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# A Comparison of Learning by Trial and Error with Learning by Observation and Insight and Its Bearing upon the Gestalt Theory

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# A COMPARISON OF LEARNING BY TRIAL AND ERROR WITH LEARNING BY OBSERVATION AND INSIGHT AND ITS BEARING UPON THE GESTALT THEORY

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# CHAPTER I

## INTRODUCTION

Some students of science are drawn to psychology because it offers an almost unlimited field for investigation and research. It has been said that psychology is individualistic and no two systems are alike. This is true only in part as there are certain principles agreed upon by the majority of psychologists, but there are also many on which leaders in this science have different opinions.

As early as 1876 Alexander Bain advanced theories regarding the method by which learning takes place. He asserted that man, in the beginning, has a proneness to make voluntary movements which are originated by stimuli, but whose course is at first the result of chance. From these spontaneous movements those are chosen which manifest adaptiveness of the organism.[1]

However, the beginning of the modern laboratory approach to the learning problem may be traced to Edward L. Thorndike's experiments with chickens, cats, dogs, and monkeys.[2] These were observed as they learned simple types of behavior and from the results certain inferences have

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[1]W. B. Pillsbury, The History of Psychology, p. 197.

[2]Henry E. Garrett, Great Experiments in Psychology, p. 102.

been made which are important for human as well as animal learning.

Thorndike discovered that when chickens were placed in a maze with four possible exits, three of which led to blind alleys, they picked the right exit by chance. If they were returned to the maze a number of times they responded for the first few trials much as before, but soon abandoned ineffectual movements and learned to run directly to the right exit. In his experiments with cats, dogs, and monkeys placed in puzzle boxes he found they would learn to open a simple catch only after many trials and failures and when they succeeded by chance they could not immediately repeat the successful movements. The monkeys showed superiority in speed and permanence of learning over cats and dogs, said Thorndike, but they exhibited no real understanding of the problem. His conclusion was that the animal made its movements as the result of some random stimulus which happened to be present and that the success was entirely accidental.

The popularity of this new theory, termed the trial and error theory of learning, increased. Educators hailed it as the foundation for teaching and W. B. Pillsbury stated the opinion of many when he wrote:[3] "The process of trial and error governs all of the learning of animals so far experimented upon from the very lowest to man."

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[3] The Fundamentals of Psychology, p. 512.

In 1912 with the publication in Germany of Wertheimer's article on seen movement a new school of psychologists may be said to have originated. Followers of this school whose principles were brought to America by the German psychologists Koffka and Köhler have attacked Thorndike's view that animals learn entirely by trial and error. On the contrary, they assert, insight plays a most important role and every single act from the beginning brings success until it culminates in the completion of the learning task. They insist learning is not a mosaic of isolated sensations and that the method of trial and error is certainly not explanatory or even truly descriptive. They further state that from the beginning an orderly arrangement of sensory data, called a configuration, exists which acts as a guide until the tension in the organism is resolved and the goal is reached. This new school has taken its name from the German word "Gestalt" (form or shape) which Titchener has called configuration.

Interest in this concept has been widespread. O. A. Oeser, writing in the British Journal of Psychology, said:[4] "Nothing so fundamentally new and revolutionary as the Gestalt theorie has appeared since the time of William James."

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[4]"Gestalt and the Gestalt Theory," British Journal of Psychology, XXI (1930), 73-94, in Psychological Abstracts, IV (November, 1930), 472.

Harry Helson and R. H. Wheeler, American psychologists, have and are now carrying on experiments, the results of which they firmly assert support the Gestalt theory. R. H. Wheeler states as a summation of his experiments the following:[5] "We may define learning as that behavior in terms of which the individual extends his insight into a given situation and increases the complexity of his actions with respect to a certain goal."

It is, therefore, apparent that there are two theories of learning divergent from one another. On one side Thorndike's conceptions of learning stand as typical of that older school which emphasizes the method of trial and error. On the other side of the learning field are the followers of the Gestalt psychology, Koffka, Köhler, Helson, Wheeler, and others, insisting that trial and error learning is not explanatory or descriptive, but that insight into the goal is the necessary thing.

Throughout this thesis these interpretations are placed on the terminology used by the above two schools. By trial and error learning is meant random procedure aroused by chance stimuli. These movements are at first excessive and unorganized, but later a routine is established by selecting those movements which by chance happen to be successful.

