OKLAHOMA ADMINISTRATORS' PERCEPTIONS
OF APPLIED SCIENCE

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CHAPTER I

INTRODUCTION

A Nation at Risk (1993) suggested that America's students need a more solid foundation in academic basics. In recent years educational reforms indicated a need for educational improvement. Reorganizing schools meant extensive changes to educational curriculums such as aligning curriculums to skills needed in the jobs of tomorrow. Since the development of the applied curriculum known as Applied Biology/Chemistry (ABC) (CORD 1988), a push toward applied sciences has occurred in Oklahoma.

In the past applied curriculums were viewed as watered down, non-academic courses. Today applied science has taken on a new image described as a technological product (de Vries, 1996). Fifty percent of today's careers require a functional knowledge of biology and chemistry (United States Department of Commerce, 1987). Jobs in the twentieth century have evolved into technological fields requiring education to develop students with the ability to work and enhance these labors with expanded and diversified skills.

Johnson and Johnson (1987) pointed out that many educators question the instructional curriculums used to effectively teach science. Harvey (1991) expressed the need for applied curriculums that make academic concepts relevant to students future careers. Application of knowledge can be beneficial to all types of students preparing for careers after high school, college, or technical trade schools. The utilization of applied science in schools will give students another avenue to make them more marketable in the work force.

Applied sciences have been introduced into the educational realm, giving way to a new curriculum in which students actually apply their knowledge learned to technological feats that will be utilized in future careers. Applied courses have been used in academic areas such as Mathematics, Science, and Communications and can be taught in combination with traditional curriculums. Cooperative learning is often a tool used to teach applied curriculums and compliments the courses with its sharing of skills and ideas from members of the class working as a team (Lapp, Flood and Thrope 1989).

Most superintendents were taught in a more theoretical atmosphere rather than with an applied curriculum. The philosophy of education for many years has been that well-educated students learn by memorizing facts and information (Beadles 1992). Many high school teachers have training in only one field and others lack formal preparation in scientific instruction (Hamby, 1995). Teachers that were educated by traditional curriculums are more likely to teach their students by the same theoretical means. For many, school is equated with memorizing as many facts about a subject as possible without any practical experience. School attendance was once considered a way to pay your dues to society. If a student could endure school without dropping out, the door was opened to him and on-the-job training began. A large amount of what was learned in school was dismissed as irrelevant knowledge once a job was obtained. Schools were considered more of a discipline than a source of relevant knowledge.

Superintendents have the choice of utilizing applied science curriculums to educate their students or continue using traditional science curriculums as they have in the past. Past studies (Beadles, 1992; Christian, 1993; Dugger, 1992; Hamby, 1995; and Wilson, 1994) have indicated applied curriculums may be an acceptable alternative to traditional curriculums. Applied curriculums may also entice students to enroll in science that otherwise would not. Considering the educational background of most career educators, and the fact that applied curriculums may enhance students learning it is vital to the existence of applied courses that we understand superintendents' perceptions of applied science courses compared to traditional science courses.

Statement of the Problem

Traditional teaching methods may not be adequate to educate students to be productive and effective members of a technical work force. Naisbitt (1989) concluded that we as a society have entered the information age. Most jobs today require not only an understanding of knowledge but also an understanding of how to use that knowledge in real world applications. Parnell (1992) indicated that in the study a majority of students are unprepared for the jobs of the future.

Mills (1990) believed students could pass high school and college courses and yet not fully understand concepts needed to apply their knowledge to science-related phenomena. Applied science may be an alternative to help students to better understand scientific concepts and apply their knowledge to relevant real-world situations. Due to the fact that school superintendents make decisions concerning public school curriculum, it is important to determine their perceptions of applied science in public schools.

Purpose of the Study

The purpose of this study was to assess the perceptions of Oklahoma Public School Superintendents concerning applied science courses such as Applied Biology/Chemistry and Applied Physics as compared to traditional science courses.

Objectives of the Study

In order to achieve the purpose of this study, the following objectives were formulated:

1. To determine the perceptions of comprehensive school superintendents in Oklahoma toward applied science courses verses traditional science courses.

2. To determine the perceptions of Oklahoma comprehensive school superintendents toward the incorporation of applied science curriculums as a way to enhance learning.

