AN EXPERIMENT IN INFANT EDUCATION

INTRODUCTORY STATEMENT

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Reprinted from THE JOURNAL OF APPLIED PSYCHOLOGY
September, 1918, Vol. II, pp. 219-228
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The following article was written at my urgent request by the father of Martha. The statements it contains border so closely on the incredible that I have thought best to state here briefly what I know about the child.

Martha lives within a few miles of Stanford University. Her father is a lawyer, having graduated from Stanford University at the age of 21 years. The mother was a teacher before marriage. I first saw Martha on the evening of March 31, 1918. At that time she was a few days more than 26 months old. Several times I had heard of her as a child prodigy who was able to read like a school child. On the day just mentioned Martha’s father brought her to my home and allowed me to observe her reading ability. Her performance was quite beyond anything I had deemed possible for a child a little more than two years old. She read from any primer fluently and with better expression than most first grade children are capable of. Her pronunciation, however, was babyish as one would expect in the case of a child who had only talked one year. Given primers which she had never seen, she read from any starting point without hesitation. Whenever she came to a word she did not know she said, “What’s that?” In one little lesson she was given to read, four new words were encountered and pronounced for her. An hour later she was able to recognize all of these even when they were shown to her in word lists at the back of the book. I did not undertake to measure her reading vocabulary, but from what I heard of her reading I am convinced that it is larger than that of the average child who has spent ten months in the first grade.

I have known Martha’s father for approximately three years and I wish to say that his statements in the following article should be accepted without the slightest discount for paternal pride or faults of observation. He has made the article a plain statement of fact, leaving each reader to interpret the interesting phenomenon according to his own theories.

One other pertinent fact should be mentioned: Martha’s
oldest brother, 11 years old at this writing, has the highest intelligence quotient I have found among California children. At nine years he tested 171, and a year later 172. At 11 years he is leading his class in the eighth grade. This boy was given a course in intensive mind culture similar to that employed in the case of Martha, only not so early in life. In his fourth year he could read various primers and at the age of six he devoured books which are ordinarily not read by children below the fourth grade. There is one other child in the family, a boy two years younger than John. This boy is making an average record in the third grade and seems to be little if any more advanced in intelligence than the average child of his age. This boy enjoyed no special instruction like that given the other two children for the reason that the father at that time was fully occupied by professional duties.

It is interesting to conjecture to what extent the precocity of John and Martha was due to the educational stimulation they received, and to what extent the average condition of the other child is the result of the omission of such stimulation. The question can here only be raised; but it is within the possibilities of psychology to find, by properly controlled experiments, an answer to this and similar questions relating to the plasticity of the human intellect. Is it too much to hope that the experimental psychology of the future will concern itself more with the dynamics of mind and character than it has in the past?

By Martha’s Father

Up to the age of nineteen months my daughter, Martha S., was apparently a normal child mentally and physically. She began to talk and to walk at the usual age and her progress in these particulars was neither more rapid nor slower than that of the average child.

At the age of about fourteen months she had acquired the use of her first three words, “mamma,” “papa,” and “pretty.” I then began an experiment in child education which has continued, more or less intermittently, up to the present time. I had heard of certain infants who showed great precocity at early ages, and was moved by curiosity to attempt to discover for myself whether such children are specially gifted by nature with unusual mental powers or whether the same development might not be attained by any normal child such as Martha appeared to be.

I had no access to any of the literature on the subject, and, indeed, up to the present time have not read any book or article dealing with cases of early mental development and the methods employed to secure it; nor have I ever been a teacher or particularly interested in educational matters. The results obtained, therefore, have naturally been limited by the fact that I was a rank layman pioneering in a field to me unknown, without knowledge of educational methods and compelled to rely upon such crude expedients, in lieu of methods, as might suggest themselves to a lay mind. In view of the measure of success which has attended an experiment undertaken under such obvious disadvantages, it is safe to assume that had the same experiment been carried out consistently and uninterruptedly by a qualified educator, the success would have been proportionately greater.

As an initial step I cut from red cardboard a number of large capital letters and tacked them on the living room wall among the various pictures hanging there. In moments of leisure I took Martha in my arms and walked from picture to picture naming the objects represented. Occasionally I stopped before one of the letters and said “See pretty B,” “There is O,” or “See M,” as the case might be. In a few days she was able to recognize B, and her fourth spoken word was “pretty B.” At this time she learned to recognize three or four of the capital letters; but her progress was slow and disheartening; and as spring work on the ranch was coming on, I dropped the experiment altogether. From that time for about five months no special effort was made to direct her mental development, which proceeded normally. I did, however, in spare moments make it a practice to point out various objects and to pronounce their names slowly and distinctly, with the result that her vocabulary of nouns was rapidly increased.