The construction placed on insight is that it is

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[5] The Science of Psychology, p. 240.

co-ordinated conscious behavior toward a definite goal. It is never taken to mean unorganized experiences and movements in regard to the behaving organism.

The term configuration is used as meaning an organized, unified response to an arrangement of stimuli, that is, a stimulus-pattern which is a whole. It is a system of energy which has shape or form in respect to the organism which is behaving.

## CHAPTER II

## PURPOSE OF THE STUDY

The purpose of this investigation is to compare under controlled conditions learning by trial and error with learning by observation and insight. To accomplish this aim three questions arose. Which method of learning is the most economical in point of time for the average student? Is there a higher correlation between intelligence and time required to complete a simple learning task involving insight than there is between intelligence and time required to do the task by trial and error? What bearing will the results of this experiment have on the Gestalt theory?

## CHAPTER III

## RELATED EXPERIMENTS

Numerous investigations have been made to support both the trial and error theory and the Gestalt theory. As far as we are able to discover no attempt has been made to compare the two in one experiment. The following results have been found from experiments carried on, some phase of each being comparable to a portion of the writer's thesis.

Köhler, in his study of apes, found an animal reacts more quickly to a situation which it can survey as a whole than it can react to absolute units which the trial and error theory requires.[1] Problems appear to be solved instantaneously as if the animal could see through the problem before reaching its conclusions.

Koffka believes the child learns to recognize and react to the "friendly" face before it has any perception of its colors, etc., as such.[2] He also, in experimenting with figure and ground patterns and the staircase illusion, asserted that the analytic attitude results in the formation of a new configuration, different from the configuration found in the natural state.

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[1]H. Helson, "The Psychology of Gestalt," American Journal of Psychology, XXXVI (1925), 342.

[2]W. B. Pillsbury, The History of Psychology, p. 310.

Professor Guilford, who asked his subjects to learn various series of memory material, some of which possessed configuration and some of which did not, found that the fact the latter could be learned at all depended upon some kind of a perception of a simple relationship to the whole.[3]

Augusta Alpert, in her experiment with insight in pre-school children, found that in every type of response a solution was arrived at only if the subject had gained insight into the problem situation. Also that chance might aid the arousal of insight by throwing the elements of a situation together, but no solution was found to be directly the result of chance.[4]

Mary Elizabeth Bulbrook experimented upon the existence and nature of insight and did not find this factor played an important role. Apparently she felt that her results favored Titchener's functional analysis conception rather than the insight theory.

Harold E. Jones and Dorothy Dunn, although not true believers in the Gestalt theory, did find a configural factor entering into children's learning.[6]

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[3]R. H. Wheeler, Readings in Psychology, p. 290.

[4]Ibid., p. 114.

[5]"An Experiment Into the Existence and Nature of Insight," The American Journal of Psychology, XLIV (July, 1932), 451.

[6]"Configural Factor in Children's Learning," Journal of Genetic Psychology, XLI (September, 1932), 3-15.

J. P. Guilford and R. A. Hilton experimented with the configurational properties of short musical melodies and the results they obtained favored the new school. An altered tone seemed to raise or lower the whole melody along with it, or, in Gestalt terms, to change one member changed all the rest.[7]

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[7]"Some Configurational Properties of Short Musical Melodies," Journal of Experimental Psychology, XVI (February, 1933), 54.

## CHAPTER IV

## PRELIMINARY EXPERIMENTATION

Several preliminary experiments were carried on to determine the best materials and procedure to be used in the solution of the problem.

The material used in the first of these experiments was a page advertisement in tones of gray cut from a current magazine and pasted on light weight cardboard. This was then cut into small pieces, some with straight edges and others with curved ones. The subjects used were a psychology major who was completing work for a Master of Science degree in psychology and a professor in the department who had received his Ph. D. degree in psychology. The student was first presented the cut-up pieces with the instruction to join them together into something meaningful. He was not informed as to the nature of the picture, the size, or shape. After about an hour's work he had accomplished very little. He was then shown a duplicate picture of the one he was attempting to put together. After this he made progress although it was so slow he felt it useless to continue.

Several days later the professor was given the same material. His progress was more rapid in the beginning than the student's, but as soon as he had pieced together the

familiar objects in the picture, he was unable to proceed further. He was then shown the duplicate picture and was able to complete the experiment.

