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THE EDUCATIONAL SIGNIFICANCE OF LEFT-HANDEDNESS

Introduction

THE problem of training forced upon the educator by the presence of the left-handed and the ambidextrous child is as old as organized education itself, and judging from the wide diversity of opinions expressed by persons competent to form judgments, it is quite apparent that many additional studies and demonstrations must be made before school administrators may issue, with any sort of assurance, directions for coping with left-handed children. Whatever the cause of our social system of dextrality may be, the fact is that our mode of living is inextricably bound by right-handed conventions. Pedestrians pass on the right, in greetings the right hand is extended, door fastenings are placed for use by the right hand, the guest of honor is placed on the right side of the host—rightness, with respect to handedness, is almost sacrosanct. In the schools, seats are usually designed for the right-handed, the flag is saluted with the right hand, and a deliberate effort is made in teaching handwriting, drawing, sewing, and other manual arts requiring precision, to train the right, rather than the left hand.

The problem of left-handedness is approached in this paper from the standpoint of a school administrator who is trying to find the answer to such apparently simple questions as what causes left-handedness, how it may be determined, how frequent it is, and what the parent and the school teacher should do about it.

Cause of Left-Handedness

There seem to be about as many theories concerning the cause of left-handedness as

there are systems or schools of psychology, and if we judge by the increasing number of new ones being advocated, we should not despair of having at least fifty-seven varieties. The numerous theories may be roughly divided into two major groups: those which seek to account for left-handedness on the basis of heredity; and those which explain it as the result of environmental or social conditions.

Among those who may be called nature-advocates, as opposed to nurture-advocates, H. E. Jordan of the University of Virginia, whose studies extend over a period of twenty-five years, is the investigator most often quoted in support of the hereditarian view. In his introduction to Sims' *Left-handedness* he expresses the view that handedness is a fundamental condition; that it is one aspect of the asymmetry of the body; that right-handed persons are usually right-legged and right-eyed; and that hare lip is more frequent on the right side. And then, with a true scientist's feeling that he may not have given full measure, he gives lagniappe in the form of a statement to the effect that the tadpole usually erupts the left forelimb first.

W. F. Jones, speaking before the National Education Association in 1915 on *The Problem of Handedness in Education* saved himself a great deal of trouble by merely assuming that the chief problem was to determine standards for detecting the two kinds of handedness, namely, "born handedness" and "adopted handedness," from which it would appear that he had no doubt about the inheritance of such a trait.

In his *Experimental Study in Left-handedness*, made at the University of Chicago in 1918, A. L. Beeley states that the hereditary view is held by Wilson, Merkel, Weber, Bardelben, Jordan, and Ramalay, while Gould and Kellogg deny it. Ramalay, as

quoted by Beeley, "concludes that left-handedness is a Mendelian recessive and exists as such in about one-sixth of the population."

While Ralph Haebner's study in 1929 of *The Educational Significance of Left-handedness*, conducted in Public School 210, Brooklyn, New York, was not essentially an effort to determine the cause of left-handedness, he did take the position that all mainly left-handed children are so by nature and that the mixed-handed ones are those whose native handedness has been changed.

Ira S. Wile, a medical practitioner with wide experience in the treatment of problem children, writing in a recent issue of *Parents Magazine*, says in no uncertain terms that left-handedness is *not* an abnormality, but is a little less positive in his statement that "handedness *appears* to be a trait that manifests itself early in life and is physiologically fixed during the first six to twelve months."

Julia Heinlein in her John Hopkins monograph under the forbidding title of *Preferential Manipulation in Children*, does at least have the advantage of a knowledge of all of the former studies, and her paper is sufficiently recent, 1930, to make her summary of statements of cause worthwhile. Of particular interest is her quotation from Downey who says that "the conventional classification of individuals into right-handed and left-handed furnishes very little information about their manual habits" and that "all degrees of unidextrality (the use of one hand in preference to the other) exist." In her summary on the nature of handedness she finds that—"Baldwin and Woolley each maintained . . . that handedness is something more than an acquired habit and that its cause must be sought in inherited physiological grounds"; and "Gesell maintains that unidexterity is based on inherent constitutional, rather than on cultural factors." Her report of Dearborn's observations on a child from birth to its third birthday gives the impression that

Dearborn belongs with the hereditarians. She, of course, reported the work of Watson, which will be considered later—in the first-hand manner that it deserves.

