A STUDY OF THE RELATIONSHIP BETWEEN THE LEADER BEHAVIOR OF SECONDARY SCHOOL PRINCIPALS AND BIOLOGY TEACHERS' ATTITUDES TOWARD BSCS BIOLOGY

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PREFACE

The work reported in this investigation was performed as a part of a series of four related studies, which were conducted simultaneously under the direction of Dr. Kenneth E. Wiggins, Co-Director of the Oklahoma State University Research Foundation. These studies are a continuation of some work that was begun by Dr. Jacob W. Blankenship, formerly of The Oklahoma State University Education Department, now Associate Professor of Education, University of Houston.

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CHAPTER I

THE PROBLEM AND ITS SETTING

Introduction

Today, education is ranked as one of the largest activities of society and is considered by many people as the most important one. The future development of any significant aspect of society depends upon the availability of intelligent manpower developed through education. The more essential education becomes to society, the more important is its administration. (46)

Administration has been an activity of importance to society for many centuries. The administration of public (and private) schools in the United States dates back for at least two hundred years. Early schools were not very complex institutions, and generally, their administration was not highly specialized. Under such circumstances, the administrator could learn his profession effectively on the job by trial-and-error processes. Little, if any, formal specialized preparation was needed, and none was provided. The minimal formal education which was designed for teachers was deemed sufficient for those who would become administrators. (46)

During the past several decades the complexity of society has increased at an amazingly rapid rate. Changes in science and technology, occupational responsibility, manpower needs, perception of human rights, governmental relations, and many other factors have contributed

to the complexity of today's world. Education must deal with a great scope of needs of many kinds of people. (24)

To provide new methods of educating youth in the sciences, several national curriculum groups have developed new curricular materials. Within the last ten to fifteen years, a number of curriculum studies such as the Biological Sciences Curriculum Study (BSCS), School Mathematics Study Group, and the Elementary Science Study have greatly improved the available instructional materials in both elementary and secondary science and mathematics. At the same time curricular innovations have occurred in other areas such as the social sciences and the language arts. While these new programs use a variety of organizational techniques, such as separate science centers or laboratories, as well as a variety of instructional techniques, they all have emphasized the need for active student participation in the classroom. The students are encouraged to develop an "alert sense of skepticism" toward all knowledge, to discuss and investigate the concepts of the particular discipline and to think for themselves instead of having the teacher think for them. To develop such students requires a teacher who will constantly challenge the students' initiative and imagination as well as let the students work on their own. It requires a classroom climate in which students are motivated to be self-disciplined and responsible learners. (3)

While the goal of increased student involvement in the learning process is one widely espoused by educators, all too often the climate of the classroom and/or school is not compatible with the achievement of this goal. (3) Thus, it seems that if new curricular programs which emphasize student involvement are to be successful, it will be

necessary for teacher educators and curriculum planners to better understand the factors which influence a teacher's attitude toward the rationale of the new curriculum. Upton (109) declares that if the faculty is not ready for change, it will not occur and that the administrator must create the climate for and must be strongly committed to change in order for it to come about. Worthen (114) warns of the danger of innovation by administrative fiat. The effectiveness of innovation depends on the acceptance and commitment given it by teachers, who, unless they play a part in inventing or selecting it, may sabotage it. In this study, attention was focused upon the leader behavior of secondary school principals and the attitude of biology teachers toward the Biological Sciences Curriculum Study Program.

Definition of Terms

1. Biology teachers: Full time and/or part time certified secondary school biology teachers.
2. Teachers: Full time and/or part time certified secondary school teachers.
3. Principals: The administrator who is the leader of the school where the biology teachers and teachers are employed. As an administrator, he utilizes or maintains existing structures or procedures in order to attain organizational goals. As a leader, he is disruptive to the status quo and affects change. (77)
4. LBDQ: Refers to the Leader Behavior Description Questionnaire used to type the secondary principal.
5. Initiating Structure: A subtest of the LBDQ which refers to the leader's behavior in delineating the relationship between himself and

the members of his work group, and in endeavoring to establish well-defined patterns of organization, channels of communication and methods of procedure. (57)

6. Consideration: A subtest of the LBDQ which refers to behavior indicative of friendship, mutual trust, respect, and warmth in the relationship between the leader and the members of his staff. (57)

7. A.I.: Refers to Biology Teacher Attitude Inventory used to determine the relative staisfaction of biology teachers toward the philosophy, content, and methods of the BSCS Biology Program.

8. Type 1 Principal: A principal who ranks high in both the "Consideration" and "Initiating Structure" dimensions of leader behavior as measured by the LBDQ.

9. Type 2 Principal: A principal who ranks high in the "Consideration" dimension and low in the "Initiating Structure" dimension of leader behavior as measured by the LBDQ.

10. Type 3 Principal: A principal who ranks low in both the "Consideration" and "Initiating Structure" dimensions of leader behavior as measured by the LBDQ.

11. Type 4 Principal: A principal who ranks low in the "Consideration" dimension and high in the "Initiating Structure" dimension of leader behavior as measured by the LBDQ.

12. BSCS Biology Program: Refers to all textbooks, laboratory manuals, laboratory blocks, teachers' guides, handbooks, and pamphlets as were developed by the BSCS groups for use in teaching and learning BSCS biology. A teacher may use one or more of the above-mentioned parts of the program. The rationale of each part is basically the same.

13. New High School Science Curricular Materials: Refers to the high school curricular materials, such as the Biological Sciences Curriculum Study and the Physical Sciences Study Committee, that have been developed through the cooperative efforts of selected science specialists, science teachers, and other interested individuals with financial support from the National Science Foundation.

14. Leader: A leader is one who is disruptive and affects change.

15. Administrator: An administrator is one who utilizes or maintains existing structures or procedures in order to attain organizational goals. One needs to be careful not to confuse administrator and leader.

Statement of the Problem

During recent years, it has become popular to talk about change and innovation in education. At times one is led to the conclusion that change has become the new "royal road" to respectability for educators. During the past ten to fifteen years, particularly, we have witnessed the introduction of numerous "new" practices in the schools: new math and science curricula, team teaching, large and small group instruction, and programmed learning, to mention only a few. Yet, not all of these practices represent genuine innovations, and of those which do, not all have been adopted and applied in such a way as to assure progress. (1) As Professor Thelen (107) has commented:

> In the face of all these changes...the schools' society and culture seems largely undisturbed. Comparing classrooms now with the classrooms of 40 years ago, one notes that at both times there were numbers of students not much interested in what was being done; the typical teacher still presents materials and quizzes the kids to see if they understand it;

> the amount of creativity and excitement is probably no greater now than then. The development of new materials and techniques has enabled us to spin our wheels in one place, to conduct business as usual in the face of dramatic changes in the society and in the clientele of the school. The operation of the educational enterprise has encountered what can only be thought of by the traditional teacher as a very large number of increasingly serious obstacles and the new devices sustain the forlorn hope of protecting and maintaining, rather than changing, the old orthodoxy in the face of the most important revolutions in the history of mankind.

Thelen suggests that each new idea has been introduced with a flurry of activity, accompanied by widespread excitement, and followed by a period of rationalization, during which traditional practices have been redefined to make them fit the title of the innovations. Thus, to cite as an example, an administrator who is confronted with a lack of classroom space will combine two groups of students under the direction of two teachers, house the newly formed group in an auditorium or some other large area, and refer to the new arrangement as an experiment in team teaching. (107) Change is often perceived by individuals as a threat to their security and status, or a challenge to their competence. (106) The problem, then, is to identify those elements in the school organization which pose a threat to the individual and thus inhibit and impede innovations. (1) One writer has indicated that the leader's performance, especially in American culture, is presumably heavy with both positive and negative effects. (101)

Logsdon (78) believes the principal plays a key role as an educational leader as determined from the following statement:

> From the beginning, a principal's duties involved the most important parts of the educational process. He has always been concerned with pupils, learning materials, and teaching methods. It became easy to say 'As is the principal, so is the school.'

Other educators also feel the principal has many roles to play as the leader and organizer of school activities, but feel the role as educational leader of the school is the most important one. (19) A study was done by Hoedt and Rothney (68) on the relationship of principals' attitudes toward an educational program and the success of the program. They concluded that a program may not make much headway unless the principal is an active supporter.

The student of human behavior can ill afford to ignore the organizational aspects of man. That such has not been the case is the obvious fact--the study of human behavior in the context of organizations in recent years has become a focal point for the interest of social scientists. In particular, the study of leaders, leadership, and more recently and specifically, leader behavior, has received attention to the point that these topics are neither new nor novel. This fact is pointed out by Onofrio (86) in the following statement:

> Phenomenal interest has been generated in recent years over studies in leadership. Researchers and practitioners evidence a growing awareness not only about leadership but also with leadership behavior. More specifically in the field of public education attention is being given to school administrators and their influence upon the shaping of our country's destiny. In most cases one immediately identifies the superintendent without question as a school leader within the community. Yet, the association of leadership with the role of the principal is not consciously identified that readily. The school principal, whether he is administrator of an elementary or secondary institution, who, more often than not, is engulfed by a labyrinth of managerial tasks, is particularly concerned and in some cases confused about his place in today's complex leadership vortex.

Notwithstanding the sums of human energy and effort devoted to better understanding leader behavior and its relationships with other variables, much remains speculative and not researched. As an area of

investigation, the summit has yet to be reached from which the researcher may have an all-inclusive perspective of leader behavior. The purpose of this study has been to investigate the relationship between the leader behavior of the secondary school principal and the attitude of the biology teachers toward one of the newer biology curriculums (BSCS). The specific question asked in this study was, "Is there a relationship between the leader behavior of the secondary school principal and the attitude of the biology teacher toward the BSCS Biology Program?"

Limitations of the Study

This study is limited by the inherent weakness of the instrumentation. Inventory type instruments do not require subjects to perform at their maximum levels and a subject may give false or dishonest responses if he feels coerced or wishes to make a desired impression or if he lacks sufficient insight to make objective responses concerning his behavior.

All conclusions or inferences to be drawn are approximate as are all inferences based on empirical data which are by their very nature, characterized by some degree of unreliability, and are probably estimates rather than statements of inviolate relationships.

Only principals and teachers who volunteered were used in the study, therefore, the sample may not be representative. However, only two superintendents of the school districts in the study area which met the criterion of the study did not wish their staff to participate.

CHAPTER II

REVIEW OF THE LITERATURE AND RATIONALE FOR THE HYPOTHESIS

Introduction

In order to investigate this problem, it is necessary to characterize the new biological science program and to survey some of the existing knowledge concerning leadership and leader behavior. To enable the investigator to relate this knowledge to the attitude of biology teachers toward the BSCS Biology Program it is necessary to gain an understanding of the instruments used.

The BSCS Biology Program is discussed on the following pages. A brief history and explanation is given of leadership and leader behavior. Teacher attitudes and the Biology Teacher Attitude Inventory are discussed. The chapter concludes with a rationale for the hypothesis.

BSCS Biology Program

In 1959, the American Institute of Biological Sciences, with financial support of the National Science Foundation, established the Biological Sciences Curriculum Study (67) as a means to contribute to the improvement of biological education in the secondary schools of the United States.

A 27-member steering committee was composed of research biologists, high school biology teachers, and other interested educators.

A base of operations for the BSCS was established at the University of Colorado, Boulder, Colorado. During 1959 and the early part of 1960, this committee, in a series of meetings, drew up the plans and framework for the BSCS Program. Five committees were initially set up to examine five critical areas relating to an effective biology program. The committee on course content, of which Dr. John A. Moore of Columbia University, was appointed chairman, was given the task of designing a first course in biology for the secondary school. Two major factors influenced the selection of the course content of BSCS Biology. These factors were: (1) the attempt to identify the procedures and conceptions that best characterize modern biological science; and (2) the knowledge, attitudes, and skills relevant to biology that would best contribute to the students' personal lives and to the performance of their responsibility in society. (20)

After considerable discussion and study BSCS members realized that there is no single best way to design a course in biology. Therefore, the group developed a variety of materials from which teachers could select those more appropriate for their own use. However, all materials retained common features. As the program finally developed, three textbooks and numerous other materials were produced.

