Lecture Vs. Discussion in Teaching Biology for Tenth Grade Students in Saudi Arabia

Sultana Kaseem Al-Faleh

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LECTURE VS. DISCUSSION IN TEACHING BIOLOGY FOR TENTH GRADE STUDENTS IN SAUDI ARABIA

by

Sultana Kaseem Al-Faleh

A THESIS

Presented to the Faculty of
The Graduate College in the University of Nebraska
In Partial Fulfillment of Requirements
for the Degree of Master of Science

Major: Agricultural Education

Under the Supervision of Professor Roy D. Dillon

Lincoln, Nebraska

December, 1992
The primary purpose of this study was to determine if there were any significant differences between lecture and discussion methods with regard to students' learning achievement.

There were three null hypotheses addressed by this study. Null hypothesis I was: there was no significant difference in the students' learning achievement with respect to either lecture or discussion methods. Null hypothesis II was: there was no significant difference between the students' pre-test scores and post-test scores. Null hypothesis III was: there were no differences in the students satisfaction with respect to the two teaching methods.

Three teachers and 151 students in six groups were selected to participate in this study. Each teacher taught two groups for one month in the Spring semester of 1992. During this month each group was taught by the lecture and discussion methods, each for two weeks.

Four tests were given to the students: two pre-tests and two
post-tests. One pre-test was given at the beginning of the first two weeks before the first treatment (lecture or discussion) was applied. The other pre-test was given at the beginning of the second two weeks after the second treatment (lecture or discussion) was received. The first and the second post-tests were given after completing the first and second treatments, respectively.

The students' test scores were recorded and used as data for measuring students' learning achievement. For measuring students' satisfaction, a questionnaire attached to the second post-test was distributed. The data for measuring both students' learning achievement and satisfaction level were used to calculate the respective means, standard deviation, percentages, and t-test values.

All the examined three null hypothesis in this study was rejected. The results showed the following: the students gained more knowledge after applying both the lecture and discussion methods; the students obtained higher scores when taught by the lecture method; and 83% of the students preferred being taught by the discussion method.
بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ
To the soul of my father

To my mother
ACKNOWLEDGMENTS

The author wishes to express her sincere appreciation to Dr. Roy D. Dillon, who served as a major advisor and graduate committee chairman, for his patience, guidance, friendship, undivided assistance, and encouragement throughout her graduate program and the conduct of this study.

She is also grateful to Dr. Leverne A. Barrett and Dr. Allen Blezek for providing advice and encouragement and for serving on the graduate committee.

Special thanks and appreciation to my husband, Ahmad, who without his support and cooperation, this study could not have been completed.

Finally, the writer wishes to express her sincere thanks to her grand mother, her sisters and brothers (especially her sister Hend and her brother-in-law Khalid), and her friends Nawal and Asma for their help and support during the entire course of this study.
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CHAPTER I
INTRODUCTION

A controversy of several decades still exists in education, about whether the lecture method or the discussion method is better with respect to the student's learning achievement. A review of available literature shows that there has been a number of research studies conducted for comparison between the lecture and discussion methods. Some of these studies indicate that there are no significant differences in the student's performance, with respect to applying either discussion or lecture method. Other studies indicated that there are differences.

McRae and Young (1988) stated that Bane (1925) concluded that lecture is better for immediate recall of the material content, and that discussion is better for retention. McKeachie (1975) also found that the lecture method is superior in the student's performance than the discussion method; but for retention and better reasoning, the discussion method is superior.

In the case of Saudi Arabia, the most common method applied in high school is the lecture method. However, some teachers are using the discussion method. It is the author's opinion that in order to achieve effective learning, teachers must apply a variety of teaching methods. However, the author believes that a dedicated instructor must select the teaching methods that are appropriate to the subject matter.

The main objective in this study was to examine whether there were significant differences between the discussion and the lecture
methods with regard to students' learning achievements. This study was conducted with high school female students in Saudi Arabia.

Statement Of The Problem

The problem that was addressed by this study was to determine if there were any significant differences between lecture and discussion method with regard to students' learning achievement.

Objectives Of The Study

1. To compare the lecture and discussion methods as measured by students' learning achievement, based on students' post-test scores.
2. To determine if there is a difference between students' scores of pre-tests and post-tests.
3. To identify the students' level of satisfaction with each teaching method.

Significance Of The Study

Saudi Arabia is a developing country that is going through many changes in different aspects, one of them being education. The government provides schools at different levels with everything that is needed to make education a priority in people's lives. Along with these developments, the government of Saudi Arabia ought to encourage educational research, in order to identify educational policies in order that the government can follow and produce high quality educated people.