Among the more important theories based on heredity are the *gravity theory* which associates left-handedness with the anatomical fact that the viscera on the left side of the body are lighter than the organs on the right side; the *mechanical theory*, an adaptation of the gravity theory, in which it is asserted that full strength cannot be put forth without taking a deep inspiration, the inspiration, through the uneven weight of the viscera, influencing the hand on the heavier visceral side; the *subclavian artery theory* based on the assumption that the muscles on the right side are better nourished than those on the left; *cerebral assymetry*, advocated by Judd, who thinks that the unequalness of blood supply in the cerebral hemispheres may account for handedness; and the *continuous variation theory* of Gould who holds that "In about 96% of all infants the right eye is the better seeing eye and thus compels the right hand to work with it." A variant of the theory advocated by Gould is found in Parsons' *ocular dominance* theory, the thesis of which is that "dependence of movement upon vision is the secret of handedness."

Turning now to the nurture advocates, we find Watson who, with little support from students of the subject, argues strongly against heredity as an influence in the cause of handedness. Beeley lists Kellogg and Gould as members of the environmentalist camp but Gould's theory of continuous variation would appear to make him a questionable member of the group. In connection with intrauterine influence J. B. Watson, in his *Behaviorism* quotes J. W. Williams, for many years professor of obstetrics at Johns Hopkins University, as follows: "The extent to which slight differences in the intrauterine position of the foetus may possibly later influence or even determine right and

left-handedness of the individual is not known." Watson, on completing a series of tests with infants including measurements of right and left anatomical structures, recording time of suspension by right and left hands, recording amount of work done by right and left hands concluded that "handedness can vary during the first few days of infancy." He continued the testing of handedness after the act of reaching had been accomplished, stating that "The results of all our tests of this nature, extending from the age of 150 days to one year show no uniform and steady handedness. Some days the right is used more often, some days the left." When he states that there is "no fixed differentiation of response in either hand until social usage begins to establish handedness," he makes a rather broad generalization from tests on a relatively small number of individuals. That he has no misgivings about the matter is easily seen as he hands down the law in these words: "The main problem is settled—handedness is not an instinct! It is possibly not even structurally determined." A touch of humanness returns, though, as he ponders—"But why we have 5% of out-and-out left-handers and from 10 to 15% who are mixtures . . . is not known."

Watson, in suggesting that our right-handed society had its origin in primitive days, lends an ear to the *primitive warfare* theory of Gould, who associates handedness with the methods of handling instruments, especially shields and spears, of primitive warfare.

The mother's method of carrying the infant, imitation, and education or training—all have their advocates in the attempt to account for handedness on the basis of environmental conditions.

Prevalence of Left-Handedness

It is a comparatively simple matter to determine for any group of children, the number who habitually use the left hand for manual operations which require a degree

of skill, but when an attempt is made to classify people with respect to born handedness and adopted handedness, which Jones and others have attempted, it is necessary to make adjustments for the theories, with respect to cause of left-handedness, held by them. Jones, prior to 1915, tested a group of individuals ranging in age from stillborn to centenarian, with his "brachiometer" and concluded that 96% of the race are born right-handed; 4% are born left-handed; and that 77% of the born left-handers shift to the right hand.

Beeley, from a study of estimates made by Gould, Smith, Lombroso, Jones, Ballard, and Baldwin, concluded that left-handedness is present in 4% of the population.

Reference has already been made to the estimate of Ramalay whose studies of 610 parents and 1,130 children lead him to venture the opinion that left-handedness exists in about one-sixth of the population.