The BSCS courses represent not only a reorganization of content, but a fresh conceptual approach to secondary school biology. A statement appearing in BSCS Newsletter (2) reports the intent of the BSCS writers:

> ...The writers seek to teach science as a way of thinking--as a method of seeking answers. To do this, they stress underlying concepts and understandings. Student work is centered in the laboratory, where real problems are explored; open ended experiments and other materials are

> used as the media for conveying an understanding of science. Through emphasis of basic concepts and the illustration of such concepts in many ways, the student is given practice in drawing generalizations, in seeking relationships, and in finding his own answers.

Currently, the BSCS Biology Program materials are in wide use throughout the United States and, indeed, they have been adapted for use in several foreign countries.

Leadership and the Principal

History demonstrates that the leadership idea which dominates contemporary thought had its germination in the dawn of the American educational system, a time when imaginative and creative power influenced educational opportunity. It is unfortunate that most men who proposed great ideas were lost to posterity, since their personal identities dissipated with their groups. However, some men who were heard and remembered are: Thomas Jefferson, Horace Mann, Henry Barnard, and Thomas Galloudet. Their leadership produced at least three guiding principles which can be claimed for our educational value system:

1. Maintenance of the political health of democracy.
2. Opportunity for each child to reach self-fulfillment.
3. Maintenance and strengthening of religious and ethical values.

No doubt a major goal of educational leadership in early days was the improvement of the literacy rate because of the importance for one to read and interpret the Bible. Moreover, the need for an educated electorate also spurred the accomplishment of this end. Each individual would then have a right to attain self-fulfillment through the

implementation of an educational system which proposes these values. School administrators, moreover, did not have to possess or employ any great skill beyond their authoritarian discipline and teaching competencies in order to maintain their positions. (86)

Americans, during the long interim period from the establishment of this heritage until the Twentieth Century, had a firm commitment to universal education and the spread of literacy. However, they were too busy with the task of empire building and problems of economic and industrial growth to give heed to major changes and improvements needed in the schools. Educational leadership was forced to take a secondary stand in light of these other "more important" elements in the nation's growth. Meanwhile, within the past fifty years, a tremendous evolution of manners, morals, economic life, and educational challenges and opportunities emerged.

The affect of these evolutionary changes upon leadership gave rise to the employment of the professional manager who often had no financial hold on the enterprise. Important studies were also conducted to meet the new challenges, such as the one by Elton Mayo (86) and his colleagues, which hinted at new ways to increase industrial production apart from the old hierarchy of autocratic management. Implications of these and similar findings were later adopted by the educational world which became convinced that cooperative, creative, and democratic leadership could be an effective and efficient approach. Moreover, with the growing competency of teaching personnel, their share in school decisions gradually grew in proportion to their increased proficiencies.

The nature of leadership is such that each member has within the limits of his capacity, contributions he can offer the total group.

Evidently, even if the principal has a wealth of experience and intelligence, his decisions are not likely to be effective until they become group decisions. The principal can work through his staff and community groups by fostering this mutuality or teamwork concept, in arriving at a pattern of leadership. Goals of democratic control should be within his reach once he approaches decision making and problem solving through group involvement. (86)

An outgrowth of history is that leadership has become a cooperative group process, especially within the world of public school education. Furthermore, if anyone connected with the work of the schools is to reflect this notion of leadership as a group process, he should be free to voice his views, knowing full well that they will be respected and, if good enough, be accepted. The shift is away from the kind of arbitrary administrative leadership formerly associated with the authoritarian practices of yesterday's principal but not away from his traditional responsibility to his staff. Certainly, one cannot deny the authority also that emanates from the entire staff working together. There is a definite trend toward the democratic sharing of his responsibility by all within his command while there is a corresponding tendency away from making the principal the recipient of all responsibility. (86)

The Kellogg Foundation, a philanthropic organization, seeks refinements of the leadership process that Halpin (56) describes. Its subsidized studies, amounting to over ten million dollars, are now reaping results. One outgrowth is a theory of pragmatic value that will be useful in determining the extent to which a principal should exercise leadership in the democratic performance of his tasks and in

decision making.

Certainly, no one would deny that leadership is an essential quality necessary to directing followers toward goals. The school principal who must seek to improve and enrich the school's educational programs may employ the leadership process to facilitate the attaining of this prime objective.

Perhaps it can truly be said that within this scheme the nature of the leadership process de-emphasizes the leader while at the same time it emphasizes leadership. Paradoxically, as the school administrator attempts to create an atmosphere of mutual stimulation, even with the individual differences of those with whom he is to work, he must help to direct their exuberant human energies toward a common goal. His task is no less diminished when he utilizes this process to the fullest. However, by using it, he has enhanced both the method and the desired end.

Hemphill (62) states that one who leads must of necessity engage in an act to initiate structure in interaction as part of solving mutual problems. Halpin (56) finds that educational administrators tend to be rated high by teachers and other principals in consideration, but not on initiating structure. Consideration refers to behavior indicative of mutual trust, warmth, and respect in relationships between the principal and teachers. Yet, he finds that the most productive principals are those who rate high in both consideration and especially high on initiating structure. Yet, a caution can be noted that the principal who wishes to encourage innovation in his school should reflect upon his behavior as a leader of his faculty.

A pertinent and interesting sampling was made in the junior high

schools of Michigan which sought to measure the degree to which innovations in the schools was associated with administrative leadership. Some highly revealing conclusions were reached which are now considered to be classic dimensions of highly innovative principals. They are the following:

1. The principal clearly defines his role and lets his followers know what is to be expected.
2. The principal exhibits foresight and accurately predicts outcomes.
3. The principal speaks out and acts as a representative of his group.
4. The principal maintains a closely knit organization and resolves inter-member conflicts.
5. The principal uses persuasion and argument convincingly.
6. The principal regards the comfort, well being, status and contribution of his followers. (71)

Of singular importance, the Michigan study found that teachers often look up to their administrator not just as a manager but as a leader who can prognosticate to some extent. They, consequently, will be more likely to make suggestions for curriculum changes under the security that he can guide them with accuracy. (71)

With this succinct explanation of a theory of leadership, it is clear that the democratic framework in which the principal works, and the demands society imposes, make his leadership role very important. The degree to which he will lead depends upon his unique job situation and the needs expectations of those who hold him accountable for enhancing and strengthening the instructional program. However, in an attempt to conceptualize leadership, the principal-leader can emerge as a consequence of the needs of his group and the nature of the situation

in which the group attempts to operate. (86)

The ideas proposed thus far about the principal working into a leadership role would not only have been unimportant but also entirely foreign to administrative studies by most authorities a quarter of a century ago or 10 years ago. Up to that time it was assumed that leaders were either born into the role or were products of situations that demanded leadership.

Knezevich (75) argues that a principal's major function is to stimulate teachers and to provide through the use of experts, the consultative services teachers need. Campbell (21) views the principal as an influence agent responsible for obtaining resources for his school in his attempts to establish and maintain an environment conducive to major output by his staff.

The principalship at both elementary and secondary school levels has been invariably viewed by authors of research reports and administration textbooks as primarily a leadership position, with particular reference to the improvement and supervision of instruction. (47) Idiculla (70) reported above 90 percent agreement among high school principals, superintendents, and professors of educational administration on the importance of supervision and instructional improvement. Ovard (88) discussed at length the leadership role of secondary school administrators, especially in the area of supervision and improvement of instruction. In a study of teachers and administrators, it was found that the role of the principal, as perceived by teachers, is best fulfilled when the principal is helping to solve teacher problems and when he is providing for teacher participation in the decision-making process. (44) Foster (40) states that curriculum modification,

direction, and leadership responsibility rests heavily on the principal. Another investigator has shown that principals could help teachers grow in self-esteem by giving them trust, respect, and encouragement to try new ideas. (94)

Gibb (42) states that it is the responsibility of a leader to stimulate effort, capture the imagination, inspire, coordinate efforts, and serve as a model in an organization. He views the leader as a catalyst, a resource person and a consultant. Gibb (42) also maintains that blocks to innovation and creativity include poor communication, fear, and forces which increase dependence. Administration, to foster innovation, must remove fear, blocks to communication, manipulative coercive acts, and increase trust.

The educational leader has a responsibility to create, internally and externally, a climate for acceptance of change in that the relationship among leader behavior and group member forces apparently hold irrespective of the level in the organizational hierarchy of the work group. (105) Bowers (9) found that the supportiveness of a foreman's supervisor was related to the foreman's behavior toward his subordinates.

The Bowers and Seashore (11) categories of leader behavior provide a convenient mechanism for ordering the available research evidence. Several studies seem to indicate the necessity for supportive behavior by the leader for organizational effectiveness. Brown (15) administered the LBDQ to 1,551 teachers in 170 Canadian schools. A factor analysis of the findings indicate the existence of two crucial dimensions of leader behavior: behavior which responds to organizational needs and behavior which responds to personal, idiosyncratic needs of

members.

Although there is a great deal of research evidence concerning what leaders do or are expected to do, little evidence is available to appraise the difference leadership makes. (80)

Teacher Attitude

One of the problems that faces investigators in the area of teacher attitudes is that of objective measurement of attitudes. One solution to this problem has been obtained through the development of attitude instruments designed for use with teachers in general. Another solution has been the designing of instruments for use with various subpopulations of the general teacher population.

Some studies relating to the attitudes of secondary school science teachers have been done. Blankenship (5) conducted a study of high school biology teachers and their attitudes concerning the BSCS Biology Program. This research involved the design, development, and use of an instrument, Biology Teacher Attitude Inventory, to determine teachers' attitudes toward features of the BSCS Biology Program. The following data were obtained from the sample of 55 science teachers: (1) number of semester hours of academic credit in undergraduate biology; (2) grade point average in undergraduate biology; (3) age; (4) years of teaching experience; and (5) nine sub-scores on the California Psychological Inventory and the Allport-Vernon-Lindzey Study of Values. Analysis of the data revealed that, in general, teachers who ranked higher on measures of capacity for independent thought and action and who had taught biology for three years or less reacted favorably to the BSCS Program. Those teachers who ranked lower on measures of capacity

for independent though and action and who had been teaching high school for more than three years tended to react unfavorably to the BSCS Program. Another study found that teachers who had taken courses in ecology, teaching of secondary science, and other courses that included a laboratory tended to have a favorable attitude toward the BSCS Program. (20)

Blankenship (5) also found that the special training in the use of BSCS materials did not necessarily guarantee a more favorable attitude by biology teachers toward the materials. He remarked as a result of his study:

> The fact that approximately 50 percent of the teachers involved in the study demonstrated unfavorable attitudes toward the BSCS Program suggests that studies need to be conducted to determine whether or not these attitudes point up the need for changes that would improve the curricular materials.

Hoy and Blankenship (69) found that some teachers' attitudes toward the BSCS Biology Program changed after the teachers taught biology for awhile.

One writer indicates that the behavior of the teacher, more than any other individual, sets the climate of the class, (38) and Medley (85) says that if a teacher has any impact on the pupils classroom learning, it will be through his behavior in the classroom. The importance of this concept lies in the fact, as indicated by Corey, (30) that any change in teacher behavior must be preceded by a corresponding change in teacher attitude and thus, in effect, this change would have a determining influence in the classroom. Sherif and Sherif (102) states that:

> Attitudes are formed in relation to situation, person or groups with which the individual comes

> into contact in the course of his development. Once formed, they determine that the individual reacts in a characteristic way to these or related situations, persons, or groups. This characteristic feature, which is inferred from behavior (verbal or non-verbal), denotes a functional state of readiness in relation to stimulus situations which elicit it.

In light of the above statement, it seems logical to conclude that the leader behavior of the principal would influence the attitude of the teacher, since the teacher is in a situation which calls for his working very closely with the principal. In fact, it is assumed by Halpin (58) that the behavior of the leader and the behavior of group members are inextricably interwoven and that how the leader really behaves is less important than how the teachers perceive that he behaves. It is their perception of his behavior, if anything, that influences their own actions and, thus, determines what is called leadership.

Rationale for the Hypothesis

The obligation imposed upon the school in our society requires the school to be a dynamic and innovative structure, constantly changing to meet immediate needs. This kind of structure requires a uniquely dynamic form of leadership. In secondary education, the instructional leader is the principal. (28)

Glen F. Ovard, (88) in his basic text on administration of the secondary schools, states:

> The principal is the key person through which educational change can occur. In a society of change, the principal must be an innovator...he must evaluate all proposals for change. He should not desire change for its own sake, but he should constantly seek that which will promote a better school program for all concerned.