Teaching methods is one area on which researchers should work on. This study is an attempt along this line. The author believes
that improving the teaching methods applied on Saudi Arabian high schools (and on high schools in general) would improve learning and produce better students and society.

"Educators do not agree as to whether performance-based instruction is as viable an approach as the traditional lecture-discussion approach. The relative lack of research comparing the two teaching methods has allowed for uncontradicted criticism" (Kanzanas & Frezier, 1982, p. 312). In this study, the author will share findings of this kind of comparative research.

This study, hopefully, will provide the General Presidency of Girls' Education (the agency that is responsible for girls' education in Saudi Arabia) with some valuable suggestions and recommendations to improve teaching methods in female high schools; furthermore, the study will encourage other researchers to do further investigations in this or other related topics.

Also, this study, to a certain extent, contributes to the existing literature on teaching methods, especially by being conducted in Saudi Arabia since it is a country that has a different culture from the American culture, and also a different educational system.

Definition Of Terms

Lecture Method:

The teacher selects the topic and presents it to the students in formal oral presentation. The students' opinions are not considered, and they are only to listen.
Discussion Method:

The students and the teacher share opinions and evaluations. The students also talk to each other in order to share information about the topic.

Delimitations Of The Study

1. The study was conducted in three female high schools in Saudi Arabia: one high school in Taif city and the other two in the capital, Riyadh.

2. The students and teachers were not randomly selected. The experiments for this study was applied by three teachers who agreed to conduct such experiments. Each teacher applied the treatments of this study on two classes that she taught in her high school.
CHAPTER II
REVIEW OF THE LITERATURE

The purpose of this study was to determine whether there were any significant differences between lecture and discussion methods with regard to students' learning achievements.

This chapter has two parts. The first part is aimed at reviewing the studies that have been conducted to determine the differences between lecture and discussion with respect to students' performance. The second part of this chapter is concerned with reviewing the studies that compared lecture with discussion in regard to students' satisfaction and preference.

Part 1

Many studies have been conducted to compare lecture with discussion methods with respect to their effectiveness on students' achievements. Some of the researchers indicated there are no differences in applying either discussion or lecture in the students' learning achievement. Others reached the conclusion that the discussion has some advantages over the lecture with regard to some respects, and the lecture has some advantages over the discussion method in different respects. Also, other researchers have stated that the lecture is superior with respect to the students' performance. Therefore, the literature review in this part will be organized in accordance to the researchers' findings indicated above. First, the author will review those studies that found no significant differences between the two methods. Second, the author will discuss those studies that reached conclusions regarding the advantages and
disadvantages of the two methods. Finally, those studies that supported the lecture methods will be reviewed.

A study by Corey (1966) had many questions to answer. One of the questions was: In terms of content mastery, will there be any difference between a lecture class and a discussion class? There were two groups involved in this study: small group discussion, with a total of 40 students, and small group lecture, with a total of 26 students. These two groups were taught by the investigator. The conclusions of this study showed that mastery of the subject matter of psychology is not influenced by the method of instruction.

Blezer and Conti (1973) conducted a study to test three hypotheses. One of these hypotheses was: there is a significant difference in grades achieved in traditional versus non-traditional methods in biology courses. The authors in this study meant by traditional that the course was taught by lecture and laboratory, and non-traditional is that the course was taught by discussion method, independent study, and laboratory. There were 134 students in two classes who were taught by the same teacher who participated in this study. The result indicated that there were no significant differences in the grades of the students who were taught by these two methods.

Nolan (1974) had stated that Dubin and Taveggia (1968) indicated there were many studies of variation in teaching techniques supporting the general conclusion that there is no significant difference among methods of teaching when measured by the students' performances on final examinations.

Tomm and Leahey (1980) conducted a study where three methods of teaching were compared. Method I was lecture with
demonstration videotapes. Method II was discussion with the same videotapes. Method III was that students had a family interview and then presented videotapes for small discussion. There were 72 students involved in this study, and each method was taught by different instructors. The results of this study highlighted there were no significant differences among these three teaching methods with respect to students' scores in the tests.

A study by Kanzanas and Frezier (1982) had four questions that the authors wanted to answer. One of them was: To what extent does the lecture-discussion method effect the students' achievement and retention? Twenty-five students were randomly selected to participate in this study. The conclusion of this study reported that there were no significant differences existing between the lecture-discussion approaches on the students' exams.