One day when she was about nineteen months old her aunt showed her the pictures in a nursery book, in which she at once became greatly interested, and from that time her mental development has been rapid. While it is doubtless unsafe to generalize from the results of a single experiment of this kind, my experience with Martha leads me to believe that the secret of unlocking the wonderful powers of the baby mind lies in securing its interested attention to matters of educational value, and that by far the most effective means of arousing such interested attention is the nursery picture book, properly employed.

I placed in her hands a book which, in addition to a number of pictures interesting to the child mind, contained capital letters in glaring type and colors. She at once became interested in the pictures and fell into the habit of rushing to
me, whenever I entered the house, to have me show them to her. At these times I took her on my lap, turned to a picture, told her what the objects represented were, and chatted about them in such fashion as seemed most to arouse her interest. Occasionally I turned suddenly to the pages of capital letters, pointed to one of them, and exclaimed with feigned excitement, “Oh Martha! Look! Look! There’s P!” Then, without giving her time to discover the deceit and to determine for herself that after all there is nothing wildly exciting about the letter P, I returned to the pictures and excited her interest in the vicissitudes of Tom the Piper’s son, only to turn back after a few moments and point with an exclamation to another letter. The pictures were unquestionably of great interest to her, and as the references to the uninteresting capitals were only occasional and momentary, the net result of these sessions was that she found the book as a whole a great joy, failed to discover the camouflage in the matter of the letters, and nevertheless became familiar with them. When she was nineteen months and thirteen days old she was able to recognize and pronounce all of the capital letters.

Although I am informed that the method of teaching a child to read by first teaching it its letters is decidedly out of vogue, I nevertheless continued in that error, if error it be, and next proceeded to teach Martha the small letters. As I had no picture-book containing the small letters in showy type, I was compelled to resort to another expedient. I drew the letters carefully on the back of business cards, and kept a few of these in my pocket. When she grew tired of looking at pictures I allowed her to play with these cards, of course calling her attention from time to time to the letter on the back of each. She became interested about this time in exploring my coat pockets and pulling the contents out of them, so I sometimes placed a few cards in a pocket open to attack, and allowed her to pull them out one at a time, refusing to let her have a new card until she pronounced the letter on the one already pulled out. As this refusal constituted an obstacle to an interesting investigation, she sensibly surmounted it by observing the letters and pronouncing them in order to experience the joy of delving into the depths of the pocket for a new card. At other times I varied the play by sitting down with a pack of the cards in my hand and giving them to her one at a time to be carried by her across the room and delivered to her mother or aunt, refusing to give her another until she told mother or aunt the name of the letter on each card delivered. Both mother and aunt always dis-played a highly gratifying interest and astonishment at all information so volunteered by her, and she doubtless felt that she was playing a very important rôle in an extremely important matter. At any rate she enjoyed the process immensely and incidentally learned her small letters.

When she was twenty months old she knew both small and capital letters thoroughly, and I next proceeded to teach her to read. For the initial steps the picture books were again resorted to. In passing from picture to picture I occasionally dropped down to the reading matter, placed my finger under the word “the,” and said in a casual manner, “And there is ‘the,’ Martha,” proceeding instantly to another picture before that wholly uninteresting image of a word could detract from the vivid interest aroused by the pictures. In a few days she knew “the” and had no difficulty in picking it out herself in a page of print. Several other words, such as “book,” “man,” “fat,” “boy,” and “girl,” were taught in the same way. These words were then transferred to the backs of cards and thoroughly fixed in her memory by following out the series of plays used in teaching the small letters.

As I felt that the type in ordinary primers would be too small for a child of her age, and as an examination of a number of these primers indicated that much more was related to things beyond her knowledge, I determined to prepare my own primer. I accordingly purchased an ordinary five cent composition book, cut highly colored pictures from magazine advertisements, pasted them in the book, and printed under them simple words referring to the pictures in letters half an inch high.

Her interest in this book was confined almost exclusively to the pictures, the reading matter in itself making no special appeal to her. She wanted to see the pictures; before a page was turned and a new picture brought to view it was necessary to pronounce the words, and she did so as a means to getting to something enjoyable. Of course new words were gradually added on succeeding pages. Although the words were arranged in short sentences she did not at first realize any connection between the words or grasp the idea that these words as combined expressed a thought. Each word was for her a picture without relation to other pictures. When she was twenty-one months and ten days old the idea that these word pictures represented thoughts suddenly dawned upon her while pronouncing the words “I see mamma” written under a photograph of her mother. This discovery was attended by every indication of mental pleasure, and from that moment
she began to read in the true sense of the word. I find from my records that on that day she had a reading vocabulary of thirty-five words and could distinguish between and name the primary colors.