By means of introspection the subjects found in the beginning insight was gained through the familiar objects in the picture, the largest of which was a Hudson sedan. The trade sign on the hub-cap marked the car as that particular make of automobile.

This material was not used because the insight gained through the familiar objects would be present in every situation, and thus no true trial and error set-up could be obtained. Furthermore, it was regarded as too difficult, due to the sameness of color, the many straight edges on the pieces, and the lightness of the cardboard.

The material used in the second preliminary experiment consisted of a small wooden Japanese puzzle composed of fifteen pieces. Subjects used were two freshmen each with a rather high gross score of 194 points as obtained on the 1931 edition of the Thurstone Psychological Examination for High School Graduates and College Freshmen. The first student was presented the pieces of the dissembled puzzle and asked to put them together. He was not told what they would form nor was he given any hint as to the nature of the completed article. He had no insight. He worked for twenty minutes and was able to put all the pieces together, although far from their correct order. He was informed this

was wrong and worked thirteen minutes longer, but came no nearer to the correct solution.

The second student was shown the completed puzzle. He then watched the experimenter take it apart and put it together in the right way. He was next given the pieces and instructed to repeat the process. He had insight into what he was attempting to do. In fifteen minutes he had the pieces all together so that they resembled the completed ship, but he also had errors.

This approached a satisfactory set-up, but, it too, had many objectionable points. The pieces of the ship fitted together in several different ways, and although they did not make the ship in any other than the correct way, the puzzle could be considered solved when all the pieces were together in some fashion. Furthermore, only one puzzle was available for use and the working time for a sufficient number to validate results would have been too great.

About this time the jig-saw puzzle became popular and through investigation it was found that some puzzles contained many colors, shapes, etc., which would give insight into the completed picture. Others, which were made chiefly of one color and which lacked these shapes, were found also. An experiment was then anticipated using two puzzles, one of the former type with many colors and shapes for the situation involving insight, and one lacking these, but of the same size and number of pieces, for the parallel situation involving trial and error. But, as no standard for measuring the degree of insight contained in each puzzle was

available, and no two puzzles of absolute equality as to difficulty were found, this set-up was not possible. Moreover, as the majority of puzzles on the market at that time required three or more hours for solving, the time element would again have been excessive for use by a sufficient number of subjects.

A small jig-saw puzzle was later found which could be solved in twelve minutes and which could be obtained in quantities sufficient for a class project. It was also observed that by turning the wrong side up all configural factors with the exception of the shape of the pieces were discarded and yet there was no change in other conditions: all would be working the same puzzle. With this information the major experiment was begun.

# CHAPTER V

# EXPERIMENTATION

## Materials and Subjects

In attempting to carry out the purpose of this thesis three experiments were conducted.

The subjects for the first two experiments were students in the Introductory Psychology, General Psychology, and Educational Psychology classes. For the third experiment five students in the eighth grade of the College Junior High School were used.

Material for the first experiment consisted of a simple jig-saw puzzle furnished by the manager of the local Fox theatre. This was made of light weight cardboard, was cut into thirty-six interlocking and straight-edged pieces, and when put together formed the picture of a boy and his dog with a statue of Abraham Lincoln and a city skyline in the background. The wrong side was white. As a working base for the puzzle an uncovered cardboard shoe box and a piece of gray blotting paper measuring twelve by fourteen inches were obtained. One side of the box was cut away and the blotting paper was fastened to the bottom of the box where the side was missing. The box afforded a place for the pieces of the puzzle to be placed and the blotting paper provided ample room and also prevented slipping.

For the second experiment as mentioned above a slightly

larger jig-saw puzzle was used. This puzzle which measured seven by ten inches was furnished by the R. B. Davis Company of Hoboken, New Jersey, and was originally made for distribution with Cocomalt. It was made of heavy cardboard, and was cut into sixty-five interlocking pieces, which when together formed a miniature of the United State map in colors enclosed in a border with a picture of the famous Flying Family placed at the center top. At the lower left hand corner was a square of printed reading matter. The wrong side was white. For the working base for this puzzle a large aluminum tray, approximately fourteen by eighteen inches, was obtained from the College cafeteria. Inside this a piece of gray blotting paper twelve by fourteen inches was placed to prevent the puzzle from slipping.