Whatever the cause of left-handedness may be, every school contains a few children who prefer the use of the left hand for most manual operations, and a larger number who appear to use both hands equally well. Such children do constitute a problem, in connection with which some action must be taken. If an adequate method of procedure, or to be up to the minute in pedagogical parlance, technique, is to be established it ought to be found through some of the numerous tests of handedness.

Tests of Handedness

Among the several methods used for the determination of "native" handedness are (1) the tests of motor control: *dynamometer*, which tests strength of grip; *tapping*, which tests the comparative quickness or rate of movement of the two hands; *tracing*, which measures accuracy and precision of movement; *steadiness*, which measures the inhibition of movements of the hands; and (2) the *manuscript* tests, which measure eye dominance.

Tapping, Steadiness, and Tracing Tests of Beeley.—For the purpose of devising a means of determining native handedness Beeley conducted a series of investigations in which he used tapping, tracing, and steadiness tests on a group of subjects ranging in age from six to fifteen years; in school grades from third to sixth. One hundred of the subjects were right-handed and fourteen were left-handed. He found that the tapping test in which finger movement was employed is better as a means of determining handedness than the tapping test in which either arm or wrist movement was used; and further that it is superior to either the steadiness test or the tracing test for diagnostic purposes. As a means of detecting native handedness, his investigations, because they were conducted with children well advanced in years, are much less conclusive than those of Watson and others conducted with infants.

Brachiometer Tests of Jones.—In an effort to establish standards for determining born handedness W. F. Jones conducted a series of experiments or tests on 10,000 individuals ranging in age from stillborn to centenarian. He apparently assumed that if an individual either is born with or has acquired unequal power on the two sides of the body there must be some evidence of a measurable nature. With an instrument called the brachiometer he measured paired bones and paired muscles. According to his chart (1) born handedness could be measured by length of "ulna plus," circumference of palm, circumference of wrist, and length of humerus; and (2) adopted handedness could be measured by relaxed forearm circumference, contracted forearm circumference, relaxed arm (biceps) circumference, and contracted arm (biceps) circumference. His conclusions with respect to the percentage of left-handedness have already been referred to. "The significant conclusion from the foregoing data," to use his own words, is that "the four bone measures reveal born handed-

ness; the four muscle measures reveal the adopted arm," and that "it is an easy matter to classify individuals into three groups: (1) pure right-handers, (2) pure left-handers, and (3) transfers."

Heinlein, in her review of a series of experiments conducted by Beeley, to test the reliability of Jones's work with the brachiometer, reports Beeley's findings as follows: "First, the theory upon which the Jones tests are devised is not valid in all cases, . . . ; secondly, the distribution of handedness does not agree with the known facts; thirdly, in most children the difference between the length of the bones of the two arms, as shown by these results, is so slight that it would seem to be somewhat hazardous to determine the life habits of a child solely upon such evidence."

Ocular Dominance Tests of Parsons.—In support of his theory of ocular dominance Parsons conducted a series of tests upon 877 grammar school pupils in Elizabeth, New Jersey. Having questioned the value of all known tests for ascertaining the nature of handedness, he devised a sort of sighting box which he called a manuscope, and which he says is useful in determining handedness. The manuscope, he states, "determines native handedness by going to the cause"; and "its sole function is to determine which visual line is used in sighting, and in determining this it helps to determine handedness." He cautions operators in making tests with the manuscope to remember that "eyedness is *cause* and handedness *effect*." "Handedness may be changed," he continues, "but eyedness persists." Parsons found that of the 877 subjects tested, 608 used the right visual line for sighting; and with four exceptions that he thinks properly belong in a separate category, all of the right-eyed persons are right-handed. He assumes that in the case of those who were diagnosed as left-handed on the basis of their left-eyedness and who claim to be right-handed that their sighting eye had been changed as a result of eye