Mcrae and Young (1988) conducted a study on 149 students, not randomly selected in Introductory Business, to determine if the students in the lecture methods would outperform those students in the discussion methods on the final exam. They found there were no significant differences in the students' performance with regard to lecture or discussion methods. Furthermore, they pointed out that Atherton (1972) conducted an extensive review, related to lecture versus discussion, which showed that many researchers indicated that no one method is more effective than any other.

According to Mayer (1968) lecture method discourages creativity and encourages passivity. In discussion-dominated classes a teacher is able to see how much work his/her students do, while classes taught by lecture method only enable students to see how
much work a teacher does. When lectures are bad, there is only one person to blame; the teacher, of course. But when discussions are bad, there is more than one person to blame; the teacher and the students. Furthermore, the students' creativity is better served in the discussion method than in the lecture; however, there is no evidence to support that.

Atherton (1972) had a study comparing the effect of three teaching methods (lecture, discussion, and independent study) on recall of facts, understanding of content, and application of principles. The sample for this study was very small, and it was not random. The author concluded there was a differential effect on students' learning as measured by examination among these three methods. As indicated from this study, the students' mean scores for recalling and understanding were higher in the discussion method than the lecture method, but for application the scores were higher in the lecture method than the discussion method.

Lecture is a better method for retention of the content than is discussion. However, the discussion method allows students to become active and creative (Blizek, Jakson and Lavie, 1974).

McKeachie and Kulik (1975) found that the lecture method was superior in performance on examination than the discussion method. But, for retention and a higher level of thinking, the discussion method was superior.

Randall (1978) compared five different teaching methods. Two of them were lecture and discussion. In this study, the author indicated the lecture method was an inefficient way of instruction because it does not involve the students. Also, he stated that lecture
can be used to introduce a new subject and for making a summary at the end of a session. This method, as the author highlighted, permits the teacher to cover a great deal of material in the least amount of time, and enables the teacher to go directly to his/her objectives. When there is a large number of students, lecture method is a good method for a teacher to use.

On the other hand, the author concluded that in the discussion method a teacher leads his/her class and steers the group in order to accomplish the objectives. Discussion method involves thinking, and any student can participate. As the author stated, the discussion method leads to better learning and retention. However, this method is more time consuming than the lecture, and it is more adaptable to a small group of 25 students or less.

Jones, Bagford, and Wallen (1979) stated that the discussion method had some advantages such as: students learned better through discussion, the discussion helped students raise questions and answer them, the students were free to give comments or not, and discussion had a positive effect upon the mental activity of the students. Moreover, there were some disadvantages such as: discussion methods need a lengthy time, some students may never participate, and there were problems in evaluating the students.

Also, they said the lecture method had some advantages such as: the lecture method was very helpful in introducing a new topic, it allowed many students to receive information quickly, and it helped the students to develop note-taking. There were also some disadvantages like: the teacher was not able to know if the students understood the lecture or not, the students were not permitted to ask
questions or share opinions, and it seldom achieved a higher level of effective learning.

Peterson and others (1979) investigated aptitude-treatment interaction with three teaching approaches: lecture, inquiry, and discussion. The subjects were 145 ninth-grade students enrolled in seven social studies classes. There were three teachers who taught his/her classes according to one of three approaches. The result of this study showed that, on average, students in lecture were significantly lower in ability than students in both inquiry and discussion. Furthermore, students in lecture were, on average, significantly more anxious than students in discussion. Finally, students in lecture were significantly lower in their average score on achievement than students in inquiry.

Tomm and Leahey (1980) pointed out that Costin (1972) indicated that the lecture method tends to be more effective in teaching factual knowledge, and the discussion method tends to be more effective in teaching intellectual abilities and skills.

In the lecture method, a teacher is active, and students are passive, while both students and teacher are active in discussion method. The discussion method is appropriate for teaching when a teacher is concerned about interaction, involvement, adjustment, and good feedback. The lecture method is the appropriate one when there are large numbers of students and/or subject objectives are based on new knowledge. However, when the objectives are based on new and old attitude or old knowledge, the discussion method is the most appropriate for teaching (Whitman, 1981).
Mcrae and Young (1988) stated that Bone (1925) concluded that lecture is better for immediate recall of the material content, but discussion is better for retention.

A study by Ruja (1954) examined three courses over two periods: Fall, 1951-1952 and Spring, 1951-1952. There were four hypotheses that the author wanted to test. One of them was: the students in discussion classes show greater subject-matter mastery as measured by course examination than the students in lecture. This hypothesis was rejected. The author also found that lecture was superior in subject matter mastery.