The effective principal is an effective leader, the catalyst committed to investigating and implementing the necessary changes within a school that will effect the kind of school which meets the needs of today's students. (28)

A distinction can be made between a leader and an administrator. To lead is to initiate new structure or procedure as part of the process of problem-solving through which an organization attempts to accomplish its goals and objectives, or attempts to change its organizational goals and objectives. (62) On the other hand, an administrator is identified "as the individual who utilizes existing structures and procedures to achieve an organizational goal or objective." (77) The distinction, then, is that the administrator is concerned primarily with maintaining, rather than changing, established structures, procedures, or goals.

According to Halpin, (58) an effective leader scores high on the Initiating Structure dimension of the LBDQ. Thus, he defines an effective leader as follows:

> The effective leader is one who delineates clearly the relationship between himself and the members of the group, and establishes well-defined patterns of organization, channels of communication, and ways of getting the job done. At the same time, his behavior reflects friendship, mutual trust, respect, and warmth in the relationship between himself and the members of the group.

Also, according to Halpin: (58)

> The swing of the pendulum seems to be associated with a tendency to judge the Initiation of Structure as being nondemocratic. This point of view is ill-founded, for there is no necessary negative relationship between democratic leadership and the Initiation of Structure. In fact, it is our impression----and here we are speculating----that what ordinarily is referred to as democratic administration or democratic

> leadership is precisely what we have defined "operationally" as leadership behavior characterized by high Initiation of Structure and high Consideration. This we have evaluated as effective leadership.

Halpin, (58) in a study of B-29 crews at Combat Crew Training School found that commanders (leaders) who were scored high on both Initiating Structure and Consideration tended to develop more favorable changes in the crew members attitude toward such things as "proficiency," "crew morale," and "frienship" than the members of those crews led by commanders who scored low on both leader behavior dimensions. This study indicates that there is a relationship between the two dimensions of the LBDQ and the people in an organization. Contemporary accounts of organizational control are complex. However, other studies also indicate that people in organizations do exert influence over one another. March (83) and Simon (103) argue that influence is simply an instance of casualty; it is the modification of one person's response through the actions of another. One aspect of this influence can be called leadership. "...The essence of organizational leadership is the influential increment over and above mechanical compliance with routine directiveness in the organization." (72)

In reviewing the literature, it seems that the leader which is scored high on both dimensions of the LBDQ has the most influence above mechanical compliance with routine directiveness in organizations. (72)

Preston and Heintz (96) conducted a study to determine the most successful technique to use in effective group changes in attitude. The types of leadership under investigation were supervisory and participatory styles. The evidence indicated that participatory leadership

is more effective than supervisory leadership in producing attitude change. In a study designed to repeat, with a different age group, the investigation undertaken by Preston and Heintz, Hare (60) also concluded that participatory leadership is superior to supervisory leadership as a modifier of attitude. The investigator concluded that a participatory leader has greater influence and more impact on his group than the supervisory leader has on his group.

A participatory leader uses many of the same techniques used by the Type 1 principal. The Type 1 principal (a principal scored high on both dimensions of leader behavior) is perceived as one who regards as important the personal feelings, attitudes, and needs of teachers. He keeps the lines of communication open. He is friendly, does personal favors for his group-members, and takes time to listen to them. However, he maintains a highly structured organization, keeps definite standards, criticizes poor work, and emphasizes the meeting of deadlines. In that the Type 1 principal is concerned with the personal feelings, attitudes, and needs of teachers and the fact that he keeps the lines of communication open, it is assumed that as a result, the teacher, to some degree, will participate in decision-making.

Seeman (101) indicates that a leader's performance contains both positive and negative effects. Hoedt and Rothney (68) concluded that an educational program will not make much headway unless supported by the principal. Kline (74) indicates that there is a direct relationship between the consideration the educational leader shows his teachers and the degree to which the teachers use the leader's curricular plans and guides.

Several other studies seem to indicate the necessity for the type

of supportive behavior which is characteristic of a Type 1 leader. (15, 75, and 21) According to Peterson, (94) a principal high on Consideration and Initiating Structure will affect the teachers' attitude toward a new curriculum because he will give the teacher encouragement to try new ideas. The principal indicates by his behavior that his teachers are capable of making wise judgments, that they do know or are willing to learn about curriculum and that they may contribute some interesting techniques or methods that are effective.

The behavior and attitude of the principal in relation to curriculum certainly has an effect on the environment in which teachers live daily. (94) For as stated by Buell, (19) "The principal is the leader of his school, of this there must be no doubt. His role as the educational leader of the school is the most important role of all." Brown (15) conducted a study which clearly indicated that teacher satisfaction and confidence in the principal are sensitive to the perceived leadership of the school. Jacobs (71) found a significant difference between the leader behavior of the principals as related to the number of educational innovations in their school. The principals of the highly innovative schools rated higher on both "Initiating Structure" and "Consideration" than those principals with lower numbers of innovations in their schools. (71) It appears, then, that one of the important factors in instituting educational change is the leader behavior of the principal.

The BSCS Biology Program that is in widespread use in this country is esteemed by many scientist and science educators as being exemplary of modern biological science. (20)

In that this program has been highly publicized as one which

meets the needs of the contemporary high school student, it seems probable that an effective principal would tend to be very supportive of a teacher who was already using the program. However, this may not be true in all cases. Also, it seems probable that an effective principal would encourage those biology teachers not using the Program to become familiar with the Program's rationale. The writer recognizes the fact that the principal may not know about the Program's rationale. However, most principals will probably be familiar with it due to the fact that it has been highly publicized.

Another investigation indicates that favorable teacher attitude would be conducive to effective use of the new science curricular materials. It also points out that there is a need to determine why so many teachers react less favorably to the widely used BSCS Biology Program. (20)

From the literature reviewed, it was found that the rationale of the BSCS Biology Program emphasizes the need for problem solving. (3) It has also been shown that principals high on Consideration and Initiating Structure have been supportive of problem-solving type situations. Therefore, it seems reasonable to assume that the leader behavior of the principal would affect the attitude of the biology teacher toward the Program. Still further support can be given to this assumption since principals scoring high on the dimensions of the LBDQ have been shown to facilitate new curricular programs. The fact that teacher satisfaction has been shown to be sensitive to the perceived leadership of the school is also supportive to the above assumption.

Hypothesis

From the foregoing rationale, the following hypothesis was deduced.

H.1. Schools, employing different Types of principals, as Typed by the principals' score on both dimensions (Initiating Structure and Consideration) of the Leader Behavior Description Questionnaire, will tend to have biology teachers who score significantly different on the Biology Teacher Attitude Inventory.

Significance of the Study

This study should lead to a better understanding of the relationship between teachers and principals. If the null hypothesis is rejected, the perceived leader behavior of the principal will have been shown to be of significance in this relationship. If the null hypothesis cannot be rejected, future studies can examine the influence of other variables affecting the teacher's attitude. If a secondary principal was to understand the effect of his leader behavior, logically he could increase the potential and impact of his leadership in the task areas for which he bears responsibility in the school system.

Since the new science curricula are considered to be a valid frame of reference for science teachers and a more favorable attitude toward these curricular materials is a desirable outcome, it appears that a study to analyze types of the principal's leader behavior in relation to teacher's attitudes toward the curricular materials would furnish information that could be used in placing certain teachers and principals in certain schools.

CHAPTER III

PROCEDURES FOR THE STUDY

Introduction

This chapter presents the methodology and design of the study. The instruments used are explained and the procedures for sample selection, data collection, and data analysis are given.

Instruments Used in the Study

Leader Behavior Description Questionnaire

The Leader Behavior Description Questionnaire (LBDQ) was developed at Ohio State University as a project of the Ohio State leadership studies. The conceptual and methodological antecedents of this instrument reach back over the past two decades of the Ohio State leadership studies. Conceptually, the studies have attended exclusively neither to leader traits nor to group characteristics but rather to specific individual behaviors that satisfy common group needs. The several contributions of Hemphill (61, 62, 63), Stogdill and Coons, (104) Halpin (51, 58) and associates will not be recited here. Methodologically, the studies have produced several research instruments as operational definitions of their significant variables. Some of the better known of these are: (1) the Group Dimensions Description Questionnaire, purporting to measure 13 dimensions of group behavior; (2) the Leader

Behavior Description Questionnaire, estimating a leader's "initiation of structure" and "consideration"; and (3) Organization Climate Description Questionnaire arranging eight subscales into six climate-profiles. (15)

Hemphill and Coons (63) constructed the original form of the LBDQ, while Halpin and Winer (59) adapted the instrument and identified the two fundamental dimensions as Initiating Structure and Consideration. These two dimensions were identified on the basis of factor analysis of the responses of 300 B-29 crew members who described the leader behavior of their fifty-two aircraft commanders. In this same study the two above mentioned dimensions accounted for 34 to 50 percent respectively of the common variance. In later research Halpin (52) reported that those leaders who exhibited a high instance of both characteristics thereby scored highly on both dimensions and appeared to be the most effective leaders. In another study the correlation between the scores of the two dimensions was found to be .38. The estimated reliability by split-half method is .83 for Initiating Structure and .92 for Consideration when corrected for attenuation.

Several other research studies have been reported in which the LBDQ was employed. Among these was the study of leadership behavior by Evenson. (36) He reports that within each of 40 secondary schools, teachers agreed among themselves in describing the behavior of the principal on both the Initiating Structure and Consideration dimensions, thus indicating the validity of the instrument. Twelve scores for each of the forty principals provided the basic data for the analysis.

Halpin found that although group members differ in their perception of the leaders' behavior, analysis of variance in which the "between group" variance and the "within group" variance on the dimension scores of the LBDQ-Real were compared for several independent samples have yielded F-ratios all significant at the .01 level of confidence. The leaders' behavior, therefore, can be described clearly and briefly by assigning to him, for each dimension, the mean of the LBDQ-Real scores by which his group members have described him.

There are thirty items in the instrument, fifteen for each dimension. The score of each dimension is the sum of the scores assigned to responses marked for each of the fifteen items. The respondent is asked to indicate the frequency with which he perceives the leader to have engaged in each behavior by marking one of five adverbs: always, often, occasionally, seldom, never. The possible range of scores on each dimension is zero to sixty. Permission had previously been requested and received to use this instrument from the Bureau of Business Research, The Ohio State University. A copy of this instrument is in Appendix A.

Division of the Principals Into Four Types

In earlier studies reported by Halpin, (56) it was pointed out that Initiating Structure and Consideration are fundamental dimensions of Leader Behavior and that the most effective leaders are those who score high on both dimensions of the instrument. However, it was noted that four types of leaders could be identified using the two dimensions of LBDQ. In a later study Peoples (89) described four types of principals.

These four Leader Behavior types were based on the scores from the two dimensions of the LBDQ. A Type 1 principal was one who ranked high in both dimensions of the LBDQ. A Type 2 principal ranked high in "Consideration" and low in "Initiating Structure." A Type 3 principal ranked low in both dimensions of the LBDQ, whereas, a Type 4 principal ranked low in "Consideration" dimension and high in the "Initiating Structure" dimension. The various types of leader behavior as measured by the LBDQ may be shown best by Figure 1.

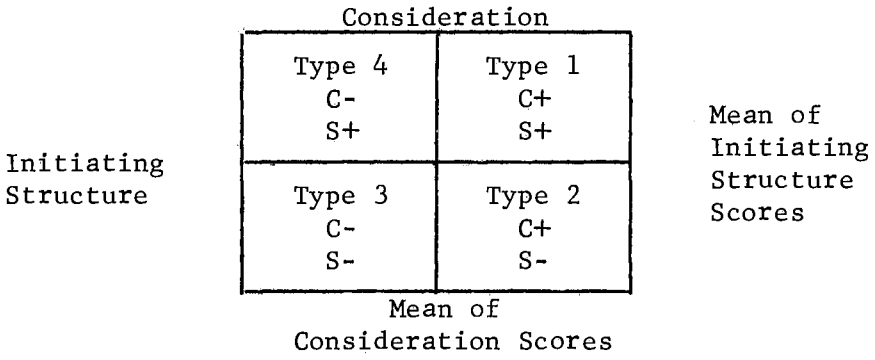

Figure 1. A Quadrant Scheme for Describing Leader Behavior on the "Initiating Structure" and "Consideration" dimensions. (56)

The leaders from each quadrant in Figure 1 are described as follows by Peoples: (91)

1. Type 1 Principal: This leader is perceived as one who regards as important the personal feelings, attitudes, and needs of teachers and at the same time he maintains highly structured organization. For example, he is friendly, does personal favors for his group members,

and takes time to listen to the group members. However, he keeps definite performance standards, criticizes poor work, and emphasizes the meeting of deadlines.