3. To describe the future use of applied science in Oklahoma secondary public schools as perceived by school superintendents.

4. To compare perceptions of comprehensive school superintendents by types of applied science courses offered in their schools.

Assumptions

1. It was assumed that superintendents responded to the phone interview honestly and accurately.

2. It was assumed that the superintendents interviewed had an understanding of applied science.

Scope

This study was conducted with a population of 69 Oklahoma comprehensive school superintendents derived from a list obtained from the Oklahoma State Department of Education. The superintendents in this study, one per district, represent the total number of public comprehensive school districts in Oklahoma (Oklahoma State Department of Education, 1998) that offer secondary students Applied Biology/Chemistry or Principles of Technology.

Definition of Terms

Applied Science - A curriculum designed to teach scientific concepts through application of knowledge. Students of applied science curriculums experience skills that can be applied to real-life situations and careers. Applied science activities encourage problem solving and higher thinking skills. Terms that are sometimes used to describe applied science are hands-on activities and real-world scenarios. For this study applied science included Applied Biology/Chemistry (ABC) and Applied Physics (Principles of Technology).

Traditional Science - A curriculum that teaches scientific concepts and is primarily concerned with subject matter. This approach is theoretical in nature and relies heavily on lectures, book work, and constricted demonstrations. Students are expected to memorize scientific facts and concepts without application of learned knowledge. For this study traditional science included Biology, Chemistry, and Physics.

Applied Biology/Chemistry (ABC) - ABC is curriculum material developed by the Center for Occupational Research and Development (CORD) in Waco, Texas. ABC instructional materials, includes printed text, true story scenarios, career profiles, realistic role play situations, instructional videos, practical laboratory exercises, and vocabulary terms.

Principles of Technology (PT) - A course which holds the philosophy that knowledge is learned through application. Principles of Technology curriculums are those described, as hands-on activities and real-world scenarios (CORD, 1993). Principles of Technology courses are also known as applied physics.

Cooperative Learning- Cooperative learning is a method of teaching where students work and learn in a cooperative manner for a common goal and succeed or fail as a unit.

Oklahoma Comprehensive School - An educational center in the state of Oklahoma that offers students training in various trade skills and vocational careers by the use of applied curriculums.

Oklahoma Comprehensive School Superintendent - This title refers to public secondary school superintendents. This study was conducted with superintendents working in school districts which offer students applied science courses. The study was conducted with Oklahoma superintendents specifically.

PASS Skills - The essential mandated academic skills for all students in the state of Oklahoma as commissioned by the State Board of Education.

CHAPTER II

REVIEW OF LITERATURE

A new discipline in education has evolved, called applied science. Some believe this may be a new wave in teaching methods that will serve to better prepare students for higher education and the work force. The purpose of this study was to determine the perceptions Oklahoma comprehensive school superintendents had about applied science. A comprehensive search was initiated through the utilization of books, government documents, professional journals, and magazines to compile a representative review of literature in this area. The literature review section titles include the following: 1) Introduction, 2) Applied Science, 3) Traditional Science, 4) Superintendents' Perceptions of Applied Science, and 5) Related Research.

Introduction

The philosophy of many educational programs of today is that traditional academics alone may not be enough for students studying for the jobs of tomorrow. <u>A Nation at Risk</u> (National Commission on Excellence in Education, 1983), an educational reform report, indicated a need for a more solid foundation in academic basics. Many educational arenas are now allowing students to apply their knowledge to simulations of job-related tasks. Employers have discovered that having a cognitive knowledge of skills and technology is not the same as having performed those skills and actually applying the technical knowledge (Kolde, 1991).

A growing philosophy in education is that schools need to put more emphasis on showing students the relevance of the subject matter for which they are responsible (National Secondary Vocational Education Commission, 1984). It is important that students be able to apply what they have learned to the concepts of the jobs they may hold someday. Having knowledge pertaining to a career, and actually being able to perform skills needed for a career are two different things.

Business and industry recognize the need for workers that have received academic basics (Hamby, 1995). The fact that students will be challenging each other for competing jobs makes it necessary for schools to produce individuals that can adjust to the work force with as little on-the-job-training in the shortest amount of time. The students that can accomplish this may advance at a higher rate than the average individual.