Byers and Hedrick (1976) conducted an experimental study to compare two teaching strategies (lecture and discussion) in a small night class. There were two classes, with a total of 33 students, and two instructors involved in this study. The authors concluded that the students who were taught by lecture method had higher scores than the students who were taught by discussion method.

Handleman (1976) carried out a study to compare the students' scores who were taught by lecture method with a similar group taught by discussion; he took a random sample of 120 students selected from a group of 420. He concluded that the lecture method was more effective. Also, he added that both lecture and discussion methods are important, but other methods also should be applied.

Another study was conducted by Elfner (1980) to determine whether the lecture method was superior to two different discussion methods (a teacher centering the discussion, and a student centering the discussion). The students in this study selected themselves, and the instructor for all three methods was the same. The result of
Elfner's study indicated that the lecture method was superior in students' performances on final exams to the discussion method.

**Summary**

The review of the literature has indicated there are three types of results when comparing discussion method with lecture method with respect to students' performances. The first type indicated that there were no differences between applying either discussion or lecture in the students learning achievements. The second type concluded that discussion and lecture methods have some advantages and disadvantages over each other. The third type revealed that the lecture is better than the discussion as it is shown in students' performance in exams.

As indicated from the previous literature, most of the studies revealed that each method has some advantages and disadvantages. Therefore, the author believes that no method is better than the other with respect to students' performance. Combining the two methods in teaching will meet most of the teacher and students' needs. Furthermore, using both methods enables the teacher to get all students, with different personality types, involved in the subject matter.

**Part 2**

This part will review the literature that has been conducted to determine if there are any differences in students' preference and satisfaction when comparing lecture with discussion method. The studies conducted have shown three results: first, there are no differences in students' preference when applying either lecture or
discussion methods; second, students prefer discussion over lecture; and finally, students prefer the lecture method.

A study by Hill (1960) compared the effectiveness of discussion with that of lecture method. The effectiveness, as defined in this study, was the degree achieved in the development of mental abilities or skills, and changes in values, interests, and attitudes. Data were collected from twelve discussion groups composed of 22 to 28 members, lecture groups with 25 to 233 members by pre and post questionnaires and semi-structured interviews, and by direct observation. General conclusions were that the same kind of people were attracted by both methods. Also, equal satisfaction was expressed with both methods that had the same effect on participants.

Canter and Gallatin (1974) conducted a study to examine students' preferences for lecture or discussion methods under conditions where no achievement test or grading was involved. There were 38 male and 57 female students from a college introductory psychology course. The result of this study pointed out there was no significant difference in students' preference for either lecture or discussion.

Beausany (1976) examined two issues in his study. One of them was to determine if there was a difference of students' preference for one method of instruction over the other. The sample involved two introductory sociology classes. The results demonstrated there was no significant difference of students' preference for one method of instruction over the other. The methods of instruction that were compared in this study were lecture, discussion, and a quasi-individualized mastery approach.
A study by Mcrae and Young (1988) investigated three major issues. One issue was to measure the students' satisfaction with regard to teaching by lecture or discussion. There were 149 students involved in this study. The finding highlighted there were no significant differences in the level of students' satisfaction with lecture versus discussion method.

"Neither student nor professor would argue that small discussion oriented classes are not preferable to large lecture classes in which the student is usually a passive recipient" (Schmerler, 1974, p. 257).

Canter and Gallatin (1974) stated that Haigh and Schmidt (1956) indicated that 72% of 212 undergraduate students prefer discussion over lecture method.

A study by Schmeler (1974) was conducted to compare discussion class with lecture class in terms of enjoyment, amount of learning, attendance, and preference. Sixty undergraduate students were involved in this study. Also, questionnaires were distributed in which the students were asked to compare discussion with lecture. The conclusions of this study showed that the students preferred and enjoyed the discussion class over the lecture class.

Byers and Hedrick (1976) conducted an experimental study to compare two teaching strategies (lecture and discussion) in a small night class. There were two classes with a total of 33 students, and two instructors. The authors concluded the students who were taught by lecture method had higher scores than the students who were taught by discussion method. However, interest and attendance records were superior for students who taught by discussion method.
Pflaster (1988) tried to identify the preferences of psychology students among five styles of classroom instruction: films, group discussion, lecture, teacher-led questions and answers, or videos. Questionnaires were distributed, and data were obtained from two teachers and 585 students. Group discussion was ranked as the third, and lecture as the fifth, which indicates that the students prefer discussion over lecture.

