the criteria to be diagnosed as Learning Disabled constitute from one to three percent of the population. Other labels for these children include perceptually handicapped, neurophrenia, minimal brain dysfunction, brain damaged, dyslexia, and neurophrenia and neurological impairment.[2] Children are usually diagnosed as learning disabled based on observed behavior after other symptons such as mental retardation, visual or hearing impairment, physical disorders, emotional handicaps, or deprived environment have been ruled out as cause of the disability.

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[1] Samuel A. Kirk, Educating Exceptional Children (Boston: Houghton Mifflin Company, 1962), p. 263.

[2] Janet W. Lerner, Children with Learning Disabilities (Boston: Houghton Mifflin Company, 1971), pp. 19-21.

Visual-motor ability is a critical indicator of the maturational process. Deviant patterns of visual-motor ability are indicative of various diagnostic conditions. One of the characteristics of children with learning disabilites is incoordination often affecting such skills as hopping, skipping, bicycle riding, and tying shoe laces. This incoordination will affect a child's academic skills in writing symbols, reading, mathematics and graphing.[3]

Screening and testing devices, educational profiles, and remedial programs always include a consideration of the child's visual-motor abilities. The diagnosis process includes testing that often starts with a general intelligence test for establishing a base. This general intelligence test is followed by special specific tests that are designed to help analyze the mental process. Specialized testing and the interpreting of the test results must, of course, be accomplished by an expert in the field -- often a team of experts.

PURPOSE OF THE STUDY

Several of the tests used to diagnose learning disabilities include evaluation of visual-motor development as a factor of the mental process. Also, many educators in the field of learning disabilities consider visual-motor development to be essential to correcting or overcoming the learning problem. The purpose of this study is to determine the worth of an

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[3]James M. Kauffman and Gerald Wallace, Teaching Children with Learning Problems (Columbus, Ohio: Merrill Publishing Company, 1973).

industrial arts unit of instruction in improving visual-motor development in children who have been diagnosed as learning disabled. A null hypothesis is suggested:

> No significant difference in visual-motor development exists between learning disabled children who have been exposed to industrial arts methods in education and those who have not.

ASSUMPTIONS AND LIMITATIONS

For this study the investigator assumes that visual-motor development will assist students in overcoming learning problems. Also, the investigator assumes that retarded visual-motor development is one of several symptoms correctly used to diagnose learning disabled students. Additionally, the investigator assumes that the population of the study has been correctly diagnosed as learning disabled.

A major limitation of this study is the size of the population which includes only thirty students, ages eight through eleven, divided into three classes. These classes are all part of the same school thus limiting generalization of results of this study to any other situation.

DEFINITIONS

For the purpose of this study the following definitions are offered:

Elementary Industrial Arts Unit: Basic use of woodworking hand tools emphasizing hand-eye coordination.

Learning Disabled: . . . . delayed development in one or

> of the process of speech, langauge, reading, writing, or arithmetic resulting from a possible cerebral dysfunction and/or emotional or behavioral disturbances and not from mental retardation, sensory deprivation, or cultural or emotional factors.[4]

Visual-motor: Coordination of eye stimulus and muscular movement.

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[4]Samuel A. Kirk, Educating Exceptional Children (Boston: Houghton Mifflin Company, 1962), p. 263.

Chapter 2

REVIEW OF RELATED LITERATURE

That visual-motor abilities are considered in diagnosing children with learning disabilities is evidenced in the tests commonly used in the diagnostic process. A screening instrument, The Pupil Behavior Rating Scale, developed under a United States Public Health Services grant, contains a section concerned with manual dexterities as one of several observations made by teachers to develop student profiles. These profiles are used as a basis for recommending students for more thorough testing by educational specialists. Students who are referredto educational specialists for learning disability evaluation are routinely tested to determine visual-motor development status. Some of the tests used in this evaluation are the Illinois Test of Psycholinguistic Abilities, the Bender Visual-Motor Gestalt Test, the Frostig Developmental Test of Visual Perception, the Developmental Test of Visual Motor Integration, and the Purdue Perceptual-Motor Survey.[1] These instruments all have test sections designed to describe the visual-motor development of the subject.

Methods of alleviating learning disabilities often include visual-motor training.[2] Kephart says that new patterns of

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[1]B.R. Gearhart, Learning Disabilities: Educational Strategies (St. Louis: C.V. Mosby Company, 1973), pp. 13-20.