trouble, or that handedness had been changed on account of handtrouble. Cuff, as stated by Heinlein, "criticises this explanation (Parsons) as being theoretical only." Cuff also maintains, Heinlein says, "that the test as devised by Parsons is unreliable for individual diagnosis." So! another scientist up, and another seeker after truth is down. What chance has the layman who simply wants to know what to do with a six-year old left-handed boy? Beeley objects to the methods used by Jones; Parsons finds fault with the technique of Jones and all of the other investigators whose work he reviewed; Cuff maintains that the tests of Parsons are unreliable; Watson implies that every worker but himself is wrong, and his sweeping generalities leave his studies open to criticism—thus only Haebner and Heinlein, whose tests are of recent date, stand without condemnation by their fellow researchers.

Transfer of Handedness

Mary E. Thompson in her *Psychology and Pedagogy of Writing* asserts that it has been found by investigation that left-handed children who have been made to learn to write with their right hands, never in later life reach the point where they can write with any degree of speed and ease. She assumes that "the location of the speech center that is so closely related to that of writing cannot be changed" and therefore concludes that it is not wise to make a left-handed child use his right hand in writing.

Jones concluded from his studies on *The Problem of Left-handedness* that the (1) skill of the left-handers is equal to the skill of the right-handers; (2) transfers show a low grade of skill; (3) the transfer has two "minor" arms; (4) the so-called ambidexter is usually the transfer; (5) the born left-hander should use his left hand; and (6) it is safe to make transfers in individuals who have not reached puberty, provided the arm-swell measures are not far from equal.

"I am firmly convinced," so Watson says

in his *Behaviorism*, "that if the job (changing left-handers to right-handers) is done early enough not the slightest harm results." He cautions, though, that the change should be made before language develops very much. Watson, as well as some of the other investigators, points out that the sudden changing over of a left-handed talking-child is apt to reduce the child to the level of a six months' old infant.

Ira S. Wile, in the article to which reference has been made, says that there is always hazard in trying to make a right-handed person of a left-handed one; particularly in connection with speech. He seems certain that experiments, though he does not name them, show that the proportion of speech defects is far higher among children who were originally left-handed and later were forced to become right-handed than among left-handed children who have never forsaken their original handedness. Efforts to convert left-handers to use of the other hand, according to him, are often accomplished by difficulties in reading, in writing, in thinking, and in behavior.

Parsons thinks that the general verdict among teachers of the primary grades is that the majority of left-handed pupils may safely be taught to write with the right hand without incurring harmful effects. He gives as his own opinion that change of handedness seldom results in stammering or other speech defects, provided the change is made at an early date. In connection with stuttering he observes that when it occurs as a result of changing the native handedness of young children it lasts only while the change is being made. Then he cautions: "When the stuttering persists, all efforts to effect a change of handedness should cease."

The nearest statement to a conclusion found in Miss Heinlein's *Preferential Manipulation in Children* is her pronouncement that "training of strongly left-handed children of pre-school age in the use of the right hand in motor activities involving

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gross muscle co-ordination as well as those involving the finer muscle co-ordinations, seems possible."

Haebner, in summarizing other investigations on handedness and speech defects says that Ballard, the Blantons, Nice, and Whipple hold that, in changing from the left to the right hand, the "resulting nerve disturbance" is a potent cause of speech disorders which often occur about the time the writing habit is in process of being changed. Wallin, Lippert, and Fletcher, he says, show little relationship between speech defect and change of hand action.

In connection with the training of the ambidextrous child, Haebner affirms that the "arguments for and against ambidexterity have produced no guiding principle which parent and teacher can confidently apply."