Tyrell (1982) stated that Dubin and Tavergia (1968) reviewed the data for several comparisons between lecture and discussion methods at the college level. They found that out of 88 comparisons, 51% favored the lecture method and 49% favored the discussion method.

Summary

The literature indicates there are three results in regard to students' satisfaction with lecture versus discussion methods. The first result demonstrated there is no significant difference in students' satisfaction. The second results revealed that students prefer discussion over lecture method. The third results indicated that students prefer the lecture method.

As indicated from this review, most of the studies pointed out that students prefer discussion over lecture. The author believes that students prefer discussion because of the activity and creativity that is associated with this method. However, this does not mean that the discussion should dominate in teaching. Rather, discussion and lecture should be demonstrated together in a way that fits the subject matter.

Also, this study, to a certain extent, contributes to the existing
literature on teaching methods, especially by being conducted in Saudi Arabia since it is a country that has a different culture from the American culture, and also a different educational system.

This study, hopefully, will provide the General Presidency of Girls' Education (the agency that is responsible for girls' education in Saudi Arabia) with some valuable suggestions and recommendations to improve teaching methods in female high schools; furthermore, the study might encourage other researchers to do further investigations in this or other related topics.
CHAPTER III

METHODS AND PROCEDURES

The primary purpose of this study was to determine if there were any significant differences in students' achievement when applying the lecture and discussion methods. In order to examine this problem, there were two treatments applied on six groups of tenth grade students; each two groups were taught by one instructor. This chapter covers the following sections: 1) Design of the study, 2) Hypotheses, 3) Population and sample, 4) Development of the instrument, and 5) Collection of data.

Design Of The Study

This study is a quasi-experimental study because there was no randomization. The design of the study is as follows:

Figure 1. The Experimental Design.

Groups. 1, 3, and 5

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[First two weeks of the third month of the second semester; six groups and two treatments.]

Groups. 2, 4, and 6

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[Second two weeks of the third month of the second semester; six groups and two treatments.]

Groups. 1, 3, and 5

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[First two weeks of the third month of the second semester; six groups and two treatments.]

Groups. 2, 4, and 6

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[Second two weeks of the third month of the second semester; six groups and two treatments.]

Where: X = Treatments; O = Pre and Post-tests; L = Lecture; D = Discussion.

As shown in Figure 1, this study had two treatments that were applied by three instructors for teaching six groups of tenth grade students (each two groups were taught by one instructor). Groups 1,
3, and 5 received a pre-test on a unit, and then were taught by the lecture method during the first two weeks of the third month of the spring semester, 1992. Groups 2, 4, and 6 were taught by the discussion method after receiving the same pre-test at the beginning of the period. After being taught, all the six groups received a post-test.

During the second two weeks of the same month, the treatment was reversed. Groups 1, 3, and 5 were taught by the discussion method after having a pre-test on another unit. Also, groups 2, 4, and 6 were taught by the lecture method after receiving the same pre-test. At the end of this period, the six groups were given a post-test. The results for each test were then recorded.

Hypotheses

Null Hypothesis 1

There were no significant differences in the students' learning achievement with respect to either lecture or discussion method.

Null Hypothesis 2

There were no significant differences between the students' scores in the pre-test and the students' scores in the post-test.

Null Hypothesis 3

There were no differences in the students' satisfaction with respect to the two teaching methods.

Population

The population for this study was all tenth grade students in three high schools in Saudi Arabia: one high school in Taif city and the
other two in Riyadh city. Each high school had 4 or 5 groups of tenth grade students, and each group consisted of 20-30 students. The entire population number in the three high schools was not known.

Selection Of The Sample

The sample was not randomly selected. There were 151 students in six groups; 48 students were in Taif's high school and 103 students were in Riyadh's high schools. Three teachers were involved in this study. Each teacher selected two classes (groups) from her school in order to apply the treatments of this study.

Development Of The Instrument

The instrument for this study included four tests: two pre-tests and two post-tests. The first pre-test was given at the beginning of the first period (two weeks). The second pre-test was given to the students at the beginning of the second period (two weeks). At the end of each period the students were given a post-test. (The first post-test was given at the end of the first period and the second post-test at the end of the second period.) These post-tests were taken by the students after receiving the treatments (i.e., the lecture and the discussion methods). Each exam was graded one to one hundred points.

