

# Effectiveness of Herrmann Model in the Achievement of Fourth-Scientific Class Female Students in Biology

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## ABSTRACT

The research aims to identify the effectiveness of Herrmann Model in the achievement of Fourth-Scientific Class female students in Biology. The researcher has adopted the partial-control experimental method to adjust the research variables. The research sample consists of 72 students (36 female students who have studied according to Herrmann model and 36 male students who have studied according to normal method). Before starting the experiment, the researcher has made an equivalence between the two groups representing in variables (age by months, students' previous achievement in biology, testing previous information and intelligence test). Statistics have proved that the two groups of research are equivalent to those variables. After conducting the equivalence, the researcher has prepared application requirements including plans, goals and tests for the two groups of research. She has applied her research tools after completing the experiment application. After marking the students' answers, she has obtained data for the experimental group and control group, where those data have been statistically processed by (T-test) for two independent samples. Results have shown superiority of the experimental group which has studied according to Herrmann Model over the control group which has studied according to the normal method in the studying achievement variable.

**Keywords:** *Herrmann Model, achievement, fourth scientific class students, biology.*

## INTRODUCTION

Studying achievement is one of the problems leading to student's failure in school, and this leads to frequent complaints by the school administration and teachers. The reason lies in that they are unaware of real reasons behind those students' low grades and accordingly a continuous decrease in their studying achievement. Finally they fail and stay in the same classes for several years without finding out actual solutions for the problem. Therefore, social and educational researchers have paid attention to study the problem completely and comprehensively from all sides to discover the truth. Encouragement of studying achievement is one of schools aims over centuries through which we can

measure students' performance level and how appropriate is the curriculum. Studying achievement neither aims to compile information in students' minds nor to get a degree to improve economic or social status. However, the real purpose of the achievement is to feed minds with knowledge and useful sciences comprehensively and gradually. As achievement and thinking are inseparable processes, insufficient achievement is accompanied by poor thinking. There is no doubt that poor achievement does not appear suddenly, but it starts with students from zero and then grows with them. Poor achievement in biology is one of the problems that students suffer from in preparatory stage; there is a defect in traditional methods followed in teaching as they concentrate on memorization and feedback. Teaching in our Iraqi schools pay attention mostly on how to make students' minds full of information without teaching them how to learn and acquire scientific bases for different knowledge. Moreover, teachers do not care about strategies used with students in learning and accordingly they follow certain modes of teaching and thinking that encourage auto-memorization more

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than thinking leading to creativity and students' poor learning skills. Therefore, learning has become soft and limited to studying achievement in its low levels. Brain Dominance as one of brain quadrants is dominating and it does not mean that the rest of styles are inactive (Ned Herrmann 1993). Herrmann has identified four styles of thinking which are: Logical style: it cares about a knowledge base and ability to understand and merge knowledge systems and processes. Organizational style: it cares about organization and schedule of activities and pays attention to details and creation of goals and procedures to achieve them. Social style: it shows ability to communicate socially and linguistically, its impact upon others and ability to deal with them. Creative style: it shows ability to imagine and visualize uncommon alternatives and overcome obstacles and problems that are shown during thinking and obtaining new ideas <sup>10</sup>. So, biology, among others, has its own and important turn in contemporary life and education, it develops the scientific thinking skills, it is no longer limited to memorization and remembering of concepts but it has become an experimental science seeking to give students skills of investigation and discovery which develop the higher levels of thinking <sup>4</sup>. Is one of the modern sciences that we need in our daily life, it is of the important and necessary sciences as it lets us know what is in our bodies such as organs, cells and biological functions and it also make us recognize organisms and plants and what is around us in the surrounding environment <sup>9</sup>. Brain has four lobes which are: Frontal lobe: it is the primary region of motor system and it includes 50% of the size of each cerebral hemisphere. It controls the movement through the top of two hemispheres. Temporal lobe: is the center of talking in the left side. Occipital lobe: is the visual processing center <sup>3</sup>.

## METHODOLOGY

Research Methodology and Experimental Design: Experimental design with a post-test has been selected for the experimental group and control group. This type of design is required to achieve equivalence between the two groups. The experimental design, which is based on Herrmann model, represents an independent variable while studying achievement represents a dependent.

### Research Experimental Design

The independent variable includes Herrmann model and normal method, while the dependent variable

includes achievement. Therefore, the researcher has used the experimental design with partial control for two equivalent groups (experimental and control).

### Research Community and sample

This research community represents the students of fourth scientific class in secondary and preparatory schools (Morning study), which belong to the Directorate General of Education in Babil (City Center), for the academic year 2017-2018. These schools should have two fourth-scientific classes at least. The researcher has selected Al-Thawra Preparatory Mixed school in Babil city center randomly, it contains four classes of fourth scientific (A, B, C, D). The researcher has selected class B (36 students) randomly to represent experimental group whose students will study according to Herrmann model. In the same way, she has selected class C (36 students) randomly to represent control group whose students will study according to the normal method.

**Test items output:** achievement test items have been created in their primary version in the light of the test map content. She has selected the type of test (multi-choices questions, True and False, and fill the blanks) which consider of the best subjective questions. The test consists of 30 items distributed to Bloom levels of knowledge (knowledge, comprehension, application, analysis, structure and assessment) concerning the four subjects of biology book.

**Test Instructions:** instructions and guidelines concerning how to answer and which represented in (selecting one correct alternative choice for the item, answer all items, time for answer, writing full name, class and section in the designated place), have been drafted.