[2]N. Kephart, The Slow Learner in the Classroom (Columbus, Ohio: Charles E. Merrill Publishing Comapny, 1971), p. 79.

muscular activity (behavior) are always built upon a structure of previously learned muscular activity.[3] He views learning disability as a general slowdown or interruption in normal sensory-motor development, including visual-motor development, resulting in inadequate or non-existant foundations for the learning of new skills. According to Kephart, motor development cannot be reversed or remain stationary. New behaviors are always learned at the child's present level of motor development techniques.

The Movigenic Theory of Development by R.H. Barsch states that movement is the basis for learning and that children who are deficient in sensory-motor development will experience difficulties in learning.[4] Barsch's program of remediation incorporates twelve dimensions of sensory-motor development.

The views of many educators concerning the importance of visual-motor development in acquiring scholastic skills is summed up by Wallace and Kauffman: "as part of total motor development, visual-motor processes are considered crucial to future academic learning." [5]

Gerald N. Getman, and optometrist, developed a visomotor program based upon the theory that perceptual skills can be

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[3]Ibid.

[4]R. H. Barsch, Achieving Perceptual Motor Efficiency (Seattle, Washington: Special Child Publications, 1967), pp. 35-59.

[5]James M. Kauffman and Gerald Wallace, Teaching Children with Learning Problems (Columbus, Ohio: Charles E. Merrill Publishing Company, 1973), p. 56.

learned and developed. He described five developmental stages in children, from birth to five years old, that stress visual perception development.[6] In 1968, Getman, along with E. R. Kane and G.W. McKee, published a training program, mostly visual-motor training, corresponding to Getman's developmental stages.[7]

Bryant J. Cratty cites handwriting as an example of the hand-eye coordination required for academic skills. Cratty uses games to develop the general coordination that seems to be important in academic situations.[8] He utilizes game participation to lengthen attention span, to aid in self-control, and to improve the child's self-concept.

J. D. Saphier, in reviewing programs designed to improve academic skills through perceptual-motor training, says that present remedial programs, in general, are formulated for each individual child based on what works for that child. Saphier calls for research to assess generalization of perceptual-motor improvement into academic performance. Such research should be completed on a reasonably large sample

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[6] G.N. Getman, The Visuomotor Complex in the Acquiring of Learning Skills, In J. Hellmath (ED.) Learning Disorders, Vol. 1 (Seattle, Washington: Special Child Publications, 1968), pp. 52-56.

[7] G. N. Getman, E.R. Kane, and G.W. McKee, Developing Learning Readiness: A Visual Motor Tactile Skills Program (Manchester, Mousouri: McGraw-Hill, Inc. 1971)

[8] B.J. Cratty, Active Learning: Games to Enhance Abilities (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1971) p. 10.

require several years of follow-up to evaluate long term effects.[9]

[9] J. D. Saphier, "The Relationship of Perceptual-Motor Skills to Learning and School Success," Journal of Learning Disabilities, VI, No. 9, (November, 1973), pp. 62-63.

Chapter 3

DESIGN OF THE STUDY

In order to accomplish this study the investigator pretested thirty students, utilizing the Frostig Developmental Test of Visual Perception, to determine individual levels of visual-motor development. The The students selected, nine females and twenty-one males, ranged in age from eight to ten. All the students involved were members of special education classes for the Learning Disabled and had been diagnosed as Learning Disabled by the city school system diagnostic team. These students are members of three Learning Disabled classes within the same special education facility. Each class had a Learning Disability certified teacher and a teacher aide; all assisted in the study.

Approval to conduct the study was granted by Dr. Phillip E. Meekins, Director of Program Development and Evaluation of the Virginia Beach City Public Schools. (Appendixes A and B).

The population was first divided into two groups, male and female. A random selection was then made selecting half of the boys and half of the girls for the experimental group. The remaining half became the control group. The first activity of the study consisted of administering the Marianne Frostig Developmental Test of Visual Perception. The thirty students were group tested under the direction of a teacher thoroughly qualified in the administration of this test. All tests were scored by the same educational specialist. Since the purpose of this study was to determine if significant improvement of scores occurs as a result of industrial arts instruction, only raw scores were used.