2. Type 2 Principal: This leader is similar to Type 1 but he tolerates a very loose organization. For example, he never assigns group members to a specific task and he never coordinates the work of the group members.

3. Type 4 Principal: This leader differs from the Type 1 in that he rarely shows warmth in relationships with group members. He does do personal favors for group members but he never consults them regarding important decisions.

4. Type 3 Principal: This leader possesses characteristics of both Type 2 and Type 4 leaders. He has little concern for motives of group members and is impersonal. Also, he never coordinates work of the group and never makes specific assignments.

In light of the fact that other researchers have found it feasible to group the principles into four different types, it was decided that the present sample should be so divided.

The four principal Types in the present sample were designated as follows: Type 1 scored above "the mean on Initiating Structure" and "above the mean on Consideration." Type 2 scored "below the mean on Initiating Structure" and "above the mean on Consideration." Type 3 scored "below the mean on Initiating Structure" and "below the mean on Consideration." Type 4 scored "above the mean on Initiating Structure" and "below the mean on Consideration." The means are based upon the total sample of principals.

Sixteen of the forty schools in the present sample employed a

Type 1 principal, whereas, 6 schools of the sample employed a Type 2 principal. Thirteen schools employed a Type 3 principal, and 5 schools employed a principal who ranked Type 4. (Figure 1)

Biology Teacher Attitude Inventory

The Biology Teacher Attitude Inventory was utilized in this study as the measure for determining the reaction of a selected group of biology teachers to the BSCS Biology Program. The Attitude Inventory was developed and used by Blankenship (5,7) in related studies.

The Attitude Inventory consists of forty-six concise statements which reflect either a view favorable to the BSCS Program or a view unfavorable to the Program. Half of the statements reflect attitudes and opinions commonly held by those persons who designed the BSCS Program; thus, agreement with these statements can be considered to represent attitudes favorable to the program. The other half of the statements reflect attitudes and opinions common to those persons who have spoken or written in favor of the traditional biology course or in opposition to the BSCS Program.

An individual's score on the Attitude Inventory was determined by computing the number of items checked which were favorable to the BSCS Program minus the number of items checked which were unfavorable to the BSCS Program. The maximum score possible on the Inventory, therefore, is a +23, indicating selection of all statements favorable to the BSCS Program. The minimum score possible was a -23, indicating selection of all statements not favorable to the BSCS Program.

In developing the Attitude Inventory, Blankenship (5) thoroughly familiarized himself with the BSCS Program through a review of

literature related to the Program and by interviews with research scientists and high school science teachers who were involved in development of BSCS material. By means of written comments from a group of science teachers who had studied the BSCS Program, he obtained information concerning teacher reaction to the materials. These teachers' comments were related to the strengths and weaknesses of the BSCS Program as each teacher interpreted its practicability for his own school situation. Included among this group of teachers were individuals who had indicated unfavorable reactions to the BSCS Biology Program. After careful study of the information that he had gathered, Blankenship, tentatively prepared a seventy-statement inventory. Half of the statements reflected attitudes and opinions held by persons who designed the BSCS Biology Program; thus favorable attitudes toward the Program. The other half of the statements reflected attitudes and opinions common to those persons who spoke or wrote in favor of the traditional biology course or in opposition to the BSCS Program. This tentative inventory was administered to a group of people who had been involved with the design and development of the BSCS Program.

Through the use of an item analysis of the tentative inventory and by incorporating suggestions from those who had responded to the statements in the inventory, it was reduced from seventy items to fifty items. The basic format of the inventory was retained. The order of the statements in the inventory was determined through the use of a table of random members. This fifty-item inventory was resubmitted to the examining group for suggestions and, following a second revision, the final form of the inventory was reduced to forty-six concise statements.

Blankenship's Attitude Inventory was selected for use in this study for two main reasons: (1) It was designed specifically to ascertain the reaction to the BSCS Program of science teachers and (2) because of its effectiveness in assessing teacher attitude. Permission had previously been requested and received for the use of this instrument from Dr. Jacob W. Blankenship, Associate Professor of Education, University of Houston. A copy of the instrument is in Appendix A.

For the purpose of looking at attitude in relation to other variables, the biology teachers were arbitrarily classified into three categories based upon their score on the Biology Teacher Attitude Inventory. Biology teachers scoring in the upper one-third of the distribution on the instrument were designated as "more favorable" (N=16, range=24-29)[a]. Biology teachers with a "less favorable" attitude were those with scores in the lower one-third of the distribution (N=16, range=1-15). Those biology teachers whose scores were not in the upper or lower one-third of the A.I. scores were considered to have an indeterminate attitude.

Questionnaire

A questionnaire was given to the biology teachers in this study. The information sought by the questionnaire was related to the actual use, lack of use, and anticipated future use of the BSCS Biology Program. In addition, reasons for non-use of the materials were sought in those instances where the program was not being used. Demographic questionnaires were given to both biology teachers and teachers. This information was used in interpreting the results of the investigation.

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[a]Ten points were added to each Biology Teacher Attitude Inventory score in order to eliminate the minus scores.

A copy of these questionnaires are in Appendix A.

Collection of Data

Since the Leader Behavior Description Questionnaire taps certain dimensions of the interaction between the principal and the teacher, the following criteria seem appropriate. In order to allow sufficient opportunity for development of this interaction, and in an attempt to control the specificity of the principal role, it seemed appropriate to include only public schools with a full-time secondary principal who had served in that position for at least one school year. Also, each biology teacher selected to respond to the Attitude Inventory and each teacher selected to respond to the LBDQ must have served under the principal at least one year.

Social factors vary from one community to another and may influence the variables being studied, but through the establishment of school size, an attempt was made to increase the representativeness of the sample in terms of Oklahoma schools. The community size was controlled indirectly as follows: The minimum size of the secondary public school was limited by those which were large enough to have a full-time principal. The maximum size was limited by not including those secondary schools which are large enough to have a science supervisor. These schools were not used in this study because the principal may not have as much direct influence on the teachers' attitude when he works through a supervisor. Also, through the establishment of school size, the representativeness of the sample should increase in terms of Oklahoma schools. School size relative to the number of teachers in each school is given in Table I. It was decided that if the other criteria

TABLE I

SCHOOL SIZE AS INDICATED BY THE NUMBER OF TEACHERS TEACHING IN THE SCHOOL

Principal Type	School Number	Number of Teachers
	17	9
	16	13
	12	15
	29	16
	38	18
	25	24
1	20	30
	34	33
	10	34
	15	35
	14	42
	32	47
	3	51
	2	62
	28	74
	30	125
	22	12
	19	15
2	40	17
	23	21
	37	21
	5	35
	1	10
	11	19
	36	19
	4	19
	9	19
	39	20
3	26	22
	7	24
	18	24
	6	26
	21	29
	33	42
	24	55
	27	18
	13	19
4	8	45
	31	67
	35	99

could be met, the secondary schools to be included in the sample would be located within a one hundred mile radius of Stillwater, Oklahoma. This arbitrary boundary was chosen because of the time and cost involved in the collection of data. However, this appears justifiable because the area of the state within this circle contained most of the state's population.

Upon examination of copies of Oklahoma State School Directory for the years 1968-1969 and 1969-1970, it was determined that only 99 secondary schools within the study area had principals which met the criteria of the study. In order to determine if these 99 schools had biology teachers who met the criteria of the study, the researcher personally telephoned each school. It was found that only 42 of the 99 schools had biology teachers who met the criteria of the study.

The superintendents of these 42 schools were contacted by telephone. The focus of the research was explained to him. He was then asked if he would permit the staff of the secondary school or schools in his district to participate in the study. In some cases, copies of the instruments were mailed to him for his examination. Two of the superintendents contacted did not want to participate in the study. This left 40 schools in 38 different districts which met the criteria of the study.

After securing permission from the superintendent, the principal of each of the 40 schools mentioned was contacted by telephone and the focus of the study was explained. He was also asked if he would permit his teachers to participate in the study. Again, as with the superintendents, it was necessary to send copies of the instruments to some of the principals for their examination. Permission was gained from all

40 principals contacted. These 40 schools were included in the study.

The instruments used in this study were administered by the researcher or by a colleague in a faculty meeting which had been previously scheduled. However, in a few cases, teachers could not meet with the researcher in a scheduled faculty meeting or were absent on the day of the visit. In such cases, copies of the instruments were left, with a letter of explanation. (See Appendix A for a copy of the letters.) A self-addressed mailer was left for the teacher, thus, giving him the assurance that only the researcher would see his responses.

The instructions given in each faculty meeting included the reading of the instructions printed on the instruments as well as the following statements:

> (1) The Questionnaire enables you to describe the behavior of your principal. This questionnaire in no way constitutes a "test" of your ability, nor does it require you to evaluate your principals performance, as no judgment of goodness or badness is involved. It is possible, however, to identify certain distinct leadership styles by such a straightforward approach. (2) No individual, school, principal, or district will be identified in the report of this study; (3) No one will see the response booklet except the researcher; (4) I cannot interpret any item on the instrument for you; each person is to respond to each item just as he reads it, and in light of his own situation; (5) Please do not talk to any other person while you are responding to the instrument; (6) When you have completed your booklet, give it to me and you are free to leave.

In most cases, responses were obtained from all of the faculty members. However, no special effort was made to get the response of the first year teacher because he was excluded from the study by the previously established criteria. Also, in four of the larger schools, only a random sampling of the faculty was used. The reason this decision was made was that according to Halpin (53) experience suggests that

a minimum of four respondents per leader is desirable, and that additional respondents beyond ten do not increase significantly the stability of the index scores.

Treatment of Data

Responses to the Biology Teacher Attitude Inventory and to the Leader Behavior Description Questionnaire were checked once by an assistant and rechecked for accuracy by the investigator. It is believed that most all errors in scoring the instrument were avoided by using this double check. The writer will accept the hypothesis if supported at the 0.05 level of significance.

Single-Classification Analysis of Variance was used to test for significant difference among the mean attitude scores of biology teachers under the four Types of principals. The Scheffe' method was used to test differences between all possible pairs of means.

Multiple Linear Regression Analysis of Variance was used to perdict biology teacher attitude from knowledge of selected predictor variables. The predictor variables were the two dimensions of the LBDQ, Initiating Structure and Consideration.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Introduction

Faculties of forty secondary schools in thirty-eight school districts responded to the instruments used to gather the data to test the hypothesis of the study. Presentation and analysis of the data are included in this chapter. The first part of the chapter contains the hypothesis and the analysis of the findings. In the second section, demographic data of the sample are presented.

Testing the Hypothesis

The hypothesis of the study, which is restated below, was tested by using Single-Classification Analysis of Variance.

> H.1. Schools, employing different Types of principals, as Typed by the principals' score on both dimensions (Initiating Structure and Consideration) of the Leader Behavior Description Questionnaire, will tend to have biology teachers who score significantly different on the Biology Teacher Attitude Inventory.

For this hypothesis the computation of the analysis of variance yielded an F-value of 3.67. With 3 and 36 degrees of freedom, the F-value was significant beyong the .05 level. Therefore, according to the level of significance previously established, the hypothesis must be accepted. A summary of relevant data in the testing of the

hypothesis is presented in Table II.

TABLE II

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN PRINCIPAL TYPES AND ATTITUDE OF THE BIOLOGY TEACHER

	Principal Type			
	1	2	3	4
Number	16	6	13	5
Mean A. I. Scores[a]	21.38	18.17	14.08	17.50
Variance	19.35	7.77	61.41	49.25
Source	df	ss	ms	f
Between Groups	3	383.69	127.69	3.67*
Within Groups	36	1263.01	35.08	
Total	39	1646.69		

* $p > .05$

[a]Mean Attitude Inventory scores for the teachers in each school were used in this analysis.

In order to determine precisely where the significant difference between the A. I. scores of the biology teachers who were employed by the four different principal types was located, the Scheffé technique was utilized.