Haebner attempted to determine left-handedness by measuring the actions of 68 pairs (right-handed and left-handed) of children in one of the public schools of Brooklyn, New York. Each pair was given a series of tests involving speech, handedness, strength of grip, intelligence, general and school interest, school adjustment, general emotionality; and each child was weighed and measured. His findings add little if anything to the solution of the problem on cause of handedness, but they do offer some suggestions with respect to the training of the left-handed child. He finds that (1) hand dominance may vary in degree from practically 100% to such a low type of strength that clear differentiation from the non-preferred hand is difficult; (2) there is no reliable difference in intelligence or in social achievement between the left-handed and the right-handed group; (3) no reliable difference with respect to height and weight between the two groups; (4) hand preference has little relation to the general interest of children. His conclusions on the matter of interfering with "natural handedness" are that (1) there is only slight evidence of a relation between

change of the writing hand and speech defects; (2) change of the writing hand appears to have little measurable effect in general physical strength and does not appear to make the child less dominant in his preferred hand.

Garry Myers in *Developing Personality in the Child at School*, says in connection with speech and handedness that nervous disorders and speech defects are much more prevalent among those children who, once left-handed, have been forced to become right-handed." The same author in *Building Personality in Children*, a book just off the press, in answer to his own rhetorical question—"Shall I make my child use his right hand if he persists in employing his left?"—emphatically answers, "No."

Training the Left-Handed

The chief conclusion from the foregoing studies is that the problem of left-handedness has been overemphasized. The relative number of left-handers is small and there is little to indicate that those who are allowed to use the left hand are not about as well circumstanced as the habitual right-handers. It is admitted that in a conventionally right-handed society right-handedness offers some advantages over left-handedness, but most of them are of minor consequence. So exceptional are the conditions under which a left-handed individual fails to accommodate himself that the strenuous efforts often made by parents and teachers to change the handedness of a child may be seriously questioned. If, as some of the studies show, left-handed children are as skillful and as mentally alert as right-handed children, what great gain would come to the child, in changing from the left to the right hand? Handwriting, sewing, painting, bricklaying, carpentering, and plumbing—to name but a few manual operations in which the favored hand is dominant—are performed equally well by left-handed and right-handed individuals.

A left-handed child who is seated for writing or drawing exercises in a chair with

an arm rest on the right side is obviously handicapped in performing this kind of school work, but it would seem much easier to place him at a table-type desk or even a "left-handed chair" than to force him to give up the use of his left hand.

While it appears from the studies quoted that handedness is socially conditioned, it is doubtful if the evidence is conclusive enough to furnish the basis for establishing a very definite policy concerning the treatment of left-handedness.

It may be assumed with a fair degree of assurance that there are degrees of handedness, an individual seldom being one hundred per cent left-handed; a situation which lessens the need of changing the handedness of a person.

If parents and teachers insist on changing the handedness of children the training should commence just as soon as left-handedness manifests itself. If the training produces no ill effects in the child, continue it, but if such unfavorable results as speech defects, nervousness, or irritability occur, stop; the slight advantage which may be gained by forcing children to adopt the common mode of handedness is not counterbalanced by the danger involved in the forced change.

Long live the left-handers; may they be allowed to enjoy life in their own way!

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EDUCATING FOR EDUCATION

EVERY day one may find in some newspaper or magazine an article advocating a principle or theory of this or that concerning teaching. In association meetings enthusiastic teachers become over-enthusiastic over some new idea of theirs. In practically every instance it is nothing but a restating or a revamping of an old principle, some going back to Plato. (I might add that if we went back we could do far worse.) The Dalton Plan, the Unit Plan, the Platoon System, and hundreds of other plans are nothing new. They have been tried; they have been used for ages, but without their educational tags, and they have been successful. The world has changed, but education has stood still, or at best crawled, except in adapting new names to old ideas.

Once it was Greek and Latin that we taught, and that would have been splendid if we had really taught them. Today it is English and history; tomorrow it will be something else. And in each instance it has never been the heart and purpose and spirit back of and in the subject but rather a list of rules—taught because they trained the mind. Why not count the bricks in a wall and remember how many? A good rule would be to remember to use a ladder, for then when counting the bricks in a high wall the pupil can see them more easily. Yes, tomorrow it will be something else, and from all indications it will not be Life that is taught.

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