In the third experiment two groups of words were used. The first group consisted of sixteen words connected so as to make the following sentence: The president can succeed only if he has the cooperation of the people of the country. The second group was made up of sixteen words which were meaningful, but which had no connection with one another. They were: Gum, window, book, apple, radio, street, chair, dress, valley, beech, engine, notes, rock, sister, screen, and plaid.

## Procedure

### Experiment I

One hundred and two students from the psychology classes were used in the first experiment. These were divided into

two parallel groups of equal intelligence. Division was made as follows: Gross scores made on the American Psychological Examination, commonly known as the Thurstone Psychological Examination for High School Graduates and College Freshmen from the name of its authors, were obtained. Eighty-two of these scores were taken from the records of the Co-Operative Bureau of Educational Research of the Kansas State Teachers' College and were for the 1931 and 1932 editions of the test. This test had been administered under carefully controlled conditions by an experienced examiner in the fall of 1931 and the fall of 1932. The remaining twenty students whose scores were not obtainable from the bureau were given the 1932 edition of this same test by an experienced examiner under carefully controlled conditions just previous to the experimentation. After all the scores had been obtained they were written down in descending order. These were then marked off in sections of four and the first and fourth of this smaller division were placed in one group and the second and third in another. This was repeated until all scores had been placed in one of two groups. By shifting a few numbers the total of the gross scores in each group was made equal.

The usual time for the meeting of the psychology classes was used with the exception of one small morning class. Because many of the students had only one hour to devote to the experiment at the usual time, but had two or more hours in

the afternoon, the time was changed to the later hour. Regular class room seats were used. Previous to the entering of the class the chairs in the room had been rearranged. Half were placed around the room facing the wall with the backs towards those remaining in the center. A puzzle, disassembled, with its accompanying box and blotter, was placed on the arm of each chair. As the students entered each was placed in his proper group, one group seated around the wall and the other on the chairs in the center. Thus one group was unable to observe what the other was doing. After all were seated those in the chairs facing the wall were instructed to work the puzzle wrong side up. Those in the center of the room were shown a picture of the completed puzzle and then instructed to work it right side up. The beginning time for each student was recorded and as every student finished he was asked to raise his hand, the time for completion was recorded and he was permitted to leave the room. Those who did not complete the experiment within the hour were urged to remain and finish, but when this was impossible, the puzzle was preserved as it was left and the student was allowed to return and finish.

Experiment II

In the second experiment the rotation method was used. Forty students in the Educational Psychology Class were given the 1932 edition of the Thurstone Psychological Examination by the writer under carefully controlled conditions. These

were divided into parallel groups in the same manner as in the first experiment, again using the gross scores as the basis for division. Chairs and seating were also arranged as in the previous experiment. The group of students seated around the wall first worked the puzzle wrong side up while those in the center worked it right side up. However, as each finished and his time was recorded, he was requested to turn his puzzle over, tear it up, and put it together in the manner opposite to what he had previously done. Thus, each student worked the puzzle wrong side up and right side up, one group working the puzzle wrong side up first and the other the right side up first. Time was kept for each individual and each way he worked the puzzle. With the exception of a few all were able to complete the project in the three class periods used. In event they did not get through, the students were allowed to return and finish their puzzle outside the regular class time.

## Experiment III

In the third experiment in which the connected and disconnected words were used, five pupils from the eighth grade acted as subjects. The sentence was first read in a monotone. The subject was asked to count aloud for twelve seconds and then write what he could remember of the sentence. If all had not been remembered in the proper sequence the sentence was read twice again, the subject counted for twelve seconds and for the second time wrote what

he could remember. This was repeated until the entire sentence was recalled without error. When this had been accomplished the words were read in a monotone voice twice, the subject counted for the twelve seconds and wrote those which he could remember. This process was done again and again until all the words were written in their proper order. Time was kept for the actual learning and not for the period of recall. Number of repetitions was also tabulated.