According to Winer (113) the Scheffé method is clearly the most conservative with respect to the type 1 error. In making test on

differences between all possible pairs of means, this method will lead to the smallest number of significant differences. (113)

In testing the difference between the attitudes of biology teachers under a Type 1 and a Type 3 principal, it was found that the calculated F-value of 10.89 was significant. In testing the difference between Type 1 and 2, 1 and 4, 2 and 3, 2 and 4, and 3 and 4 no significant difference was found. The F-values for the above mentioned pairs are 1.28, 1.63, 1.96, .03, and 1.21 respectively.

In this study multiple linear regression was used to predict biology teacher attitude from knowledge of selected predictor variables. The predictor variables were the two dimensions of the LBDQ, Initiating Structure and Consideration.

The coefficient of multiple correlation between Attitude Inventory and a combination of Initiating Structure and Consideration is not significant beyond the accepted 0.05 level. However, it is of interest to note that with a standard error of multiple estimate of 6.18 one can be confident that roughly two-thirds of the time, the predicted Attitude Inventory score from the multiple-regression equation ($\tilde{Y}$=-0.6940018 + $0.3106198X_1$ + $0.1554334X_2$) will be no more than 6.18 from the actual A. I. score the subject will attain. The principal in this study showed a significant correlation between the Initiating Structure and Consideration scores (r=.67, P > .01) (Table III). It is of interest that this is in contradiction to some research on education as reported by Halpin. (58)

Due to the fact that regression analysis indicates an R^2 of .10 relating attitude to I. S. and Consideration, other statistical tests were run. These tests were run for the purpose of looking at the

relationship between attitude and the variables that were obtained from the questionnaires. It was also hoped that some of the variance in the attitude scores could be explained through the use of these tests.

TABLE III

PREDICTION OF BIOLOGY TEACHERS SCORES ON THE ATTITUDE INVENTORY BY TWO VARIABLES, INITIATING STRUCTURE AND CONSIDERATION

Relationship	Coefficient
A. I. and I. S.	r= 0.30 (N.S.)
A. I. and Consideration	r= 0.26 (N.S.)
I. S. and Consideration	r= 0.67*
A. I. and I. S. and Consideration	R= 0.31**
Standard Error of Multiple Estimate	s= 6.18

* $P < .01$

** $.05 < p < .10$

The writer was curious to know if school size had any effect on the attitude of the biology teacher. The forty schools were arbitrarily divided into relatively small (less than 30 teachers) and relatively large (more than 30 teachers). The calculated F-value for testing the mean difference between the two groups of schools was 2.69. With 1 and 38 degrees of freedom this F-value was not significant at the .05 level (see Table IV).

TABLE IV

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN SCHOOL SIZE AND ATTITUDE OF THE BIOLOGY TEACHER

	School Size	
	Relatively Small	Relatively Large
Number	22	18
Mean A. I. Scores[a]	16.56	19.86
Variance	43.12	35.13

Source	df	ss	ms	f
Between Groups	1	108.83	108.84	2.69 (N.S.)
Within Groups	38	1537.86	40.47	
Total	39	1646.69		

[a]Mean Attitude Inventory for the teachers in each school were used in this analysis.

According to Bruning and Kintz (18) if one has measures along one variable and has another variable that is dichotomized, then the point-biserial correlation is used. Thus, this technique was used to see if there was any correlation. Of the 49 biology teachers in this study, 35 were male and 14 were female. The mean male attitude score was 19.00, whereas, the mean female attitude score was 16.86. The result of this analysis was r=.15. To test the significance of r, the t test was used. The t was found to be equal to 1.05 and thus was not significant.

In order to determine the relationship between the mean ages of

the biology teachers with a more favorable and less favorable attitude toward the BSCS Biology Program, an analysis of variance was performed. In testing this relationship, it was found that the F-value was .97. With 1 and 29 degrees of freedom the calculated F-value was not found significant at the .05 level (Table V).

TABLE V

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN BIOLOGY TEACHER ATTITUDE AND AGE

	Biology Teacher Attitude	
	More Favorable	Less Favorable
Number[a]	15	16
Mean Age	36.33	40.68
Variance	149.52	152.90

Source	df	ss	ms	f
Between Groups	1	146.78	146.78	0.97 (N.S.)
Within Groups	29	4386.77	151.27	
Total	30	4533.55		

[a]One biology teacher with a more favorable attitude did not indicate his age

The analysis of variance was used to check the relationship between biology teacher attitude and the number of years he had been under the

present principal. The F-value for testing the mean difference was .01. With 1 and 30 degrees of freedom, this F-value was not significant at the .05 level (Table VI).

TABLE VI

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN BIOLOGY TEACHER ATTITUDE AND NUMBER OF YEARS UNDER PRESENT PRINCIPAL

	Biology Teacher Attitude	
	More Favorable	Less Favorable
Number	16	16
Mean No. Years Under Present Principal	3.56	3.69
Variance	11.60	5.43

Source	df	ss	ms	f
Between Groups	1	0.13	0.13	0.01 (N.S.)
Within Groups	30	255.38	8.51	
Total	31	255.51		

An analysis of variance was used to determine the relationship between biology teacher attitude and the number of years teaching experience in the present school. The calculated F-value for testing the relationship was .07. With 1 and 30 degrees of freedom, this F-value was not significant (Table VII).

TABLE VII

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN BIOLOGY TEACHER ATTITUDE AND NUMBER OF YEARS EXPERIENCE IN PRESENT SCHOOL

	Biology Teacher Attitude	
	More Favorable	Less Favorable
Number	16	16
Mean No. Yrs. Experience in Present School	7.19	7.88
Variance	56.43	51.98

Source	df	ss	ms	f
Between Groups	1	3.78	3.78	0.07 (N.S.)
Within Groups	30	1626.19	54.21	
Total	31	1629.97		

Using the analysis of variance to test the difference between the more favorable and less favorable biology teacher attitude and total teaching experience, it was found that the F-value was .01. With 1 and 30 degrees of freedom, the F-value was not found to be of significance (Table VIII).

The analysis of variance was used to analyze the relationship between biology teacher attitude and the number of years since he had a science course or workshop. The F-value for testing the mean difference was .78. With 1 and 27 degrees of freedom, this F-value was not significant at the .05 level (Table IX).

TABLE VIII

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN BIOLOGY TEACHER ATTITUDE AND TOTAL EXPERIENCE

	Biology Teacher Attitude	
	More Favorable	Less Favorable
Number	16	16
Mean No. Years Total Experience	14.00	14.38
Variance	119.47	111.05

Source	df	ss	ms	f
Between Groups	1	1.13	1.13	0.01 (N.S.)
Within Groups	30	3475.75	115.26	
Total	31	3458.88		

TABLE IX

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN BIOLOGY TEACHER ATTITUDE AND RECENCY OF SCIENCE COURSES OR WORKSHOPS

	Biology Teacher Attitude	
	More Favorable	Less Favorable
Number[a]	14	15
Mean No. Years	4.93	4.20
Variance	6.38	3.60

Source	df	ss	ms	f
Between Groups	1	3.84	3.84	0.78 (N.S.)
Within Groups	27	133.33	4.94	
Total	28	137.17		

[a]Two teachers with more favorable attitudes did not respond and one teacher with a less favorable attitude did not respond to the item.

The relationship between the more favorable and less favorable biology teacher attitude and school size relative to the number of teachers under each principal was analyzed with the analysis of variance technique. The F-value was found to be 1.02. With 1 and 30 degrees of freedom, this value was not significant (Table X).

TABLE X

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN BIOLOGY TEACHER ATTITUDE AND SCHOOL SIZE

	Biology Teacher Attitude	
	More Favorable	Less Favorable
Number	16	16
Mean School Size	46.75	36.56
Variance	780.60	853.73

Source	df	ss	ms	f
Between Groups	1	830.28	830.28	1.02 (N.S.)
Within Groups	30	24514.98	817.16	
Total	31	25345.26		

Analysis of variance was used to analyze the relationship between educational level and biology teacher attitude. The two educational levels considered were those biology teachers with an educational level below the masters and those with a master's degree or above. In testing

the relationship, it was found that the F-value was .02. With 1 and 47 degrees of freedom, this F-value was not significant (Table XI).

TABLE XI

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN EDUCATIONAL LEVEL AND BIOLOGY TEACHER ATTITUDE

		Educational Level		
		Below Master's	Master's and Above	
Number		18	31	
Mean Attitude Score		18.22	18.48	
Variance		31.59	48.79	
Source	df	ss	ms	f
Between Groups	1	0.78	0.78	0.02 (N.S.)
Within Groups	47	2000.85	42.57	
Total	48	2001.63		

Analysis of variance was used in order to determine the relationship between principal types and the variables of biology teacher age, biology teacher experience under present principal, biology teacher experience in present school, total teaching experience of the biology teachers, school size, and the recency of biology teacher participation in science courses and workshops.

In testing the difference between Type 1, 2, 3, and 4 principals

and biology teacher age, it was found that the F-value was .72. With 3 and 40 degrees of freedom, this F-value was not found significant at the .05 level (Table XII).

TABLE XII

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN PRINCIPAL TYPES AND BIOLOGY TEACHER AGE

	Principal Type			
	1	2	3	4
Number[a]	19	5	13	7
Mean No. Years	35.53	42.20	38.15	42.29
Variance	128.26	187.20	160.47	195.24

Source	df	ss	ms	f
Between Groups	3	332.52	110.84	0.72 (N.S.)
Within Groups	40	6154.68	153.87	
Total	43	6487.20		

[a]Five biology teachers did not indicate their age: three under Type 1, one under Type 2, and one under Type 3 principals.

The F-value for testing the mean difference between principal Types 1, 2, 3, and 4 and biology teacher experience under present principal was .16. With 3 and 45 degrees of freedom, this F-value was not significant (Table XIII).

TABLE XIII

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN PRINCIPAL TYPES AND BIOLOGY TEACHER EXPERIENCE UNDER PRESENT PRINCIPAL

	Principal Type			
	1	2	3	4
Number	22	6	14	7
Mean No. Years	4.00	3.67	3.64	3.33
Variance	10.95	10.27	6.55	1.81
Source	df	ss	ms	f
Between Groups	3	4.15	1.38	.16 (N.S.)
Within Groups	45	377.40	8.39	
Total	48	381.55		

The calculated F-value for testing the relationship between principal Types 1, 2, 3, and 4 and biology teacher experience in present school was .99. With 3 and 45 degrees of freedom, this F-value was not found significant (Table XIV).

TABLE XIV

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN PRINCIPAL TYPES AND BIOLOGY TEACHER EXPERIENCE IN PRESENT SCHOOL

	Principal Type			
	1	2	3	4
Number	22	6	14	7
Mean No. Years	5.31	8.67	7.86	10.28
Variance	12.99	68.27	55.36	51.79

Source	df	ss	ms	f
Between Groups	3	163.44	54.48	1.25 (N.S.)
Within Groups	45	1955.25	43.45	
Total	48	2118.69		

The calculated F-value for testing the relationship between Type 1, 2, 3, and 4 principals and the total teaching experience of the biology teacher was .99. With 3 and 45 degrees of freedom, this value was not significant (Table XV).

TABLE XV

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN PRINCIPAL TYPES AND TOTAL BIOLOGY TEACHER EXPERIENCE

	Principal Type			
	1	2	3	4
Number	22	6	14	7
Mean No. Years	11.86	17.83	12.14	17.29
Variance	75.93	114.56	97.98	174.57

Source	df	ss	ms	f
Between Groups	3	297.56	99.19	0.99 (N.S.)
Within Groups	45	4488.58	99.76	
Total	48	4786.14		

The calculated F-value testing the mean difference between Type 1, 2, 3, and 4 principals and school size relative to the number of teachers under each principal was 2.32. With 3 and 36 degrees of freedom, this value was not significant at the .05 level (Table XVI).

TABLE XVI

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN PRINCIPAL TYPES AND SCHOOL SIZE

	Principal Type			
	1	2	3	4
Number	16	6	13	5
Mean Size	39.25	20.17	25.23	49.60
Variance	858.07	64.97	134.19	1174.80
Source	df	ss	ms	f
Between Groups	3	3775.03	1258.34	2.32 (N.S.)
Within Groups	36	19505.34	541.82	
Total	39	23280.37		

The calculated F-value for testing the mean difference between principal Type 1, 2, 3, and 4 and the recency of the biology teachers participation in science courses or workshops was 2.95. With 3 and 40 degrees of freedom, the F-value was significant beyond the .05 level (Table XVII).