Applied Science

Traditional methods of teaching such as lectures and step-by-step procedures may not be the acceptable style of training future employees (Beadles, 1992). Students must be taught problem solving skills to be able to apply scientific knowledge. Today's society more readily accepts the philosophy shift from essentialist to experimentalist, producing a more relevant form of education (Dobson, Dobson, and Koetting, 1985).

The philosophy that science is the quest for knowledge, not the knowledge itself (Renner, 1979) is becoming a belief many educators are trying to instill in the minds of their superintendents and school boards. Many teachers educate their superiors, by putting forth their classrooms as first hand examples. They use the resources that are available and help from the community to initiate a plan of hands-on activities to motivate students to learn by doing. Dewey (1913) used experiential learning to teach students, otherwise known as learning by doing. Teachers hope, parents and superintendents will see excited and motivated students seeking to learn, and in return, will back the applied science curriculums with monetary and moral support.

Teachers in applied science classrooms become facilitators and are not simply providers of all facts (Willis, 1993). The teacher experiments by allowing the students to participate in numerous learning experiences such as hands-on activities, manipulatives, and use of technology (Miles-Wilson, 1994). They are part of the class, not necessarily the one person that dictates what will be learned in the course. In a true applied science class the teachers become students as well and learn along with their pupils. Students help themselves to a self-taught environment directed by their teachers to the information needed to apply their knowledge in practical experiences. The Center for Occupational Research and Development (CORD) published an applied curriculum, used as a guide by many science teachers to direct students through these practical experiences. The CORD curriculum has received an excellent rating as an applied curriculum (Witkop, 1988).

Students of today don't learn just because they are told they must go to school and get an education. Children and adults question what others expect of them and need to have motivators for almost everything they do. In applied science courses, practical experience is the motivator (Raizen, 1989). It is this practical experience and motivation factor that may give students of applied science the edge over those who are taught in a traditional manner. These two aspects of applied science compliment each other. Practical experience creates motivation, which in turn creates the desire, for more practical experience. Positive learning experiences may increase self-esteem. When self-esteem is increased, students work harder toward their goals and dropout rates decrease (Musko, 1992).

Students needs are best met by courses that apply abstract concepts to real-world situations and involve them in hands-on learning (Hamby, 1995). Applied science actually takes the applied knowledge a person has and allows that person to perform activities that will give him an advantage in the work force. Applied science students should have a better understanding of their subject matter due to the hands-on approach to learning. Hands-on experiences are gained through the use of the CORD curriculum. The ABC curriculum (CORD, 1991) was developed with in-depth studies for students to gain a greater appreciation for science and technology while acquiring skills that will help them gain a better working knowledge for entry into today's work force (Hamby, 1995).

Most teachers have been taught in one field and lack a broad knowledge of scientific information (Hamby, 1995). Their teachers usually taught by lecture and demonstration only, making it difficult for them to instruct students by different methods. In order for them to utilize applied methods they must be flexible enough to implement many different styles of teaching. Outstanding teachers tend to be more diverse among their peers while ineffective teachers seem to be more alike in characteristics (Kindsvatter, 1988). Teachers find it difficult to change their normal style and sometimes meet opposition to the change from parents, superintendents, and school boards. Not only do they run into road blocks just because of their desire to change their method of delivery, but they sometimes need to attend more training workshops and run on higher budgets, which take up more time from home and work, not to mention much more money that superintendents may not be willing or able to part with.

Research indicates a positive relationship between attitude toward science and performance in science courses (Hounshell and Hill, 1989). Once an appreciation for the subject has been established, creativity on the part of the students and teacher can flow with ease (Rubin, 1985). It is human nature to do better and work harder on activities that interest us the most. The greater the enthusiasm, the greater likelihood of student success. Students begin to increase their self-esteem and work harder toward their goals and schools start to show a decrease in dropout rates (Musko, 1992). Low self-esteem and high failure rates, may cause some to give-up and dropout, while encouragement and practical applications of concepts create highly interested and successful individuals. Some of these individuals will probably become teachers someday and the idea of applied science will be utilized more and understood better.

Traditional Science

The curricula used in most traditional schools does not emphasize or suggest any application where the student might apply the specific concepts being taught (Miles-Wilson, 1994). Teacher evaluations are sometimes based on whether the teacher has control over the classroom or not. Many teachers, superintendents, and parents alike believe a classroom full of children, all in their seats, silent, and their nose to the grind stone was a perfect example of learning taking place.