There were a variety of types of questions which were developed by the author for each test, i.e., short essay, multiple choice, and true or false questions (see Appendix A and Appendix B). Also, a questionnaire was attached to the second post-test for measuring the students' satisfaction (see Appendix C). The course used for applying
the two treatments was a biology course for tenth grade students. The material contents taught in this experiment consisted of the following units:

**Unit #1**

Human Nervous System:

A) Neuron
B) Human Nervous System
C) Functions of Nervous System
D) Allergy

**Unit #2**

Reproduction in Flowering Plants:

A) Reproduction in Flowering Plants
B) Schematic Structure of the Flower
C) Fertilization
D) Formation of Fruit & Seed
E) Seed & Fruits Dispersion
F) Germination

**Collection Of The Data**

There were four tests given to the students: two pre-tests (see Appendix A), and two post-tests (see Appendix B). After each test, the teachers corrected their students' exams and then recorded the results (these scores were from one to one hundred points). The pre-test and the post-test examination scores were used as data for this study. Also, questionnaire results (see Appendix C) were utilized as additional data for this study. Thus, the students' responses regarding
their satisfaction about the methods (lecture and discussion) were used as part of the data for this study.
CHAPTER IV

FINDINGS

The primary concern of this study was to determine if there were any significant differences between the lecture and discussion methods with respect to students' achievement.

Objectives

1. To compare the lecture and discussion methods as measured by students' learning achievement, based on students' post-test scores.
2. To determine if there is a difference between students' scores of pre-tests and post-tests.
3. To identify the students' level of satisfaction with each teaching method.

Analysis Of The Data

The data (pre-test and post-test scores) were obtained during the summer of 1992 after the treatments were employed in three Saudi Arabian high schools during the spring semester of 1992. These data were then transferred into the computer in order to compute means, standard deviations, and percentages of the data. T-tests were also computed to determine whether the post-test mean was significantly different from the pre-test mean, and to determine whether there were significant differences between the discussion post-test mean and the lecture post-test mean.
Findings For The Null Hypotheses

The findings of this study are basically interpretation of results pertaining to the null hypotheses.

Null hypothesis 1 was: there was no significant difference in the students' learning achievement with respect to either the lecture or discussion methods.

Table 1 presents means, standard deviations, and t-test value of the lecture and discussion post-test scores. This table reveals that the students' average scores were higher in the lecture method than in the discussion method.

The findings, presented in Table 1, suggest that the differences between lecture and discussion means were highly significant at the .01 level. Null hypothesis 1 was, therefore, rejected.

Table 1

Means, Standard Deviations, and t-test Value: Comparison of Two Methods (Lecture and Discussion)

<table>
<thead>
<tr>
<th>Method</th>
<th>n</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>151</td>
<td>72.28</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>Discussion</td>
<td>151</td>
<td>60.86</td>
<td>7.8</td>
<td>2.16*</td>
</tr>
</tbody>
</table>

* Indicates significant at the .01 level.
Null hypothesis 2 was: there was no significant difference between the students' scores in the pre-test and the students' scores in the post-test.

Table 2 presents means, standard deviations, and t-test value of the pre-test and post-test scores. It is shown clearly in the table that the students' average scores were higher on the post-tests than on the pre-tests.

The findings, presented in Table 2, for this null hypothesis suggest that the differences between the pre-tests and the post-tests were significant at the .01 level. Thus, the null hypothesis was rejected.

Table 2

Means, Standard Deviations, and t-test Value: Comparison of Two Tests (Pre-Tests and Post-Tests)

<table>
<thead>
<tr>
<th>Test</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test #1</td>
<td>151</td>
<td>17.10</td>
<td>15.85</td>
<td></td>
</tr>
<tr>
<td>Post-test #1</td>
<td>151</td>
<td>63.20</td>
<td>24.01</td>
<td></td>
</tr>
<tr>
<td>Pre-test #2</td>
<td>151</td>
<td>17.21</td>
<td>15.79</td>
<td>19.70*</td>
</tr>
<tr>
<td>Post-test #2</td>
<td>151</td>
<td>69.95</td>
<td>7.46</td>
<td>20.44*</td>
</tr>
</tbody>
</table>

* Indicates significant at the .01 level.

Null hypothesis 3 was: there were no differences in the students' satisfaction with the two teaching methods.
Table 3 presents the results of the students' satisfaction toward the discussion and the lecture methods. The results indicate nearly 83% of students had a high or very high level of satisfaction with the discussion method compared to 45.70% of the students who had a high or very high level of satisfaction with the lecture method, i.e., more students prefer to be taught by the discussion method.

The findings, presented in Table 3, indicate that there were differences in the students' level of satisfaction; therefore, the null hypothesis was rejected.