## CHAPTER VI

## RESULTS

The following table gives the results obtained in the first experiment:

TABLE I

Results of First Experiment in Terms of Minutes Required for Fifty-one Students To Work Jig-Saw Puzzle Wrong Side Up and For Fifty-one Students to Work Jig-Saw Puzzle Right Side Up Together with Gross Scores on Thurstone Psychological Test

| | Group 1 Right Side Up | Group 2 Wrong Side Up |
|---|---|---|
| Number of Students . . . . . | 51 | 51 |
| Total Time for Group (Minutes) | 1029 | 3351 |
| Mean Time (Minutes) . . . . . | 20.18 | 67.72 |
| Median Time . . . . . | 15 | 60 |
| Standard Deviation . . . . . | 12.30 | 30.10 |
| Group Total on Gross Scores on Thurstone Test . . . . | 6848 | 6848 |
| Mean Score . . . . . | 134.2 | 134.2 |
| Median Score . . . . . | 136 | 135 |
| Standard Deviation . . . . . | 51.45 | 50.10 |

The mean or average time required for working the puzzle right side up for the fifty-one students in the first experiment is 20.18 minutes as shown in the above table. The mean time for working the puzzle wrong side up is 65.72 minutes, making a mean difference of 45.54 minutes. Using formula No. 19 in Garrett's Statistics in Psychology and Education we find the $\sigma$ difference of the two averages to be 4.55. The obtained difference, D, is 17.8; therefore $\frac{D}{\sigma diff}$ is 3.9. It is customary to take a $\frac{D}{\sigma diff}$ of 3 as indic-

ative of complete reliability and a $\frac{D}{\sigma Diff.}$ of 3.9 then would be 30 per cent higher than required for complete reliability. Using formula No. 20 in the above book by Garrett to obtain the PE difference of the two averages, we find it to be 3.07. The obtained difference, D, is 17.8; therefore, $\frac{D}{PE\,Diff}$ is 5.7. In this case a $\frac{D}{PE\,Diff}$ of 4 represents complete reliability. A $\frac{D}{PE\,Diff}$ of 5.7 is 42.5 per cent higher than is required for complete reliability.

Using the results of this experiment for making a correlation between the scores and time required to work the puzzle wrong side up a negative correlation of -.209 is obtained. (See appendix for figures.) The probable error is .0903. The correlation between the gross scores and the time required to work the puzzle right side up is -.412. The probable error is .0784. As the correlations have been made between the highest scores and the longest time required to work the puzzle in both instances, the interpretation of the negative correlation is that there is a correlation in both instances between the highest scores and the shortest length of time.

Table II gives the results of the second experiment. The larger puzzle accounts for the increase in average time for this group over the previous experiment.

TABLE II

Results of Second Experiment In Terms of Minutes For Two Groups to Work Jig-Saw Puzzle Right Side Up and Wrong Side Up Together With Gross Scores On Thurstone Psychological Test

| | Group 1 Right Side First | Group 2 Wrong Side First |
|---|---|---|
| Number of Students | 20 | 20 |
| Time for Wrong Side (Min.) | 1685 | 1812 |
| Mean Time for Wrong Side (Min.) | 84.25 | 90.6 |
| Time for Right Side (Min.) | 540 | 468 |
| Mean Time Right Side (Min.) | 27 | 23.4 |
| Mean Time Both Ways | 111.25 | 114 |
| Total on Gross Psychological Scores | 3496 | 3485 |

The group of students which began working the puzzle right side up took an average of 27 minutes to work it right side up and an average of 84.25 minutes to work it wrong side up. This made a total of 111.25 minutes which is the average time required for each student to work the puzzle both right and wrong side up. The second group which first worked the puzzle wrong side up took an average of 23.4 minutes to work the puzzle right side up and an average of 90.6 minutes to work it wrong side up, making a total of 114 minutes for the average time required for each student to work the puzzle both right and wrong side up. The first group spent 76 per cent of its time working the puzzle wrong side up and 24 per cent of the time working it right side up. The second group spent 79 per cent of its time working the puzzle wrong side up and 21 per cent of the time working it right

side up. Referring to Table I we find that the average time for working the small puzzle in Experiment I both right and wrong side up is 87.5 minutes. Thus 77 per cent of the time was spent working this puzzle wrong side up and 23 per cent of the time working it right side up. As it can be observed, the averages in the three different groups have a very small variance and in every case the time necessary to complete the puzzle wrong side up or by trial and error is over three times as great as that required to work the puzzle right side up with insight.

Table III shows the time and number of repetitions necessary for each of the five eighth grade students to learn the connected and disconnected material in the third experiment.