Traditional science may be the best method for a controlled atmosphere. Uphoff (in Willis, 1993) stated children in the U.S., during the sixties, were to do "oodles of sit-still, pencil-and-paper work" due to the launch of the Russian's Sputnik. The teacher usually had constant control of the classroom by lecturing, demonstrations, book work, and seat activities and was most concerned with disseminating subject matter (Hamby, 1995). Any student who strayed outside of what the teacher had planned for them to learn that day was deemed a trouble maker and dealt with accordingly. What was to be learned in the course had already been predetermined, or "by the book" (Barton, 1990), and there was no room for experimentation or spontaneous learning. Most traditional style teachers feel a loss of control when students challenge the curriculum for new and additional information. These teachers become frustrated when their students want to put their hands on something that was designated for demonstration or display purposes only. Pedrotti (1992) stated that student needs cannot be satisfied by requiring them to earn more traditional course credits.

Traditional science teachers like students to learn by rote memory (Hamby, 1995). Students are taught abstract concepts, which sometimes confuse them and sometimes make the teacher look as if they are the only intelligent ones in the classroom. It is fearful for a teacher to have a student that may be smarter. They only allow self-contained examples, that do not permit spontaneous ideas to arise.

Teachers do not understand the difference between teaching science as a reading and lecturing course and the real understanding that comes from hands-on experiences with scientific phenomena (Hamby, 1995). Many traditional science teachers feel that if they provide students with the knowledge, they should be able to use that knowledge to obtain a job. That may be true, but once they have a job they have no practical experience to do the job. Applied classes have been popular with students and employers due to the fact that students have more involvement in learning (Goodlad, 1984) and graduate with a working knowledge of their career and already have experienced skills needed to accomplish the task within those careers.

Traditional science does not like or allow change. Teachers do not want to be Principles of Technology teachers (ODVTE, 1990). Those teaching traditional science, do not like to place themselves in situations where they have to admit, they don't know something or that they have to learn with their students. The teachers' personality can be damaged when they are challenged by others to learn and do new things they are not comfortable with, causing a defensive attitude and a breakdown in the teacher-students relationship. These teachers have a standoffish appearance and will not show a personal side of themselves to their students.

Public school teachers move from the students' desk to the teachers' desk with very little practical experience in between. Most absorb subject knowledge in high school and college and then pass it to their students without ever experiencing what they are teaching. Vocational technical schools are aware of this traditional background of most public educators. They like to employ individuals that are experts in their fields and place them in a classroom/lab environment. These individuals have a working knowledge of what their field is actually like but do not have a preconceived idea as to what traditional teaching is all about. Sometimes these individuals did not fit the traditional classroom themselves and know what might have motivated them to learn. Vocational technical teachers have usually worked in their field five or more years before entering their classrooms, giving them time to grow a strong, clear-minded, and independent idea of how to educate and motivate students.

Motivation is lacking from traditional science. Students in traditional science are there because they are required to be. Teachers of traditional science know the students are required to attend their classes. They present the material and the student must absorb the knowledge and abide by the rules or marked a misfit and become a dropout in society eyes. Many students drop out due to the traditional styles of teaching and those who teach in traditional classes. Later in life some school dropouts come back to education when they discover outlets that educate by applied means.

Most teachers find it hard to change midstream in their careers from traditional styles of teaching to applied styles. It may mean a gradual change in the new upcoming teachers in order to achieve a relevant education in the future.

Superintendents' Perceptions of Applied Science

Preparing students for the information age work force means re-evaluating our educational strategies (St. Armand, 1992, p.23). Superintendents must align their schools so as to be beneficial to the work force of tomorrow. Their evaluations of school programs are influenced by the perceptions they have toward teachers and teaching styles. The perceptions' superintendents have about applied science, along with the availability of resources can and will dictate the future of its existence.

Schools have been described as being "tools of society" and "tools for society" (Shepard and Ragan, 1982). Superintendents have the duty to assess schools and determine what methods, turn out successful students that become admirable employees.

It is also for these reasons that superintendents must decide what changes to education need to be made in order to better serve the community that serves it.