**Marking the test answers:** after drafting the test items, a scale has been developed to mark the answers. One grade for each correct answer and zero for the wrong answer, abandoned item that the student didn't answer and the item that was answered by more than one choice. Accordingly, the maximum grade is 30 and the minimum grade is zero.

**Test Validity:** face validity and content validity have been verified. Results showed that face validity achieved 90% as a rate of agreement by arbitrators and experts. Concerning the content validity, results showed that all the achievement test items are statistically

significant. Therefore, the achievement test is valid to measure the extent of the fourth-scientific class students' comprehension in biology.

### **Exploratory Application of the achievement test**

First Exploratory Application: the achievement test has been applied in its first exploratory stage on a group of students of fourth-scientific class other than the research sample (30 students). The purpose is to recognize the clarification of test instructions and guidelines, the extent of comprehension and clarification of test items for the students and calculate the time necessary for the test where the researcher has recorded the time of completing the test for each student. By calculating the arithmetic average of time, it is found that time needed for answering the test items is 33, 34 seconds. Second Exploratory Application: the test has been applied on a sample of 100 students of the fourth-scientific class other than the research sample. The purpose is to analyze the achievement test items statistically, which represented in item difficulty, item discrimination and effectiveness of wrong alternatives.

### **Statistical Analysis of the Achievement Test**

**Items:** the achievement test items have been analyzed as the following: Item difficulty: by conducting statistical analysis for the achievement test items, it is found that difficulty coefficient of the items ranges from 0,36 to 0,56. Therefore, the achievement test items are considered good and their difficulty is appropriate. Item Discrimination: one of the characteristics that should be available in the test items is item discrimination which means the possibility of items to discriminate students' individual differences. Test items are valid as the items discrimination coefficient is 0, 20 and above and the discrimination coefficient value of the achievement test ranges from 0,33 to 0,63. Accordingly, the achievement test items have a good discrimination coefficient and are considered suitable. Test Reliability: test reliability coefficient depends on relationship between one item and another or between all test items. This is apparent through its grades stability and items consistency. Test reliability coefficient can be calculated by using legal relation between the test units. Some of the characteristics of good test are validity and reliability so that test items are clear, valid and reliable at the same time. Reliability indicates a consistency of test grades when repeating it again, i.e. it refers to balanced and stable students' grades in the test.

**Split-half Method:** it is one of the most used methods because it avoids the disadvantages of some other methods. For obtaining two equivalent versions of the test, the researcher has divided the test items into odd and even items. By selecting the students' answers of the exploratory sample amounting to 100 answers and by getting Peterson correlation coefficient between the grades of the odd and even items, it is obtained the reliability coefficient amounting to 0,86. As the reliability coefficient of the split-half method does not measure total homogeneity of the test (its half is reliable only). Therefore, marking the answers is made by using Spearman correlation coefficient which is 0.92 and it is a good reliability coefficient from the experts' view.

**Kuder-Richardson Method:** Kuder-Richardson formula has been applied according to students' grades. The researcher has found that the test reliability value is 0.82. Accordingly it is a good and suitable value and the test is reliable.

**Application of research tool:** the experimental and control groups of the research have been informed about the application time of the achievement test a week before. It has been applied after finishing the educational material specified for the two groups of the research at the same time and the researcher has supervised the test application.

**Statistical Means:** the researcher has used the T-test for two independent samples to conduct equivalence between the two groups by the following variables: (age by months, students' achievement in the Mid-year exam of Physics, Otis-Lennon Intelligence test and SPSS).

## **RESULTS AND DISCUSSION**

An achievement test has been made for both groups after completing the educational material taught by the researcher. Results show the supremacy of the experimental group over the control group and according to table 1. The table shows the experimental group supremacy over the control group in the achievement test. Therefore, there is a statistically significant level between grades average of the experimental group students who study biology according to Herrmann model and grades average of the control group students who study the same subject according to the normal method in the achievement and for the favor of the experimental group. This is consistent with previous studies that confirmed the supremacy of the experimental

group which studies according to Herrmann model over the control group which studies according to the normal method. This shows us that teaching according to Herrmann model has a positive impact on understanding information, scientific facts and interpretation of mathematical laws through cooperating groups and what students discuss and this will lead to raise their scientific level and achievement. Results of statistical processing have proved the supremacy of the experimental group's students over the control group students. The researcher has attributed the results to one of the following reasons:

Use of Herrmann model has helped to create a free and unlimited atmosphere and enhanced the experimental group students' confidence. Use of the logic and organizational style in this method has led to organize the female students' thinking and increase their attention and concentration on lessons. Use of Herrmann model has given the female students the chance to participate in thinking collectively and exchange and respect opinions. The model has given a space for each student to express herself and make judgments about different opinions and ideas among them.

**Table 1. The supremacy of the experimental group over the control group**

Group	Number	Arithmetic average	Standard deviation	Variance	Freedom degree	T-values		Significance level
						Calculated	Tabular	
Experimental	36	26,02	6,29	39,56	70	2,157	2	Statistically significant
Control	36	22,65	6,77	45,83				

## CONCLUSION

In the lights of the results reached by the research, the researcher has concluded the following: The effectiveness of Herrmann Model in the achievement of the experimental group female students in Biology. The model can make the students a center focus in the learning process through giving the chance to express opinions freely and subjectively and this meets the modern requirements of teaching. The model requires a lot of teacher's efforts to achieve a high level of interaction between him and students in any thinking method.

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**Conflict of Interest:** None to declare.

**Ethical Clearance:** All experimental protocols were approved under the Department of Teaching Methods of Science, College of Basic Education, University of Babylon, Hillah city, Iraq and all experiments were carried out in accordance with approved guidelines.

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