In order to determine precisely where the significant difference between the four principal Types was located, the Scheffé technique was used. Using this technique, the points of difference were found to be between principal Type 1 and 4, and 3 and 4. The F-values for these pairs were 7.59 and 7.39 respectively. The points of no difference were found to be between principal Types 1 and 2, 1 and 3, 2 and 3, and

2 and 4. The F-values for these pairs were .17, .03, .26, and 2.45 respectively.

TABLE XVII

SUMMARY DATA AND ANALYSIS OF VARIANCE DATA FOR THE RELATIONSHIP BETWEEN PRINCIPAL TYPES AND RECENCY OF BIOLOGY TEACHER PARTICIPATION IN SCIENCE COURSES OR WORKSHOPS

	Principal Type			
	1	2	3	4
Number	20	4	13	7
Mean No. Years	4.05	4.50	3.92	6.43
Variance	3.10	3.00	3.58	7.29
Source	df	ss	ms	f
Between Groups	3	34.21	11.40	2.95*
Within Groups	40	154.59	3.86	
Total	43	188.80		

* $p > .05$

Demographic Data

The demographic data of the study are reported for the biology teacher, the teachers, and the principals. In that no prior hypotheses were formulated, few statistical analyses were made on these data. The mean Biology Teacher Attitude Inventory score and the mean Initiating

Structure and Consideration scores are given in Appendix B for each of the forty schools in this study.

An interesting observation is that 14 of the 49 biology teachers in this study were female and that seven of the 14 were teaching in schools which employed a Type 3 principal. These seven females were 50 percent of the total number of biology teachers that were female and 50 percent of the total number of biology teachers teaching under a Type 3 principal (Table XVIII). Also, it is noted that only 4 of the 22 biology teachers teaching in schools employing Type 1 principals are female (Table XVIII). The 35 male biology teachers in the study had a mean Attitude Inventory score of 19.00, whereas, the 14 female biology teachers had a mean Attitude Inventory score of 16.86.

TABLE XVIII

SEX AND MEAN ATTITUDE INVENTORY FOR BIOLOGY TEACHERS SERVING UNDER TYPE 1, TYPE 2, TYPE 3, AND TYPE 4 PRINCIPALS

Leader Type Principal	Number of Biology Teachers		Average A. I.		
	Male	Female	Male	Female	All
1	18	4	21.61	19.75	21.27
2	6	0	18.17	0	18.17
3	7	7	12.28	15.57	13.92
4	4	3	20.25	16.00	18.42

A greater proportion of biology teachers serving in schools which employed Type 1 principals tended to have Masters' degrees. However, the educational level of the biology teacher serving under each type principal is similar. The data are summarized in Table XIX.

After the previously mentioned analysis of variance of the mean age of the biology teachers serving under a Type 1, 2, 3, and 4 principal, it can be concluded that schools with a Type 1 principal had about the same proportionate number in each age category as does a school with a Type 3 principal. Table XX contains relevant data.

TABLE XIX

EDUCATIONAL LEVEL OF BIOLOGY TEACHERS SERVING IN SCHOOLS WITH TYPE 1, TYPE 2, TYPE 3, AND TYPE 4 PRINCIPALS

Principal Type	Degree				
	B.S.	B.S.+	M.S.	M.S.+	Doctor's
1	2	5	9	6	0
2	0	2	2	2	0
3	2	5	3	4	0
4	1	2	2	1	1

TABLE XX

AGE OF BIOLOGY TEACHERS SERVING IN SCHOOLS WHICH EMPLOY TYPE 1, TYPE 2, TYPE 3, AND TYPE 4 PRINCIPALS

Principal Type	20-29 Years	30-39 Years	40-49 Years	50-59 Years	60-69 Years	Average Age
1	6	8	2	2	1	36.58
2	2	0	1	2	0	42.20
3	4	4	3	1	1	38.15
4	2	1	0	3	1	42.29

Biology teachers in schools which employ a Type 1 principal and a Type 3 principal had been under their present principal about the same length of time and their total experience was about the same. However, the biology teacher in a school employing a Type 1 principal had a mean number of 5.31 years of experience in the present school, whereas, those under a Type 3 principal have a mean number of 7.86 years of experience. But according to the previously mentioned analysis of variance, there was no significant difference between these means. The data are summarized in Table XXI. The same general pattern of experience is found for biology teachers serving under a Type 2 and Type 4 principal as was observed for the Type 1 and 3 principal. See Table XXII for the summarized results.

TABLE XXI

EXPERIENCE OF BIOLOGY TEACHERS SERVING IN SCHOOLS WHICH EMPLOY TYPE 1 AND TYPE 3 PRINCIPALS

Principal Type	Years of Experience	Under Present Principal	In Present School	Total Experience
1	1-5	19	15	7
	6-10	1	4	6
	11-15	2	3	3
	16-20			2
	21-25			1
	26-30			3
	31-35			
	36+			
	Average Years	4.00	5.31	11.86
3	1-5	10	6	3
	6-10	4	5	5
	11-15		1	2
	16-20		1	3
	21-25			
	26-30		1	
	31-35			
	36+			1
	Average Years	3.64	7.86	12.14

TABLE XXII

EXPERIENCE OF BIOLOGY TEACHERS SERVING IN SCHOOLS WHICH EMPLOY TYPE 2 AND TYPE 4 PRINCIPALS

Principal Type	Years of Experience	Under Present Principal	In Present School	Total Experience
2	1-5	5	3	1
	6-10	1	1	1
	11-15		1	
	16-20			
	21-25		1	3
	26-30			1
	31-35			
	36+			
	Average Years	3.67	8.67	17.83
4	1-5	5	2	1
	6-10	1	1	1
	11-15		1	
	16-20		1	1
	21-25			1
	26-30		1	1
	31-35			
	36+			1
	Average Years	3.33	10.28	17.29

Due to the fact that the study was conducted in the secondary school, it is not surprising that an almost equal proportion of males and females taught under each of the four principal types. It is interesting to note that for each principal Type the mean Initiating Structure score is almost the same for both the males and females responding to the LBDQ. The same is true for the mean Consideration scores as reported by the male and female teachers. The data are reported in

Table XXIII.

TABLE XXIII

SEX AND MEAN INITIATING STRUCTURE AND CONSIDERATION SCORES FOR TYPE 1, 2, 3, AND 4 PRINCIPALS

Principal Type	Number		I. S. Scores			Cons. Scores		
	M	F	M	F	All[a]	M	F	All[a]
1	93	106	44.43	47.02	45.82	44.53	46.70	45.70
2	26	24	34.19	32.75	33.50	42.96	45.98	44.22
3	72	76	35.13	32.80	33.93	38.04	37.51	37.77
4	36	37	45.11	45.59	45.38	36.86	40.84	38.93

[a]Includes those teachers which did not indicate their sex (Type 1 had one teacher who did not indicate sex; Type 4 also had one who did not respond.)

The educational level of teachers serving in schools which employed a Type 1, 2, 3, or 4 principal was similar with one exception. A smaller percentage of the teachers serving under a Type 4 principal had the master's degree. The data are presented in Table XXIV.

TABLE XXIV

EDUCATIONAL LEVEL OF TEACHERS SERVING UNDER TYPE 1, 2, 3, AND 4 PRINCIPALS[a]

Principal Type	Percent of Teachers							
	Less Than B.S.	B.S.	B.S. +	M.S.	M.S. +	6th Year or Equiv.	6th Year	Doctor's
1	1	15	35	26	16	6	1	0
2	4	16	30	26	18	6	0	0
3	1	24	26	27	15	7	0	0
4	3	20	36	25	8	8	0	0

[a]One teacher with a Type 3 principal did not indicate educational level.

The mean age reported by the teachers employed by schools with a Type 1, 2, 3, or 4 principal was 39.94, 41.54, 39.82 and 41.56 respectively. Analysis of the age categories indicated a similar pattern between the four groups of teachers (see Table XXV).

TABLE XXV

AGE OF TEACHERS SERVING IN SCHOOLS WHICH EMPLOY TYPE 1, 2, 3, AND 4 PRINCIPALS

Principal Type	Number Reporting[a] 20-29 Years	30-39 Years	40-49 Years	50-59 Years	60-69 Years	Average Age
1	48	56	26	35	14	39.94
2	9	8	10	9	3	41.54
3	34	39	21	30	8	39.82
4	20	15	14	16	8	41.56

[a]Type 1 had 21 non-responders
Type 2 had 11 non-responders
Type 3 had 16 non-responders
Type 4 had 1 non-responder

The experience level of teachers serving under a Type 1 and a Type 3 principal was similar. The mean number of years the teachers had served under a Type 1 principal was 4.28 years, whereas, the Type 3 group had served under their principal for an average of 4.39 years. The mean number of years in the present school was almost the same for both groups of teachers. Also, the mean total experience was about the same. The data are delineated in Table XXVI.

TABLE XXVI

EXPERIENCE OF TEACHERS SERVING IN SCHOOLS WHICH EMPLOY TYPE 1 AND TYPE 3 PRINCIPALS

Principal Type	Years of Experience	Under Present Principal	In Present School	Total Experience
1	1-5	161	123	57
	6-10	24	29	49
	11-15	11	21	26
	16-20	1	3	18
	21-25	1	10	10
	26-30	0	9	15
	31-35	0	2	10
	36+	0	3	15
	Average Years	4.28	8.02	14.23
3	1-5	101	77	40
	6-10	42	36	43
	11-15	5	9	19
	16-20	0	10	11
	21-25	0	14	11
	26-30	0	0	9
	31-35	0	0	8
	36+	0	2	7
	Average Years	4.39	8.22	13.87

The mean experience level of teachers serving under a Type 2 and a Type 4 principal was almost the same with a difference of less than one year. Also, there was no substantial difference between the two groups as far as the mean number of years in the present school and the mean number of years of teaching experience (see Table XXVII).

TABLE XXVII

EXPERIENCE OF TEACHERS SERVING IN SCHOOLS WHICH EMPLOY TYPE 2 AND TYPE 4 PRINCIPALS

Principal Type	Years of Experience	Under Present Principal	In Present School	Total Experience
2	1-5	46	25	11
	6-10	1	7	12
	11-15	3	5	0
	16-20	0	6	9
	21-25	0	6	8
	26-30	0	1	6
	31-35	0	0	3
	36+	0	0	1
	Average Years	3.55	9.50	16.25
4	1-5	68	37	25
	6-10	3	12	9
	11-15	1	7	11
	16-20	2	6	8
	21-25	0	6	5
	26-30	0	4	7
	31-35	0	1	3
	36+	0	1	6
	Average Years	3.49	9.88	15.40

It is interesting to note that of the forty schools used in this study, 16 of them employed a Type 1 principal and 13 employed a Type 3 principal, whereas, six of them employed a Type 2 principal, while five employed a Type 4 principal. However, this was expected due to the fact that principals which are ranked high on one dimension of LBDQ will likely be ranked high on the other, whereas, those which are ranked low on one dimension will most likely be ranked low on the other.

The mean number of teachers serving under Type 1, 2, 3, and 4 principals was 39, 20, 25, and 50 respectively (see Table XXVIII). Analysis of schools does reveal some difference, but as has already been reported, it was not statistically significant.

TABLE XXVIII

NUMBER OF SCHOOLS AND MEAN STAFF SIZE OF SCHOOLS EMPLOYING TYPE 1, TYPE 2, TYPE 3, AND TYPE 4 PRINCIPALS

Principal Type	Number of Schools	Mean Number of Staff
1	16	39.25
2	6	20.17
3	13	25.23
4	5	49.60

It is noteworthy that 12 of the 22 biology teachers teaching under a Type 1 principal were not teaching BSCS Biology. However, 9 of these 12 teachers indicated that they prefer the BSCS Biology Program and would teach it if the situation permitted it. Three of the 12 were teaching the program and did not prefer to teach it due to a lack of preparation and training and the lack of adequate facilities. Three of the six biology teachers who served under a Type 2 principal did not teach the BSCS Program. Twelve of the 14 biology teachers serving in schools which employed a Type 3 principal did not teach BSCS Biology.

Nine of the 12 did not prefer to teach the Program. However, three of them indicated that they would prefer to teach the Program if the situation permitted it. Four of the seven biology teachers serving under a Type 4 principal were not using the BSCS Biology Program. Two did not prefer the Program, whereas, the other two preferred it and would teach it if the situation permitted. The data are delineated in Tables XXIX and XXX.