It may be observed that up to this time the process of teaching was one of indirection. No effort was made to interest her directly in characters or words to be memorized. These were, on the contrary, studiously kept in the background, and her attention was directed to them only casually and momentarily from time to time in connection with pictures or matters which aroused and held her interest. In a world overflowing with things interesting to the baby mind it is a difficult task to secure direct concentration on such uninteresting things as letters and word pictures.

The difficulty of securing such direct interest in reading matter now began to manifest itself. With each additional lesson added to the home-made primer the number of words in proportion to pictures increased, and Martha's interest began to decrease in much the same proportion. The reading matter was assuming a prominence which no longer made it incidental to the pictures, but which threatened to make the pictures incidental to it; and as she had not reached the stage where the act of reading in itself afforded pleasure, she began to get suspicious of a book in which interesting pictures appeared only between arid stretches of word pictures. It was now necessary to bridge the difficult gap between this point and the point at which the act of reading would begin to be a pleasure by reason, not of the accompanying pictures, but by reason of the thought conveyed. To that end I resorted to all sorts of expedients, some of them doubtless ridiculous. To encourage her I once applauded her by clapping my hands after she had finished reading a page. That pleased her, and when she finished another page she demanded more applause. Finally it came to be understood that whenever she finished reading a page all present must break out into riotous hand-clapping. This outburst of applause was so pleasing to her that she began to seek the opportunity of reading in order to provoke it. Often after wading almost through a page and observing that she was within a line or two of the bottom, she would cease reading, look up with eyes dancing with joyous expectation, and exclaim "Pretty soon patty-cake!" (clap). Later on, when handclapping had lost something of its novelty I once became so enthusiastic after she finished a difficult page that I broke out in the chorus of "Marching through Georgia," beginning, of course, with the words "Hur-rah! Hurrah!" That also tickled her fancy and for a time she read for the purpose of hearing this chorus bellowed by the family at the end of each page. At other times she read for the purpose of being tossed up in the air or of being taken out to see the stars. When all these failed I fell back on rewards and, to some extent, on downright compulsion. Her small allowance of candy was cut off and she was given to understand that she could have candy only by reading for it. If the promise of candy was insufficient to coax her away from her dolls and toys a piece would be placed on the table in plain sight until she surrendered and expressed a willingness to read for it. On a few occasions, when everything else failed, I even resorted to a light spanking to get her started to reading. I mention this fact not because I believe it to be a method to be recommended; but in order to make this record a true one. I now feel that by the exercise of a little more patience and ingenuity I could have surmounted all difficulties by more rational methods. By the time she was twenty-three months old she began to experience the mental pleasure of reading, and the necessity for these methods passed.

Her reading was supplemented with the cards until her vocabulary increased to about seventy-five words. She then began to exhibit an aptitude for assimilating new word forms which rendered further use of the cards unnecessary.

In the reading matter specially prepared for her capital letters were eliminated entirely except in the case of proper nouns. She was reading by the word method in which each word is in effect nothing more nor less than a picture with a given name. Considered as a picture, the picture "the" is decidedly different from the picture "The;" and it clearly confused the child to hear the same name applied to dissimilar pictures. When she was far enough advanced to begin the use of printed school primers she no longer had any difficulty in recognizing words beginning with capitals.

The composition book primer was not wholly satisfactory. Its leaves were of such flimsy paper that in the hands of a baby they were readily torn; and we were obliged to keep it out of her reach except when an older person could be present to watch over it. To obviate this difficulty I procured a sheet of artificial wall-board of the type of "Beaver Board," and sawed it into pieces about nine inches long by seven inches wide, on which the lessons prepared for her were pasted. The boards so prepared were practically indestructible, and served not only as a reading text, but as a toy as well, with which the baby might play at her pleasure. Martha
took kindly to these boards, and when twenty-three months old ordinarily spent as much as an hour each day on the floor, playing with the boards, and reading the lessons aloud to herself. After she had mastered the contents of some fifteen of these boards, she had acquired a reading vocabulary of about one hundred and fifty words, and had developed considerable proficiency in reading. Ordinary school primers took kindly to these boards, and when twenty-three months old, she had acquired a reading vocabulary of over two hundred words. At the age of twenty-four months she had a reading vocabulary of over two hundred words. She is at the time of this writing twenty-six and one-half months old, and has a reading vocabulary of over seven hundred words. In addition to the matter specially prepared for her on the boards, and in addition to considerable matter mastered in various nursery books, she has finished four school primers and is about half way through a fifth. Her vocabulary of spoken words is very extensive, so much so that I have given up trying to keep track of it; but it must be well over two thousand words. Her pronunciation has by no means kept pace with her progress in reading; but her expression while reading leaves little to be desired.