The experimental group was then given two hours of elementary industrial arts instruction per week for six weeks. Exercises stressing hand-eye coordination were assigned during the industrial arts instruction period. This instruction consisted of a one hour period per week in the industrial arts laboratory with twenty to thirty minutes a day of related exercises in the regular classroom. Activities introduced to the experimental group included use of the coping saw, hammer, hand drill, brace and bit, and screwdriver. Activities were also assigned in pattern tracing, hand sanding, and painting. Student interest was kept at a high level by intergrating these industrial arts activities into the fabrication of two projects per student -- a key chain tag and a bird house.

During the time that the experimental group was in the industrial arts laboratory the control group was engaged in activities in the home economics laboratory. The home economics program, however, was especially designed not to include activities that would require hand-eye coordincation. Also, classroom activities for the control group were designed not to include hand-eye coordination exercises during the time that the experimental group was enaged in industrial arts related activities.

Upon completion of the industrial arts unit of instruction by the experimental group, both groups - experimental and control - were retested. Results of the pretest and post-test were then statistically analyzed and the t-test method of comparison was utilized to test the hypothesis at the .05 level of confidence.

Chapter 4

ANALYSIS OF DATA

Scores achieved on the pre and post test are as follows:

Control Group			Experimental Group		
Student	Pretest	Post test	Student	Pretest	Post test
1M	70	69	1M	69	70
2M	54	71	2M	DID NOT COMPLETE THE PROBLEM	
3M	66	73	3M	42	48
4M	56	70	4M	64	72
5M	53	59	5M	DID NOT COMPLETE THE PROBLEM	
6M	41	49	6M	68	70
7M	60	72	7M	61	58
8M	60	65	8M	67	68
9M	59	63	9M	69	71
10M	70	73	10M	67	53
11M	59	60	11M	37	51
12F	10	18	12F	65	67
13F	47	39	13F	57	66
14F	58	70	14F	67	64
15F	52	64	15F	29	45
	$\sum X=815$	$\sum X=911$		$\sum X=762$	$\sum X=803$
	$\sum \frac{X}{N}=54.333$	$\sum \frac{X}{N}=60.73$		$\sum \frac{X}{N}=58.62$	$\sum \frac{X}{N}=61.77$

Variance / standard deviation analysis of pre to post tests with "t" test evaluation within control and experimental groups.

$$s^2 = \frac{\Sigma x^2}{N} = \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{N}}{N}$$

where X = score

N = sample size

$x = X - \bar{X}$

Control Group		Experimental Group	
Pretest	Post test	Pretest	Post test
$\Sigma X^2 = 47237$	58517	$\Sigma X^2 = 46878$	50693
$(\Sigma X)^2 = 664225$	829921	$(\Sigma X)^2 = 580644$	44665
$N = 15$	15	$N = 13$	13
$s^2 = 197.02$	212.60	$s^2 = 170.23$	84

Weighted / pooled standard deviation for use in 't" test formula:

$$Sp = \sqrt{\frac{N_1 = N_2}{N_1 \times N_2} \left[\frac{(N_1 - 1)\,S_1^2 = (N_2 - 1)\,S_2^2}{N_1 = N_2 - 2} \right]}$$

Control Group	Experimental Group
$S_1^2 = 197.02$	$S_1^2 = 170.23$
$S_2^2 = 212.60$	$S_2^2 = 84$
$N_1 = N_2 = 15$	$N_1 = N_2 = 13$
$Sp = 5.2267$	$Sp = 4.422$
$\bar{X}_2 = 60.73$	$\bar{X}_2 = 61.77$
$\bar{X}_1 = 54.333$	$\bar{X}_1 = 58.62$

$$t = \frac{\bar{X}_2 - \bar{X}_1}{Sp}$$

Control Group	Experimental Group
t = 1.2239	t = 0.7123

For the control group the sample "t" score of 1.2239 falls outside the one tailed test range of 0 to 0.0276 for $N_1 = N_2 = 30$. Therefore it can be concluded that the difference in mean scores between the pre and post test for the control group is significant and not attributable to chance.

For the experimental group the sample "t" score of 0.7123 falls outside the one tailed test range of 0 to 0.0285 for $N_1 + N_2 = 26$. Therefore, it can be concluded that the difference in mean scores between the pre and post test for the experimental group is significant and not attributable to chance.

Variance / Standard deviation analysis of post to post tests with "t" test evaluation between experimental and control groups.