TABLE III

Number of Seconds and Repetitions Necessary for Five Eighth Grade Students To Learn Connected and Disconnected Material

| Subject No. | Number of Repetitions | | Seconds Required | |
|---|---|---|---|---|
| | Sentence | Words | Sentence | Words |
| 1 | 6 | 18 | 74 | 441 |
| 2 | 6 | 18 | 72 | 420 |
| 3 | 10 | 8 | 91 | 186 |
| 4 | 4 | 18 | 49 | 434 |
| 5 | 2 | 27 | 27 | 386 |
| Total | 28 | 89 | 313 | 1867 |

Subjects one and two were almost identical in length of time and number of repetitions. Subject three, it will be noticed, required a greater number of repetitions, although shorter time, to learn the connected material than he did the disconnected material. This is probably due to the fact that in learning the sentence he was able to recall it correctly after the first two readings with the exception of substituting an "a" for a "the." Not until the sentence had been read for the tenth time was he able to correct this error. Because he seemed to feel this error the result of carelessness he made a special effort on the disconnected words. A total of 28 repetitions was required for the five students to memorize the connected material and a total of 89 repetitions or 3.18 times as many to learn the disconnected material. A total of 313 seconds was required for the five students to learn the connected material and a total of 1867 seconds or 5.97 times as long to learn the disconnected material.

## CHAPTER VII

## SUMMARY AND CONCLUSIONS

### Summary

The purpose of this experiment is to compare learning by trial and error with learning by observation and insight. Three experiments have been carried out in which parallel learning situations with the exception that in one insight was employed and in the other trial and error was used have been set up. Three different methods have been used, the parallel group method, the rotation method and the single group method. The results of the first experiment in which the parallel group method was used showed that an average of 20.18 minutes was required to work the jig-saw puzzle with insight while 67.72 minutes were required to work the same puzzle by trial and error. The correlation between the gross scores made on the Thurstone Psychological Examination for High School Graduates and College Freshmen and the time required to work the puzzle by insight was -.412. The correlation between the gross scores made on this same test and the time required to work the puzzle by trial and error was -.209.

In the second experiment in which the rotation method was employed the group which first worked the puzzle right side up spent an average of 24 per cent of the total time required to work the puzzle both right and wrong side up, or 27 minutes, working the puzzle right side up and 76 per cent of the time, or 84.25 minutes, working the puzzle wrong

side up. The second group which first worked the puzzle wrong side up spent an average of 21 per cent of the total time required to work the puzzle both right and wrong side up, or 23.4 minutes, working the puzzle right side up, and 79 per cent of the time, or 90.6 minutes, working it wrong side up. The first group spent an average of 111.25 minutes working the puzzle both right and wrong side up and the second group spent an average of 114 minutes working the puzzle both ways.

In the third experiment in which connected and disconnected material was memorized by a single group of five eighth grade students the disconnected material required an average of 3.18 times as many repetitions and an average of 5.97 times as many seconds for learning as did the connected material.

## Conclusions

From the results of the experiments the following conclusions may be drawn:

1. It is more economical in point of time for the student to learn by the insight method than by trial and error. It requires several times as long to do a task without the aid of a configuration or insight as it does when these factors are used.

2. The higher the degree of insight employed in a learning task the more nearly perfect will be the correlation between intelligence and time required for its com-

pletion. Also the absence of insight causes the correlation between intelligence and time involved to approach zero. In the first experiment of this thesis a correlation lacking only .006 of being twice as large was obtained between the Thurstone gross scores and time required to work a jig-saw puzzle by insight as was obtained between the Thurstone gross scores and time required to work the puzzle by trial and error. It is the writer's opinion that had there been no insight present in the situation used in this experiment as exemplifying the method of trial and error the correlation would have been much nearer zero. The shape of the pieces of the puzzle used in this case probably added some insight. Furthermore, had a set-up been possible which contained the maximum of configurational possibilities it is believed the correlation would have been much higher.