School superintendents' perceptions of applied science fall into one of three categories. The first category is that they believe, without reservation, that applied science is the best method of teaching. Second, there are those superintendents that believe that a combination of traditional and applied science methods compliment each other and form a better way to relay education. Third, the superintendents that find applied science methods are too costly and non-productive.

Good superintendents shouldn't care what method is the best as long as it works for their school and community. Getting academic institutions and vocational faculties to cooperate is the successful key (Coorough, 1992). They need to remember that what works for the school isn't always what is best for the community and the work force. All areas must be considered when dealing with the most effective educational methods.

There is a need to promote high quality work from both schools and businesses (Glasser, 1990). Superintendents need to find a bridge between schools and businesses that will benefit both and allow students to achieve their full potential. Superintendents' perceptions, personal and professional, affect the types of bridges used and the way they are utilized. Others, have a say in the decision making that is involved in school policies, but the majority of the decision making lies in the hands of the superintendents themselves. Good superintendents, seek out as much information as possible about all styles of teaching, and learning. When possible the information should come to them first hand through their own experiences or those of their teachers under them.

Cost is something superintendents have to consider when deciding the future of their school's curriculum. If money is no object, the decision rests on which method is truly the most effective. Money is usually a factor though, and superintendents have to deal with what they have to work with.

Businesses have expressed the concern that students should learn by doing. For many years vocational technical schools have enlisted the philosophy of John Dewey and have taught students by allowing them to learn by first hand personal experience. Applied sciences implement learning by doing. If superintendents' perceptions will determine the future of teaching styles, then it is important that they choose a method that will please the work force and find one that utilizes the Dewey philosophy of learning by doing. As mentioned above, vocational schools believe in Dewey's philosophy and have for many years. They seem to have a good record of helping students to succeed in business where as public schools with traditional ways only marked these individuals as dropout material.

Related Research

This section of the review of literature will provide an overview of the research studies, related to applied academic curricula. Specifically, four comprehensive studies relating to this research effort will be described in the following text.

A two year Iowa State University study (Dugger and Johnson, 1989) was conducted comparing students in traditional physics classes with students enrolled in Principles of Technology (Principles of Technology) curriculum courses. The Principles of Technology curriculum was developed by CORD (1991) and was designed to teach basic physics concepts by applied means. The Cord curriculum consists of fourteen different units focusing on such topics as energy, force, power, rate, resistance, and work.

The study included 675 students from fifteen Iowa school districts. The students in both traditional physics classes and Principles of Technology classes were first administered a pre-test, and upon completion of their course given a post-test.

The study revealed that the traditional physics students outscored the Principles of Technology students on the pre-test by an average of five points. This was not surprising, but one year later when the post-test was administered to both groups of students the Principles of Technology students outscored the traditional physics students by an average of 11 points. The traditional physics students gained an average of 12 points from the pre-test to the post-test, while the Principles of Technology students gained an average of 29 points. Percentage wise, the Principles of Technology students scored an average of 141 percent higher than students enrolled in traditional chemistry classes.

A similar research study was conducted at Auburn University (Baker, Wilmoth, and Lewis, 1990) comparing student's achievement in eight pilot Principles of Technology classes to those enrolled in eighteen traditional physics classes. The scope of the study encompassed 532 students with the utilization of twenty-three teachers. The traditional physics students numbered 306, while there were 226 students enrolled in Principles of Technology classes. Eight teachers made up the Principles of Technology teaching staff, with the remaining fifteen teachers instructing the traditional physics classes. The findings of the study concluded that Principles of Technology courses were equivalent to the traditional physics courses in terms of student achievement.

During a study similar to the Iowa and Auburn research done in Oklahoma by Christian (1993) no significant difference was discovered between the applied (Principles of Technology) instructional approach and the traditional methods used to teach physics. A major discovery during the study was that although there was no significant difference in the achievement levels of the two different instructional methods, there was a greater desire to enroll in science courses from students who otherwise would not have taken another class unless required to do so. Those students achieved levels equal to students enrolled in the traditional physics classes.

A fourth study done by Beadles (1992) compared traditional biology to the ABC curriculum. No significant difference was discovered in terms of student achievement or attitude while comparing the two types of curriculums. Beadles recommended that the ABC curriculum be offered as an equal alternative to traditional biology in meeting high school graduation and college entrance requirements.