Table 3

<table>
<thead>
<tr>
<th>Level of Students' Satisfaction Toward the Lecture and Discussion Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Satisfaction</td>
</tr>
<tr>
<td>Method</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>Lecture</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Discussion</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Note: n = 151 students.
SUMMARY

Statement of the Problem:

The problem that was addressed by this study was to determine if there were any significant differences between lecture and discussion methods with regard to student achievement.

Objectives:

1. To compare the lecture and discussion methods as measured by students' learning achievement, based on students' post-test scores.
2. To determine if there is a difference between students' scores of pre-tests and post-tests.
3. To identify the students' level of satisfaction with each teaching method.

Procedure:

Three instructors and 151 students in six groups (ranging from 20-30) were selected to be used for this study; each instructor taught two groups.

There were four tests developed by the author; two pre-tests and two post-tests. The first pre-test was given to the students in each group at the beginning of the first two weeks of the third month of the second semester, 1992 (see Appendix A). After the pre-test was taken, the students received the treatment (lecture or discussion). Then, they received the first post-test. The second pre-test was given at the beginning of the second two weeks of the same
month; then, the students received the other treatment. After that
they were given the second post-test (see figure 1 and Appendix B).
The students' scores of both the pre-tests and post-tests were
recorded and used as data for measuring students' achievement with
regard to applying discussion and lecture methods. Students'
satisfaction, on the other hand, was measured through distributing a
questionnaire to the students of each group after applying the
treatments (see Appendix C).

The data was then fed to the computer to calculate the means,
standard deviations, percentages, and t-test values.

Conclusions And Discussion

Based on the fact that the sample for this study was not random
(i.e., it was with selected teachers in selected schools), on the fact
that the teachers may be highly trained in using the lecture method,
and on the fact that the post-tests was used to measure immediate
recall (i.e., the post-tests were taken immediately after the
treatments), the conclusions of this study are as follows:
Conclusion and Discussion for Null Hypothesis 1:

Conclusion: the conclusion for this null hypothesis indicates the
students got higher scores, thus reaching higher achievement, with
regard to the units of Human Nervous System and Reproduction in
Flowering Plants when they were being taught by the lecture method.

Discussion: the author believes that because the lecture is the
most common method used in Saudi Arabia in all high school grades,
the students obtained high scores.

The above conclusion is supported by the previous research such
as those conducted by Bone (1925), Ruja (1954), Byers (1976), Handleman (1976), and Elfner (1980). This research reveals that the lecture method is superior with respect to students' performance. Other research reviewed indicated that the lecture method is better for immediate recall and short-term retention.

**Conclusion and Discussion for Null Hypothesis 2:**

**Conclusion:** students who were taught by both the lecture and discussion methods achieved high scores in the post-tests in the units of Human Nervous System and Reproduction in Flowering Plants.

**Discussion:** nearly all high school students acquire knowledge and understanding about the subjects of a scientific course such as biology after being taught the subjects. Thus we do not expect the students, on average, to obtain high scores in the pre-tests, i.e., before they set in their classrooms, listen to their instructor, and study the subjects that they were taught.

In this study, students seemed to gain knowledge and develop understanding about the biology subjects that they were taught, whether the method used was lecture or discussion. The students, therefore, obtained higher scores in the post-tests.

**Conclusion and Discussion for Null Hypothesis 3:**

**Conclusion:** the conclusion for this hypothesis indicated 83% of the students prefered being taught by the discussion method compared to about 46% of the students who prefered the lecture method.

**Discussion:** the author believes the reason for most of the students preferring the discussion method is that it prompts the students to be active and involved in the classrooms. Thus using the
discussion method allows the students to share information, give opinions, and offer comments. In contrast, using the lecture method as the only means for teaching appears to make most of the students bored very quickly, and thus lose enthusiasm and interest of what the instructor has to say. This conclusion is supported by the findings of Schmerler (1974), Canter and Gallatin (1974), Byers and Hedrick (1976), and Pflaster (1988).

Recommendations

The recommendations as a result of this study are:

1. High school teachers in Saudi Arabia should use both lecture and discussion methods in teaching biology, with more emphasis in using the former method. Although the examined high school groups indicate most of the students prefer being taught by the discussion method, their performance is higher when using the lecture method. Using both methods, therefore, is required, but with utilizing more the lecture method; especially if improving student performance is the prime objective in high school education in Saudi Arabia.