TABLE XXIX

DESCRIPTION OF BIOLOGY TEACHERS' SITUATION

Principal Type	Number Teaching BSCS	Number Not Teaching BSCS	Description[a]			
			A	B	C	D
1	10	12	9	0	9	3
2	3	3	2	0	0	3
3	2	12	2	0	3	9
4	3	4	2	0	2	2

[a](A) I am currently teaching BSCS Biology and I prefer to continue teaching it.

(B) I am currently teaching BSCS Biology but I do not prefer it and would rather teach the conventional course.

(C) I am not currently teaching BSCS Biology but I prefer the program and I would teach it if the situation permitted it.

(D) I am not currently teaching BSCS Biology and I do not prefer to teach BSCS Biology.

TABLE XXX

REASONS FOR NOT TEACHING BSCS BIOLOGY[a]

Principal Type	A	B	C	D	E	F	G	H
1	3	4	4	5	1	1	1	2
2	2	1	1	4	3	1	0	0
3	4	6	5	5	5	0	0	2
4	0	3	1	3	1	0	0	1

[a]The reasons represented by the above letters are as follows:

(A) I do not think the program is an improvement over the conventional biology course that we are using.

(B) I do not think the program fulfills our local needs.

(C) Textbooks and related materials are not available.

(D) Adequate laboratory space is not available.

(E) I do not feel that I have adequate preparation and training to teach BSCS Biology.

(F) Too much extra work is required of the teacher when teaching the BSCS Biology Program.

(G) The local school administration does not favor use of the BSCS Program.

(H) Fellow biology teachers do not favor use of the BSCS Program.

So far in this chapter, biology teachers serving under Type 1, 2, 3, and 4 principals have been compared. Also, the teachers serving under these principals were compared.

As was hypothesized, the mean Biology Teacher Attitude Inventory

score was significantly greater for those teachers serving under a Type 1 principal than those under Type 3.

The principal Type used was based on the mean of the responses which the teachers gave to the LBDQ. The mean Initiating Structure score for the Type 1, 2, 3, and 4 principals was 44.83, 33.54, 33.61, and 44.07 respectively. The mean Consideration scores for the Type 1, 2, 3, and 4 principals was 45.35, 44.36, 37.27, and 39.07 respectively. For a summary of data, see Table XXXI.

School personnel in the schools employing a Type 1, 2, 3, or 4 principal did not appear to differ greatly in the mean age of the staff, the mean number of years' experience served with the same principal or the mean number of years' experience in the school with the exception of the fact that the biology teachers and teachers serving under a Type 4 principal had a greater number of mean years experience in the present school and a greater total years of experience. These data are summarized in Table XXXII.

TABLE XXXI

SUMMARY OF MEANS FOR SCHOOLS EMPLOYING A TYPE 1, 2, 3, OR 4 PRINCIPAL

Principal Type	Number of Schools	Mean Staff Size	Mean* Biology Teachers' A.I.	Mean* Initiating Structure	Mean* Consideration	Mean Age	
						Biology Teachers	All Teachers
1	16	39.25	21.38	44.83	45.35	35.53	39.94
2	6	20.17	18.17	33.54	44.36	42.20	41.54
3	13	25.23	14.08	33.61	37.27	38.15	39.82
4	5	49.60	17.50	44.07	39.07	42.29	41.56

*Means of the means for each school

TABLE XXXII

SUMMARY OF MEANS FOR SCHOOLS EMPLOYING A TYPE 1, 2, 3, OR 4 PRINCIPAL

Principal Type	Mean Years Under Present Principal		Mean Years Experience in Present School		Mean Total Years Experience	
	Biology Teachers	All Teachers	Biology Teachers	All Teachers	Biology Teachers	All Teachers
1	4.00	4.28	5.31	8.02	11.86	14.23
2	3.67	3.55	8.67	9.50	17.83	16.25
3	3.64	4.39	7.86	8.22	12.14	13.87
4	3.33	3.49	10.28	9.88	17.29	15.40

CHAPTER V

FINDINGS AND IMPLICATIONS

Summary of Findings

This study was made in order to determine the relationship between the leader behavior of the secondary school principal and the attitude of biology teachers toward the BSCS Biology Program.

The findings are as follows:

1. An analysis of variance test for significant difference among mean attitude scores of biology teachers under the four types of principals disclosed significant difference. A test of all possible pairs to locate specific difference disclosed significant difference only between biology teachers under Type 1 and Type 3 principals.

2. An effort was made to relate attitude of biology teachers with demographic variables. No significant difference between biology teacher attitudes was found when biology teachers were categorized according to size of school, sex, age, number of years under present principal, number of years in present school, total number of years teaching experience or their educational level.

3. Also, an effort was made to relate principal types with demographic variables. No significant difference between principal types was found when biology teachers were categorized according to age, number of years under present principal, number of years in present

school, total number of years teaching experience, and size of teacher staff. However, a significant difference was found between principal type and the recency of the biology teachers participation in science courses or workshops. A test of all possible pairs to locate specific differences disclosed significant difference only between biology teachers under principal Types 1 and 4 and between those under principal Types 3 and 4.

4. The coefficient of multiple correlation between attitude of the biology teacher toward the BSCS Biology Program and a combination of the two dimensions of the LBDQ, Initiating Structure and Consideration, was found not to be statistically significant.

Implications

The rationale from which the hypothesis guiding the study was deduced stressed the importance of the principal as an innovator and supporter of problem-solving type situations. The rationale also stressed the importance of attitude change prior to a behavior change. As will be recalled, Halpin (58) and others reported that Initiating Structure and Consideration are fundamental dimensions of leader behavior and that the most effective leaders are those who score high on both dimensions of the LBDQ. It was assumed that due to the close contact of the principal with the biology teacher that the principal would influence the biology teacher's attitude.

The confirmation of the hypothesis that schools employing different principal Types will tend to have biology teachers who score significantly different on the Attitude Inventory provided some support for the assumption that the principal does influence his teachers' attitudes.

A comparison of attitude scores from teachers teaching under Type 1 principals and Type 2 principals showed no significant difference. Likewise, the comparison of teachers serving under Types 1 and 4 principals, Types 2 and 3 principals, and Types 3 and 4 principals were not found to be significant. This, then, does not support the hypothesis that the different principal Types will tend to have biology teachers who score significantly different on the A. I.

Faculty members concerned with improving learning might find the study of value to them. It could help them to determine what assistance they could hope to receive from the principal should they choose to introduce innovative practices.

The public school principal should be viewed and should view himself as an instrument of change and experimentation. Today's technological age certainly demands a never ending search for improvement. His most rewarding role is to help his teachers construct and support policies and goals, the evaluation of curriculum, the selection of instructional materials, school and class organizational structures, pupil groupings, pupil management, pupil opportunities, roles and responsibilities of various staff positions, and other aspects of the school's total complex. This is his role whether he wants to recognize it or not because of the expectations held of him which have grown out of staff, organizational, community, and nationwide conditions.

No one expects him to abandon completely his managerial administrative role to become a leader. This is an unrealistic expectation since the board of education and its agent, the superintendent, set policy which will determine to a large measure the latitude of freedom a principal may exercise. However, there is still a great margin of

discretionary power which any principal has, if he will only take the time to seek it. It is within this sphere that our present age demands that he exercise greater directional leadership to the excellence public education deserves. He must rise to the occasion by using his own personal talents, education, and foresightedness to lead his staff, students, and community through the processes outlined heretofore, toward establishing a realistic, creative, and far-reaching climate for the improvement of instruction. Finally, if his behavior is characterized by both consideration for others and a tendency to initiate structure or bring order into a situation by planning and arranging the situation so that the work can go forward in a shared direction, he is assuming some degree of the leadership expectations his role today demands. The extent to which he will practice leadership will depend upon his personality, initiative, job complex, and use of the democratic process.

One writer has indicated that if the factors which influence the biology teachers' attitude toward the BSCS Biology program can be identified, then there may be a way to facilitate the Program. (68) Perhaps this study has made a contribution toward determining the factors which influence biology teacher attitudes.

The writer realizes that the conclusions drawn upon the findings must be tempered by the limitations imposed by the characteristics of the sample. Generalizations based upon the findings of this study, but which extend beyond the sample, must be made with care. In addition, caution must be exercised against considering the established relationships in a cause and effect manner.

Suggestions for Further Study

While this investigation of biology teachers' attitude and principal leader behavior revealed some relationship between principal Types and biology teacher attitudes, much remains unknown. It is recognized that many related studies could be undertaken. Some questions for study are given as follows:

1. Is there a relationship between the leader behavior of the secondary principal and the attitude of teachers toward other specific curricular programs?

2. Are there perceptions of leadership behavior other than those described by the LBDQ which influence teacher attitudes?

3. How can the principal best evaluate the effect his behavior is having on his staff?

4. Is there a relationship between the biology teachers' attitude and other variables such as organizational climate or the hierarchical structure of the school system?

5. Is there a relationship between the leader behavior of elementary school principals and the attitude of the faculty toward various curricular programs?

6. Is there a relationship between the attitude of the teacher toward various curricular programs and the social-emotional development of the students?

7. What is the relationship between the LBDQ scores and other independent criteria of effectiveness in the various areas of principal responsibility?

The preceding questions are only a few that might be raised. They indicate that much is yet to be learned about the interactions of the principal, teachers, and students.

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APPENDIX A

INSTRUMENTS

OKLAHOMA STATE UNIVERSITY • STILLWATER

Research Foundation
(405) 372-6211, Ext. 271

74074

Dear Biology Teacher:

Your participation is requested in a research study investigating attitude and educational leadership. Three forms are enclosed for your reactions (1. Information Sheets, 2. Attitude Inventory, and 3. Questionnaire.)

The Information Sheet may be needed in the interpretation of the results of this study. The information supplied by you is considered confidential and will be seen only by the researchers.

There are no "right" or "wrong" answers to the Attitude Inventory items. The best answer is your honest and frank opinion. You can be sure that whatever your opinions may be on a certain statement that there are some who agree and some who disagree.

The Questionnaire enables you to describe the behavior of your principal. This questionnaire in no way constitutes a "test" of your ability, nor does it require you to evaluate your principals performance, as no judgment of goodness or badness is involved. It is possible, however, to identify certain distinct leadership styles by such a straightforward approach.

Please read each item on the three forms carefully and mark each and every item with your personal point of view, according to your first reaction.

Kindly return the three forms as soon as possible using the stamped, addressed envelope.

We express our thanks for your participation in filling out the forms and assure you that your answers will not be seen by the principal whom you described, and that no mention of names or schools will be included in the study. The questionnaires are numbered for clerical purposes only. All information will, of course, be strictly confidential.

Sincerely Yours,

Wilford F. Lee,
Graduate Student

Dr. K. E. Wiggins,
Co-Director,
Research Foundation

Information Sheet

Instructions:

Please complete this form by checking the appropriate boxes and filling in blanks where indicated.

1. Sex
   ( ) Male ( ) Female

2. Marital status

   ( ) Single ( ) Widowed
   ( ) Married ( ) Divorced

3. Education

   ( ) Less than Baccalaureate
   ( ) Baccalaureate Degree
   ( ) Graduate work (no advanced degree)
   ( ) Master's Degree (or equivalent)
   ( ) Graduate work beyond Master's (no advanced degree)
   ( ) Sixth Year Degree
   ( ) Graduate work beyond Sixth Year Degree (no advanced degree)
   ( ) Doctorate

4. What is your average class size

   ( ) less than 15; ( ) 16-20; ( ) 21-25; ( ) 26-30; ( ) 30+

5. Age (Nearest birthday): _____.

6. Number of years teaching experience in this school (including this Year):_____.

7. Total number years teaching experience (including this Year):_____.

8. Number of Children (Your own):_____.

9. How many years have you taught under the present principal (including this year): _____.

10. Have you taught BSCS Biology prior to this school year?( ) Yes ( ) No

11. Are you currently teaching BSCS Biology? ( ) Yes; ( ) No

12. Are you planning to teach BSCS Biology during the next school year?

    ( ) Yes; ( ) No.

13. If you are teaching BSCS Biology and you are using or will use a laboratory block, please specify the block involved.

_____

14. If you are teaching BSCS Biology, please check the version that you are using.

( ) Blue; ( ) Green; ( ) Yellow

15. If you are not teaching BSCS Biology, please check the reason or reasons below indicating why you are not. (Check all reasons that apply)

( ) I do not think the program is an improvement over the conventional biology course that we are using.
( ) I do not think the progrom fulfills our local needs.