Additional studies such as Key and Lee-Cooper (1994) and Christian (1998) found no significant difference in student achievement and attitude, while other studies like Miles-Wilson (1994) support the evidence of greater student achievement and attitude within their research. Still another research study by Jobe (1997), indicated the need for additional training and support of those teachers implementing applied courses as an alternative to traditional courses.

Summary

Past research has concluded that students instructed by applied methods have achievement and attitude levels at least equal to and sometimes greater than students taught by traditional methods. Research has also discovered that a certain student clientele enrolled in applied science courses would not have taken traditional physics classes otherwise and that those students received the same comparison of learning as students in traditional courses (Christian, 1993). Evidence showed and researchers recommended that applied curriculums should be offered as an alternative to traditional science (Beadles, 1992). Students are more likely to pursue higher levels of education and achieve more when their interest in subject matter is increased (Musko, 1992). Studies indicate that applied courses sometimes allow students to realize the relevance of their academic endeavors. Applied curriculums have the capability to entice more students to enroll in science and set the stage for possibly higher levels of achievement and better attitudes toward science concepts. Franz (1979) believed that students who stay interested in a subject are more likely to remain on tasks and learn more. Many researchers have found that a positive attitude toward school has a direct relationship to student achievement (Beadles, 1992).

The pitfalls of applied courses can run the gamut from higher overhead costs (ODVTE, 1990), increased resource needs, extended teacher training, not to mention some negative attitudes from parents, teachers, and superintendents that may look at it as watered down.

Superintendents' attitudes can be a major influence in deciding their school's curriculum. For this reason it is important that those superintendents fully understand the relevance of applied science curriculums. Superintendents must realize that applied science courses have the potential to enlist more students in science courses and increase achievement levels as well as interest and attitudes toward classes that they may otherwise have passed up (James, 1989).

CHAPTER III

DESIGN AND METHODOLOGY

The purpose of this study was to assess public comprehensive school superintendents' perceptions of applied science versus traditional science in Oklahoma secondary schools using phone interviews to obtain the needed data. In order to achieve the purpose of this study, the following tasks were accomplished in order to collect and analyze pertinent data:

1. Determine the population for the study.
2. Develop an instrument for data collection.
3. Gain Institutional Review Board approval of instrument.
4. Develop an effective data collection procedure.
5. Select data analysis methods.

Study Population

The population for this study consisted of 69 comprehensive public school superintendents actively employed by the state of Oklahoma during the 1997/1998 school year. A list of these superintendents' schools was obtained from the Oklahoma Department of Education in Oklahoma City, Oklahoma during March, 1998. The list consisted of three groups of schools. Group A consisted of a total of 36 schools that offered only Applied Biology/Chemistry. Group B consisted of a total of 21 schools that offered Physics/Principles of Technology courses. While Group C was comprised of 18 schools offering both Applied Biology/Chemistry and Applied Physics/Principles of Technology. Some of the larger school districts had more than one school offering applied science courses which accounted for the smaller number of superintendents than number of schools.

Development of the Instrument

In order to obtain relevant information from the Oklahoma public comprehensive school superintendents an original instrument had to be developed. During the development of the instrument, similar studies, related literature, and comparable instruments were reviewed.

During the review process the method of choice for collecting data was a telephone interview. Finley and Key (1983) compared mailed questionnaires to telephone surveys and found telephone surveys to be more economical and effective. To summarize their analysis of several telephone surveys they were found to be: more economical, more valid, highly reliable, and well suited to large or small populations.

Initially a total of twenty-one open-ended questions was developed to secure information pertaining to the three major objectives in this study. Those objectives included the perceptions of comprehensive school superintendents when comparing applied science to traditional science, the future of applied science in public schools, and how applied science enhances learning. The researcher planned an interview length of 10 to 15 minutes.

Upon completion, the instrument was approved by the Institutional Review Board (IRB) at Oklahoma State University Stillwater, Oklahoma. It was then pilot tested using several Oklahoma State University Agricultural Education Graduate Students who were not a part of this study, but did have some knowledge pertaining to applied science. Oklahoma State University Agricultural Education Faculty critiqued the instrument as well.

After the pilot test it was determined that open-ended questions would cause the length of the survey to well exceed 15 minutes and some were vague and needed to be clarified. Knowing it would be imperative to have an interesting survey in a minimal amount of time, the instrument was revised. The final draft of the instrument consisted of 18 questions. Seventeen questions were given between 3 - 5 choices to choose from, leaving the last question open-ended.