3. Since the correlation between insight learning and intelligence was found to be practically twice that found between intelligence and learning by trial and error the results of this investigation, although they may be taken as merely indicative, favor the Gestalt theory. It would be presumed that conditions which coincide with man's original potentialities for which he was made to carry on with perfection would be more easily adapted to. Therefore, it would be logical to incorporate extensively in education that learning method which experimentation establishes as the one man readily adapts to, the method of insight and observation, rather than

to continue the wide use of the older and apparently less efficient method of trial and error. We could furthermore infer that, since the problem which was solved by insight, which was grasped as a whole, and which was consequently worked in a shorter length of time in every experiment in this thesis, the mind itself works similarly as a unit or totality and not as an aggregation of mosaic sections comparable to a disassembled jig-saw puzzle.

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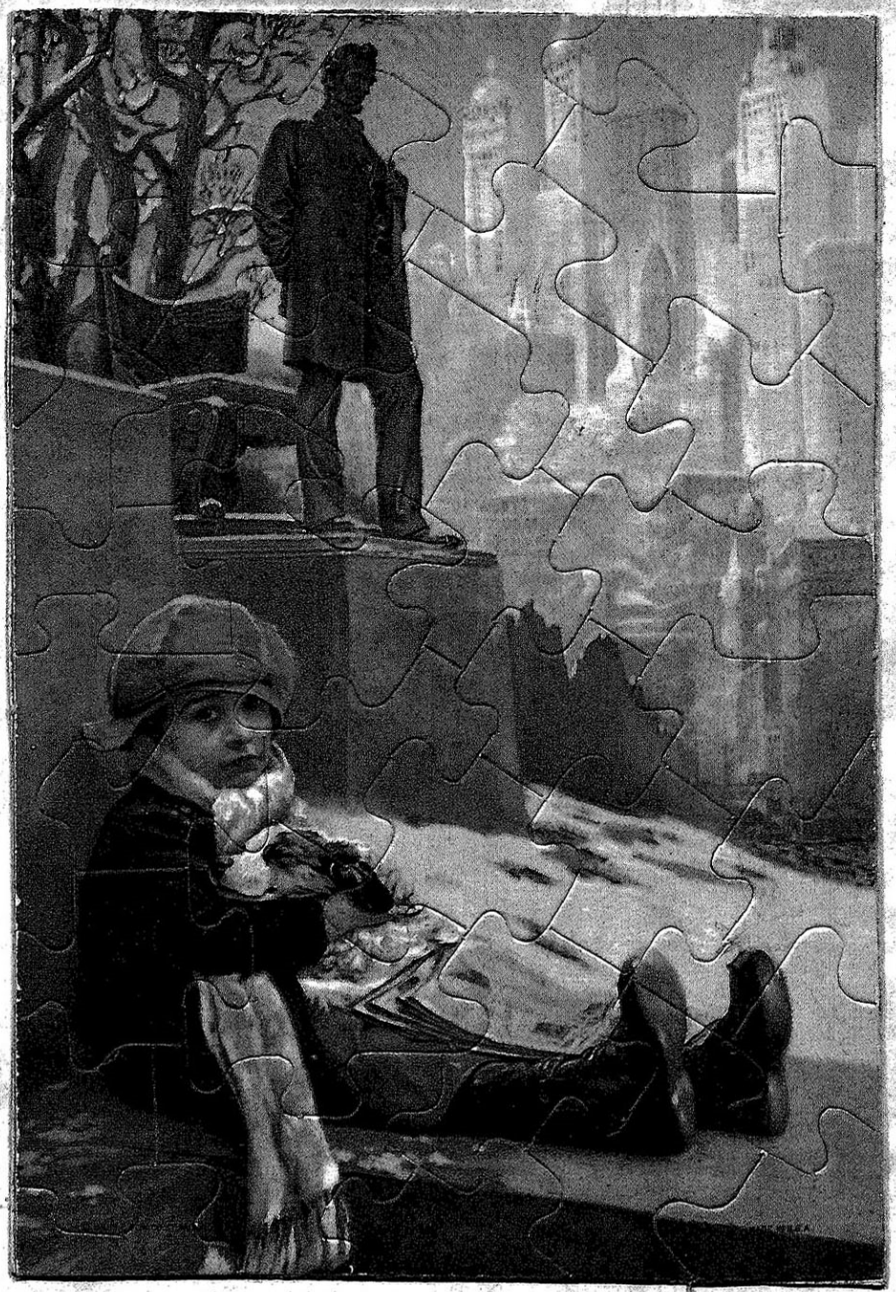
# APPENDIX



Puzzle Used in Experiment I