Control Group	Experimental Group
$N_2 = 15$	$N_1 = 13$
$S_2 = 212.60$	$S_1 = 84$
$\overline{X}_2 = 60.73$	$\overline{X}_1 = 61.77$

Weighted / pooled standard deviation for use in the "t" test formula:

$$Sp = \sqrt{\frac{N_1 + N_2}{N_1 \times N_2} \left[\frac{(N_1 - 1)\ (s_1{}^2) + (N_2 - 1)\ (s_2{}^2)}{N_1 + N_2 - 2} \right]}$$

$$Sp = 4.691$$

$$t = \frac{\overline{X}_2 - \overline{X}_1}{Sp}$$

$$= \frac{60.73 - 61.77}{4.691}$$

$$= 0.2217$$

The sample "t" score of 0.2217 falls outside the critical two tailed "t" value range of 0 to 0.056 for .05 confidence level when $N_1 + N_2 = 28$. It can therefore be concluded that the difference in mean scores between post-tests of the control and experimental groups is significant and not attributable to chance. The null hypothesis is rejected.

Chapter 5

SUMMARY AND CONCLUSIONS

Analysis of the data indicates that elementary industrial arts instruction aids in the development of visual motor abilities as tested by the Frostig Developmental Test of Visual Perception. An added benefit to the student of the industrial arts instruction, and not reflected in the test scores, is the positive student self-concept development incurred as a result of successfully completing industrial arts projects. Positive feedback was received from teachers, parents, and students concerning participation in the elementary industrial arts unit.

The pretest to post-test comparison results within the control and experimental groups can be attributed to student test practice. For example, the time consumed for the pretest was over two hours while the time required for the post-test was only forty-five minutes.

A comparison of pretest scores of the control group to the pretest scores of the experimental group was not required because the two sample groups were randomly selected.

The industrial arts instruction given the experimental group was not ideal for learning disabled student. The time allowed for the industrial arts instruction, six one hour sessions, was far too little to allow the repitition necessary for these students to learn the tasks involved. The class size, thirteen students, exceeded the maximun class size recommended by Virginia guidelines for learning disabled students and, therefore, individualized instruction was limited. Also, the unfamiliar surroundings and the disturbing noise of the industrial arts laboratory were contrary to the environment usually required for those students to learn. Nevertheless, this industrial arts unit was sonsidered a successful educational experience by all those who participated.

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January 23, 1976

Dr Phillip E. Meekins
Director of Program Development and Evaluation
Virginia Beach City Schools

Dear Dr. Meekins:

I request that I be granted permission to execute the attached research proposal. The purpose of this project is to determine the effect of elementary industrial arts instruction in visual motor development for children diagnosed as learning disabled. This research is to be accomplished as one requirenebt for MS(Ed) from Old Dominion University.

I plan to use three learning disabled classes at The Center for Effective Learning as the study population. The teachers of these classes have volunteered to participate and assist and have stated that there is a need for information in this area. Also, the home economics teacher has offered to give non-related instruction to the control group of the population during the time the experimental group is receiving industrial arts training.

Instruction, both industrial arts and home economics, will be given during scheduled teacher planning time so that no instructional time will be lost for other classes.

No records will be kept that will identify a particular student with the study. Students participating in the study will be known only to the Center staff. Results of the study will, of course, be reported to your office.

Yours truly,

Vernon M. Fueston Jr.
Teacher, Industrial Arts
Center for Effective Learning

Virginia Beach City Public Schools

SCHOOL ADMINISTRATION BUILDING
P.O. BOX 6038
VIRGINIA BEACH, VIRGINIA 23456

E.E. BRICKELL
SUPERINTENDENT OF SCHOOLS

February 6, 1976

Mr. Vernon M. Fueston, Jr.
Center for Effective Learning
233 North Witchduck Road
Virginia Beach, Virginia 23462

Dear Mr. Fueston:

Your application for research project "Visual Motor Development in Learning Disabled Diagnosed Children Utilizing Industrial Arts Methods" has been reviewed and is approved for implementation. Your study is of interest to the instruction department as well as to this department, and I have given a copy of your proposal to Mr. C. Mac Rawls, Assistant Director of Instruction. The topic appears to have potential value for inclusion in a project being planned by the instruction department.

Best wishes for a successful conclusion to your project and to the completion of the degree.

Sincerely yours,

Philip E. Meekins

Philip E. Meekins, Director
Program Development and Evaluation

PEM:dlh

cc: Mr. C. Mac Rawls
Assistant Director of Instruction

Mrs. Peggy Bryson, Principal
Center for Effective Learning