The instrument was pilot tested a second time by Oklahoma State University Professors and a superintendent that had completed a related dissertation and was found to be a more viable survey than the first. The survey took less than 10 minutes and flowed in a more natural manner. The revised instrument was resubmitted to the Oklahoma State Institutional Review Board and approved.

Institutional Review Board (IRB)

All studies involving human subjects require review and approval of all research before the actual research begins. This is required by federal regulations and Oklahoma State University policy. To protect the rights and welfare of human subjects the Oklahoma State University Office IRB conduct a review of the research. In compliance to this policy, this study received the proper surveillance was granted permission to continue, approval number AG-98-014-A (See Appendix).

Collection of the Data

The telephone interviews were implemented between April 7, 1998 to May 1, 1998, during business hours 8:00 - 5:00, Monday through Friday. The average length of the interviews were approximately five minutes. A double survey was conducted from the study population of 69 secondary school superintendents. The first survey yielded 40 participants or (57%) of the population. The second survey yielded 10 participants or (14%) more. One participant or (1%) answered the survey questions and then requested that her survey not be used in the study. The two repondent groups were compared for differences. After comparing the groups no differences were found so the two were grouped together as a whole. This created a respondent group of 49 participants or (71%) of the study population. Nineteen superintendents or (28%) did not return phone calls after messages were left with their personnel.

Analysis of the Data

The population of the study consisted of 69 comprehensive school superintendents employed by Oklahoma school districts offering Applied Biology/Chemistry, Applied Physics/Principles of Technology, or both during the school year of 1997/1998. The Oklahoma State Department of Education supplied the current list of schools participating in some form of applied science .

The list obtained from the Oklahoma Department of Education provided the name of the school and the name of the applied science offered by the school. Superintendent names and phone numbers were found in the 1997-1998 Oklahoma Superintendents' Phone Directory.

The data received from this population provided the following groups of information: superintendents' perceptions concerning applied science, the future of applied science in high schools, and whether applied science enhanced learning or not.

The survey involved 17 questions ascertaining quantitative information. One additional open-ended question yielded qualitative information (attitudes and opinions). Descriptive statistics were used in this study since the total population was surveyed. After the completion of the interviews, responses for each question were grouped and frequency scores, percentages, and means were calculated.

The interview script of the instrument provided the respondents with a short statement of the purpose of the study, an assurance of confidentiality of all the data, and allowed them to choose not to be interviewed. Verbal consent to participate in the study was obtained from the respondents. At the end of the interview, the respondents were thanked for their participation. The interview records were coded and no names appeared on them.

The superintendents' perceptions of applied science were determined through questions 1, 2, 6, 7, 8, 10, 11, 12, and 13 of the interview. Questions 1 and 2 asked what superintendents believed were the acceptance levels of their teachers and students concerning applied science. Question 6 determined the degree of satisfaction superintendents had toward applied science. Questions 7 and 8 determined the superintendents' perceptions concerning the amount of credit applied science courses should be given compared to traditional courses. Questions 10 and 11 asked superintendents what students benefitted most from applied science courses. Questions 12 and 13 asked superintendents to describe their teachers' and students' perceptions of applied science.

The future of applied science in Oklahoma high schools were determined through questions 3, 9, 16, and 17. Question 3 asked superintendents what additional training they felt teachers needed to teach applied science. Question 9 asked superintendents how applied science courses should be offered in the future. Question 16 determined, if facilities were better utilized when applied science courses taught. And question 17 compared the cost of applied science courses to the cost of traditional courses.

Questions 4, 5, 14, and 15 were concerned with the enhancement of learning through applied science courses. Question 4 compared the amount of learning taking place in an applied science course to the amount of learning taking place in a traditional science course. Question 5 asked which type of science course did students learn "PASS Skills" better. Questions 14 and 15 determined if applied science better prepared students for work and college.

Frequency scores were determined for responses from questions 1 through 17. Each question had either three, four, or five forced choice questions. The choices in questions 1, 2, 6, and 17 were given a point value for purposes of calculating and categorizing mean responses. The researcher chose to use a four-point scale for calculation purposes.