Because of lack of time very little has been attempted in the way of developing her mathematical sense. When she was twenty-one months old she had acquired the use of the words "one," "two," "three," "four," "five," "six," and "seven," but without any concept of the number value expressed by the words. At that age I spent many hours, and exhausted every resource of my ingenuity in an attempt to get her to recognize the number of objects up to three, but without success. She had absolutely no mathematical sense at that age, although her ability to recognize colors and word forms was already well developed. The first glimmering of a mathematical sense appeared during her twenty-third month, when she began to count small groups of objects correctly. By the time she was twenty-four months old she recognized and read the printed numerals up to 100, and correctly counted groups of objects up to ten. No effort has since been made to develop her mind in this direction.

Owing to pressure of other matters I have been able to give her little attention since her twenty-fourth month; and for some time have devoted to her only a half hour or so in the evening two or three times a week; so that her development, considerable as it is, by no means approaches the limits of possibility. Indeed, I am much impressed with the idea that the limits of the baby mind have never been sounded. It appears to be capable of performing feats beyond the powers of the mind of either the adult or the child of school age. As an illustration, it is no unusual thing for Martha, when conditions are favorable, to cover twenty pages of simple new matter in a primer and add twenty or more new words to her vocabulary in a single session of half an hour. The instant her eye encounters an unfamiliar word she exclaims "What's that?" I pronounce the word for her once, or at most twice, have her repeat it, and it is stamped in her memory; and thereafter she recognizes and pronounces it in whatever connection she meets it. In doing this she receives no aid from phonics. Up to the present time she reads by the word method only. The lightning-like rapidity with which her mind, apparently without effort or concentration, assimilates new word forms is almost uncanny. Since beginning this article I have had an opportunity to put this ability to a somewhat strenuous test. I brought the child to my office to spend the day with me away from the distracting influences of family life. I gave her a primer she had not previously seen—"Gordon's Reader, Book I." She read, with frequent intervals of happy play, for about three hours and a half, when she rebelled and refused to read further. During this period she covered the first forty-four pages of the primer (excluding three pages of verse), or a total of 2,464 words. In this number of pages she encountered fifty-one unfamiliar word forms, which were pronounced for her until she was able to repeat them, but which were not reviewed. The book was then put away for thirty hours, at which time of the fifty-one new words she recognized thirty-eight and failed on thirteen.

As the baby mind doubtless foreshadows the mind of the child of school age, a fact observed during the course of the experiment should be of interest to the educator. While it is true that her baby mind is capable of feats beyond the powers of older minds, this power displays itself in its highest perfection only during those hours of the day when her physical vitality is at its best. When physical weariness supervenes the collapse of the mental powers is more absolute and complete than in the case of an older child. In Martha's case, her mental powers are not at their highest immediately after awakening from a refreshing sleep. They begin to spark about two hours after she awakes, blaze forth in their greatest brilliancy four, five, or six hours after awakening, and then gradually decline. As bed time approaches they die out almost completely. Then, even if she expresses a desire to read, as she often does, her mind wanders from the
printed page, she is unable to assimilate new word forms, which leave no impression on her memory, and she completely forgets words with which she has long been familiar.

Since undertaking the experiment I have been warned by kindly friends against "over-taxing" the baby's mind, and have been favored with citations from the works of educators containing grave warnings against straining the mental powers of the young. The answer to such warnings appears to me to be, first, that the baby mind is naturally intensely active, and if Martha had been left to her own devices during the periods devoted to teaching her, her mind would have been just as actively occupied with something of no ulterior value to her as it was in fact occupied with learning to read; and second, that it is impossible to drive the baby mind beyond that which affords it pleasure, whether such pleasure is found in an act itself or in anticipation of a reward for doing the act. I have stated that at one stage in her development I occasionally lightly spanked her to get her to read, and, unexplained, this statement might imply that I thereby forced her to mental effort. The fact is, however, that the spanking merely served to wrest her attention from dolls and toys. When her attention was so diverted I directed it to the reading matter, a new interest and pleasure supervened, and she forgot her dolls. When the time comes, as it often does, when reading ceases to be a pleasure to her, and her interested attention can no longer be commanded, I have yet to discover a method of forcing her to proceed.