( ) Textbooks and related materials are not available.

( ) Adequate laboratory space is not available.

( ) I do not feel that I have adequate preparation and training to teach BSCS Biology.
( ) Too much extra work is required of the teacher when teaching the BSCS Biology Program:
( ) The local school administration does not favor use of the BSCS Program.
( ) Fellow biology teachers do not favor use of the BSCS Program.

( ) Other Reasons (Please Specify)_____

_____

16. Please list your current teaching schedule:

Course (e.g., Chem, Biol.) Include Study Hall and Preparation Periods	Grade Level	Class Periods Per Week	Type of Class Adv., Avg., Slow

17. Please list all extra-classroom activities for which your are responsible and that are considered part of your teaching responsibilities. (i.e., Math Club, Science Club, Pep Squad, etc.)

_____

_____

_____

18. Please check only one of the following four statements. Check the one statement that most nearly describes your situation.

( ) I am currently teaching BSCS Biology and I prefer to continue teaching it.

( ) I am currently teaching BSCS Biology but I do not prefer it and would rather teach the conventional course.

( ) I am not currently teaching BSCS Biology but I prefer the program and I would teach it if the situation permitted it.

( ) I am not currently teaching BSCS Biology and I do not prefer to teach BSCS Biology.

19. Undergraduate major_____

20. When did you last take a science course?
Within the last (check one)

( ) 3 years ( ) 6 years ( ) 9 years

( ) 12 years ( ) 15 years ( ) over 15 years

21. When did you last attend a science workshop or seminar?
Within the last (check one)

( ) 3 years ( ) 6 years ( ) 9 years

( ) 12 years ( ) 15 years ( ) over 15 years

22. Comments (if you are not teaching BSCS Biology, but you are using some of the BSCS ideas, e.g., lab blocks, please comment on this. Also, feel free to explain any of the responses made above.)

_____

_____

_____

_____

ATTITUDE INVENTORY

Instructions

Attached are statements pertaining to the high school biology programs. These statements reflect a wide range of attitudes concerning these programs.

We would like for you to read each statement carefully and ask yourself whether you agree or disagree with the statement. We realize that in some cases the decision will be difficult. If you agree with the statement, place a check mark in the space provided by the statement. If you do not agree with the statement, leave the space provided blank.

Remember: Place a check mark only by those statements with which you definitely agree.

THE INVENTORY BEGINS ON THE NEXT PAGE

_____ 1. Laboratory work in high school biology should be more closely integrated with the text material.

_____ 2. The high school biology program should be designed and controlled only by high school biology teachers.

_____ 3. The high school biology laboratory work would be more interesting if the nature of laboratory work were more investigative.

_____ 4. Demonstrations are not as effective as student participation type laboratory work.

_____ 5. Students gain more scientific knowledge by participation in BSCS-type laboratory work than they do in the conventionally patterned laboratory work.

_____ 6. It would be difficult, if not impossible, to teach the BSCS biology course in its present form.

_____ 7. It is not necessary that a student actually perform laboratory work in order to understand the principles of scientific investigation.

_____ 8. The BSCS biology program reflects the current trend in the biological sciences.

_____ 9. The situations which students are exposed to in BSCS biology are similar to those situations faced by a scientist in his every day work.

____ 10. The BSCS biology program has failed to provide for some of the most important aspects of the high school biology course.

____ 11. A practical biology course that has immediately useable information for the student is what is needed in the high school.

_____ 12. BSCS biology adequately provides for differences in student ability.

_____ 13. The major emphasis in high school biology should be the structure and functions of organs and tissues.

_____ 14. Well-prepared motion pictures could be substituted for all high school biology laboratory work.

_____ 15. Our knowledge in the life sciences has been derived from limited observations.

_____ 16. A slight modification of the existing high school biology program is all that is needed to provide an effective high school biology program.

_____ 17. BSCS biology would enable the student to understand better the ways in which hypotheses are developed and tested.

_____ 18. Students come to understand science through participating in laboratory work rather than by reading about science and watching demonstrations.

_____ 19. Accurate evaluation of a student's achievement in a laboratory-oriented course, such as the BSCS course, would be impossible.

_____ 20. At the present time, there is no need for a major revision of the high school biology program.

_____ 21. The use of six weeks of concentrated laboratory work in one area of biology is justifiable.

_____ 22. College-bound students would profit more from the conventional type of biology course than they would from the BSCS biology program.

_____ 23. In high school biology, major emphasis should be placed on the molecular, cellular, and community aspects of biology.

_____ 24. In considering the high school biology program as a whole, it appears that the existing program is adequate.

_____ 25. Biological laws are only summations of experiences, consequently, in the future one may expect these laws to become modified or even discarded.

_____ 26. The BSCS biology program seems designed exclusively for the above-average student.

_____ 27. It is only by engaging in the steps of scientific inquiry that a student becomes able to discern the difference between experimentation and complex instrumentation.

_____ 28. Actually, the so-called conventional high school biology course and the recommended BSCS biology course are quite similar.

_____ 29. The biology textbooks and laboratory manuals currently in use in the high schools are adequate.

_____ 30. The study of science as inquiry should be one of the major objectives of high school biology.

_____ 31. The benefits that a student derives from actual first-hand laboratory experimentation cannot be justified in terms of the amount of teacher time and materials required.

_____ 32. Laboratory investigations and open-ended experiments are excellent means for conveying an understanding of science.

_____ 33. Demonstrations performed by the science teacher are just as effective as student-performed laboratory experiments.

_____ 34. It is more important for the average student to understand the purpose and method of science than for him to be acquainted with the latest theory of the universe or the newest hormone.

_____ 35. BSCS biology could be taught just as effectively without the extensive laboratory investigations suggested.

_____ 36. Laboratory exercises should stress the names of structures and processes.

_____ 37. The traditional biology course offered in the high school is no longer adequate.

_____ 38. The need for the students to acquire factual information is greater than the need for them to understand the ways in which hypotheses are developed.

_____ 39. Research biologists whould be involved with others in designing the high school biology curriculum.

_____ 40. Biology should be taught as a body of factual information.

_____ 41. The BSCS biology program reflects careful planning of a practicable course.

_____ 42. In high school biology, student work should be centered in the laboratory where real problems are explored.

_____ 43. It is doubtful that the BSCS approach to teaching high school biology would result in the students' acquiring a better understanding of the true work of the scientist.

_____ 44. The amount of time suggested for laboratory investigation in the BSCS biology program is excessive.

_____ 45. A student comes to understand science through participating in science, rather than by serving as a bystander who only reads about science.

_____ 46. Wholesale revision of the conventional high school biology course is imperative if a modern curriculum is to be developed.

OKLAHOMA STATE UNIVERSITY • STILLWATER

Research Foundation
(405) 372-6211, Ext. 271

74074

Dear Teacher:

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The Questionnaire enables you to describe the behavior of your principal. This Questionnaire in no way constitutes a "test" of your ability, nor does it require you to evaluate your principal's performance, as no judgment of goodness or badness is involved. It is possible, however, to identify certain distinct leadership styles by such a straightforward approach. All information supplied by you is considered confidential and will be seen only by the researchers.

Please read each item carefully and mark each and every item with your personal point of view, according to your first reaction.

Kindly return the questionnaires as soon as possible using this stamped, addressed envelope.

We express our thanks for your participation in filling out the questionnaires and assure you that your answers will not be seen by the principal whom you described, and that no mention of names or schools will be included in the study. The questionnaires are numbered for clerical purposes only. All information will, of course, be strictly confidential.

Sincerely Yours,

Wilford F. Lee
Graduate Student

Dr. K. E. Wiggins,
Co-Director,
Research Foundation

Information Sheet

Instructions:

Please complete this form by checking the appropriate boxes and filling in blanks where indicated.

1. Sex

( ) Male ( ) Female

2. Marital status

( ) Single ( ) Widowed
( ) Married ( ) Divorced

3. Education

( ) Less than Baccalaureate
( ) Baccalaureate Degree
( ) Graduate work (no advanced degree)
( ) Master's Degree (or equivalent)
( ) Graduate work beyond Master's (no advanced degree)
( ) Sixth Year Degree
( ) Graduate work beyond Sixth Year Degree (no advanced degree)
( ) Doctorate

4. What is your average class size

( ) less than 15; ( ) 16-20; ( ) 21-25; ( ) 26-30; ( ) 30+

5. Present teaching assignment (math, history, English, etc.)

_____.

6. Age (Nearest birthday):_____.

7. Number years teaching experience in this school (including this year):_____.

8. Total number years teaching experience (including this year):

_____.

9. Number of children (your own):_____.

10. How many years have you taught under the present principal (including this year):_____.

QUESTIONNAIRE

Directions:

a. READ each item carefully.

b. THINK about how frequently your principal engages in the behavior described by the item.

c. DECIDE whether he always, often, occasionally, seldom, or never acts as described by the item.

d. DRAW A CIRCLE around one of the five letters preceeding the item to show the answer you have selected, using the following code:

A---Always
B---Often
C---Occasionally
D---Seldom
E---Never

A B C D E 1. He makes his attitude clear to the staff.

A B C D E 2. He does personal favors for staff members.

A B C D E 3. He tries out his new ideas with the staff.

A B C D E 4. He does little things to make it pleasant to be a member of the staff.

A B C D E 5. He rules with an iron hand.

A B C D E 6. He is easy to understand.

A B C D E 7. He criticizes poor work.

A B C D E 8. He finds time to listen to staff members.

A B C D E 9. He speaks in manner not to be questioned.

A B C D E 10. He keeps to himself.

A B C D E 11. He assigns staff members to particular tasks.

A B C D E 12. He looks out for the personal welfare of individual staff members.

A B C D E 13. He works without a plan.

A B C D E 14. He refuses to explain his actions.

A B C D E 15. He maintains definite standards of performance.

A B C D E 16. He acts without consulting the staff.

A B C D E 17. He encourages the use of uniform procedures.

A B C D E 18. He is slow to accept new ideas.

A B C D E 19. He emphasizes the meeting of deadlines.

A B C D E 20. He treats all staff members as his equals.

A B C D E 21. He makes sure that his part of the organization is understood by all members.

A B C D E 22. He is willing to make changes.

A B C D E 23. He asks that staff members follow standard rules and regulations.

A B C D E 24. He is friendly and approachable.

A B C D E 25. He lets staff members know what is expected of them.

A B C D E 26. He makes staff members feel at ease when talking with them.

A B C D E 27. He sees to it that staff members are working up to capacity.

A B C D E 28. He puts suggestions made by the staff into operation.

A B C D E 29. He gets staff approval on important matters before going ahead.

A B C D E 30. He sees to it that the work of staff members is co-ordinated.

APPENDIX B

ATTITUDE INVENTORY AND LBDQ SCORES FOR FORTY SCHOOLS

ATTITUDE INVENTORY AND LBDQ SCORES FOR FORTY SCHOOLS

School Number	Attitude Inventory	LBDQ	
		Initiating Structure	Consideration
1	1	37.75	41.25
2	21	43.46	42.77
3	29	45.25	44.38
4	12	32.57	39.29
5	15	31.50	45.25
6	26	30.29	40.43
7	4	35.43	41.57
8	10	44.77	31.54
9	24	21.90	31.90
10	21	40.63	42.00
11	9	37.00	29.13
12	15	45.33	44.00
13	25	40.67	41.44
14	21	46.00	46.12
15	20.5	47.53	49.24
16	19	41.10	44.80
17	19	45.50	48.25
18	21	35.00	41.14
19	15	31.67	44.67
20	27	49.65	43.50
21	22	36.17	36.72
22	19	34.80	42.60
23	18	32.14	42.29
24	12	36.00	41.42
25	21	45.53	50.59
26	14	30.11	37.50
27	11	45.57	41.57
28	23	47.31	46.85
29	28	43.43	43.86
30	15.5	44.36	44.91

School Number	Attitude Inventory	LBDQ	
		Initiating Structure	Consideration
31	17.5	41.88	41.13
32	27	39.78	41.89
33	7	38.42	39.75
34	19	49.60	44.67
35	24	47.46	39.68
36	12	30.29	34.43
37	22	32.00	45.89
38	16	42.75	47.83
39	19	36.00	30.00
40	20	39.11	45.44

VITA

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