2. In addition to the lecture and discussion methods, high school teachers should use other methods (such as small groups and problem solving, etc.) when appropriate. The literature indicates using more than two methods in teaching would more likely meet the students' needs.

3. Further research is needed to determine a long-term retention. This study measured only short-term retention.

4. A duplication of this research is needed, but by utilizing
many groups of different high school grades. Such an extension might enhance our understanding about the appropriate methods that should be used for teaching biology in high schools.
BIBLIOGRAPHY


Biology Science for Tenth Grade Students (In Arabic). 1990.


APPENDICES
APPENDIX A

Pre-Tests
APPENDIX A

PRE-TESTS

Pre-Test #1

Human Nervous System

1. How do neurons work?

2. What are the functions of the following:

3. Describe how the eye helps us to see a picture.

Choose the right answer:

1. The part of the eye that receives the pictures is the:
   a. Iris       b. Fovea       c. Pupil

2. The part of the cerebral that is responsible for controlling the respiration process is the:

3. Nucleus, cell body, schwann cell, axon and node are parts of the:

4. The __________ is a center for balance, equilibrium, and coordination.

True or False

1. The central nervous system consists of the brain and medulla. ( )

2. The medulla controls many internal body functions. ( )
3. The autonomic nervous system has two opposing parts, the sympathetic and parasympathetic system. (  )

4. The spinal cord is responsible for the heartbeat in the human body. (  )
Pre-Test #2

Reproduction in Flowering Plants

1. What are the differences in germination between corn and beans?
2. Explain the dispersion of seeds and fruits.
3. Describe the process of seed fertilization in plants.

Choose the Right Answer:

1. Cambium cells produce xylem and phloem in the following manner:
   a. The cambium cell divides.
   b. The inner daughter begins from the axylem cell.
   c. Both xylem and phloem mature into function tissues.
   d. All the above.

2. The female part of the flower is called:

3. The fruit grows from the part of a flower which is called the:

4. The part of the flower that produces the seed is the:

True or False:

1. Following fertilization, the ovary enlarges into fruits. ( )
2. The male part of a flower is called stamens. ( )
3. Apomicts requires pollination in order to produce the required triploid endosperm. ( )
4. Angiosperms produce flowers, seeds, and fruits. ( )
APPENDIX B

Post-Tests
APPENDIX B

POST-TESTS

Post-Test #1

Human Nervous System

1. Compare the human eye with a camera's lens.
2. Draw a picture which illustrates the structure of a neuron.
3. Explain how the ear helps us in hearing voices.

Choose the Right Answer:

1. The part that is responsible for the balance in the human body is the:

2. The part that is responsible for the heartbeat in the human body is the:

3. The central nervous system consists of:
   a. The brain and spinal cord.
   b. The brain, spinal cord and medulla.
   c. Spinal cord and medulla.

4. The _________ monitors and controls many internal body functions:
   a. Iris    b. Medulla    c. Hypothalamus

True or False

1. Neurons specialize in detecting, processing and responding information. ( )
2. Resting neurons are not polarized with a resting potential of 70 MV across the cell membrane. (  )

3. Because of the differential movement of ions in and out of neurons, the two sides of the cell membrane often bear opposite electrical charges. (  )

4. Proprioception is the ability to detect the position of the body and its parts. (  )
Post-Test #2

Reproduction In Flowering Plants

1. What is the difference between asexual reproduction and sexual reproduction in plants?
2. Describe the circumstances in which fertilization occurs in plants.
3. Explain the functions of the following:
   a. Corolla   b. Androecium   c. Calyx

Choose the Right Answer:

1. A flower consists of:
   a. Calyx   b. Corolla   c. Androecium   d. Gynoecium
   e. All of the above
2. The male part of the flower is called:
   e. All of the above
3. Simple fruits are derived from the:
   a. Embryo   b. Ovary   c. Pollen   d. Micropyle
4. What plant part comes first?
   a. Fruit   b. Flower   c. Root   d. Embryo   e. Seed

True or False:

1. Plants follow seasonal and climatic regularity in flowering? ( )
2. Mature seeds consist of an embryo, a food supply, and protective seed coats. ( )
3. In grafting, young stem stock is used in cutting from older shoots. ( )
4. The female part of the flower is called petals. ( )
APPENDIX C

A Questionnaire
APPENDIX C

A QUESTIONNAIRE

Circle the appropriate level of satisfaction:

<table>
<thead>
<tr>
<th>Method</th>
<th>Level of Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>Very Low</td>
</tr>
<tr>
<td>Discussion</td>
<td>Very Low</td>
</tr>
</tbody>
</table>