The questions with four forced choices (1, 2, and 6) were assigned the following values:

Response	Scale	Range Limits
Choice #1	4	3.50 - 4.00
Choice #2	3	2.50 - 3.49
Choice #3	2	1.50 - 2.49
Choice #4	1	1.00 - 1.49

The question with five forced choices (17) was assigned the following values:

Response	Scale	Range Limits
Choice #1	5	4.50 - 5.00
Choice #2	4	3.50 - 4.49
Choice #3	3	2.50 - 3.49
Choice #4	2	1.50 - 2.49
Choice #5	1	1.00 - 1.49

Questions 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16 calculated percentages of each forced choice.

Question 18, an open-ended question asking superintendents what they believed the future of applied science might be, was analyzed through the use of qualitative technics, categorizing responses given by respondents.

Questions 1, 2, 6, and 17 were analyzed again comparing the schools that offered ABC/PT, ABC, or PT. Each question used the same categories and were assigned the same values as when first analyzed. A mean was calculated for each type of school and then compared to each other.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The purpose of this chapter is to describe the specific information received from Oklahoma public school superintendents whose schools contain at least one or more types of applied science such as Applied Biology/Chemistry, or Physical Science sometimes referred to as Principles of Technology (PT). The information was derived from questions relating to superintendents' perceptions of applied science, their views as to its future in high schools, and if they believed applied science courses enhanced learning as compared to traditional science courses.

The data collected in this study was secured by individual phone interviews the researcher conducted with 49 participants from a study population of 69 Oklahoma public school superintendents whose school districts offered some type of applied science. For purposes of presenting the data this chapter is divided into the following sections:

- Superintendents' perceptions of applied science
- Enhancement of learning when comparing applied science courses to traditional science courses as perceived by superintendents
- The future of applied science in high schools as perceived by superintendents.
- Comparison of perceptions by types of applied science courses offered.

Superintendents' Perceptions of

Applied Science

The questionnaire contained five questions pertaining to superintendents' perceptions of applied science. Superintendents were asked to give their perceptions of the following topics:

- Teachers' acceptance of applied science
- Students' acceptance of applied science
- Teachers' perceptions of applied science
- Students' perceptions of applied science
- Superintendents' satisfaction with applied science

In Table 1 the distribution of superintendents' perceptions of teachers and students acceptance of applied science (Survey Questions 1 and 2) is recorded. The two questions had four forced choice answers and used the following response categories and point scale values to facilitate the calculation and interpretation of combined means:

Response Category	Scale	Range Limits
Excellent	4	3.50 - 4.00
Good	3	2.50 - 3.49
Fair	2	1.50 - 2.49
Poor	1	1.00 - 1.49

Superintendents' responses showed they believe teachers and students both have a "good" acceptance of applied science. Fifty-one percent of superintendents chose "good" as their choice when asked about teachers acceptance of applied science, while the overall calculated mean response figured out to be (3.31) or "good". It was notable that 41% of the superintendents that were interviewed chose "excellent" as the degree of acceptance by teachers. Only 3 superintendents or (6%) of the respondents believed the level of acceptance to be "fair". One participant or only (2%) of the overall 49 interviewees responded with "poor".

TABLE 1

SUPERINTENDENTS' PERCEPTIONS OF TEACHER AND STUDENT ACCEPTANCE OF APPLIED SCIENCE COURSES

	Excellent		Good		Fair		Poor		Total	Mean	Response
	n	%	n	%	n	%	n	%	n		
Teacher	20	41.00	25	51.00	3	5.00	1	2.00	49	3.31	Good
Student	12	24.00	30	61.00	7	14.00	0	0.00	49	3.10	Good

When asked about student acceptance of applied science (61%) of the respondents chose "good", creating an overall mean response of (3.10) or "good". Twelve interviewees or (24%) indicated "excellent" as their choice. Only (14%) of the superintendents felt students acceptance of applied science to be "fair". No superintendent chose "poor" as their response.

Superintendents' responses indicated teachers have a slightly higher level of acceptance of applied science than do students. If teachers and students, acceptance levels of applied science means are combined, they show a value of (3.21) or a response of "good".

In Figure 1 the distribution of superintendents' perceptions of teachers and students perceptions of applied science (Survey Questions 12 and 13), is recorded. Responses from superintendents for both teachers and students are shown for analysis.

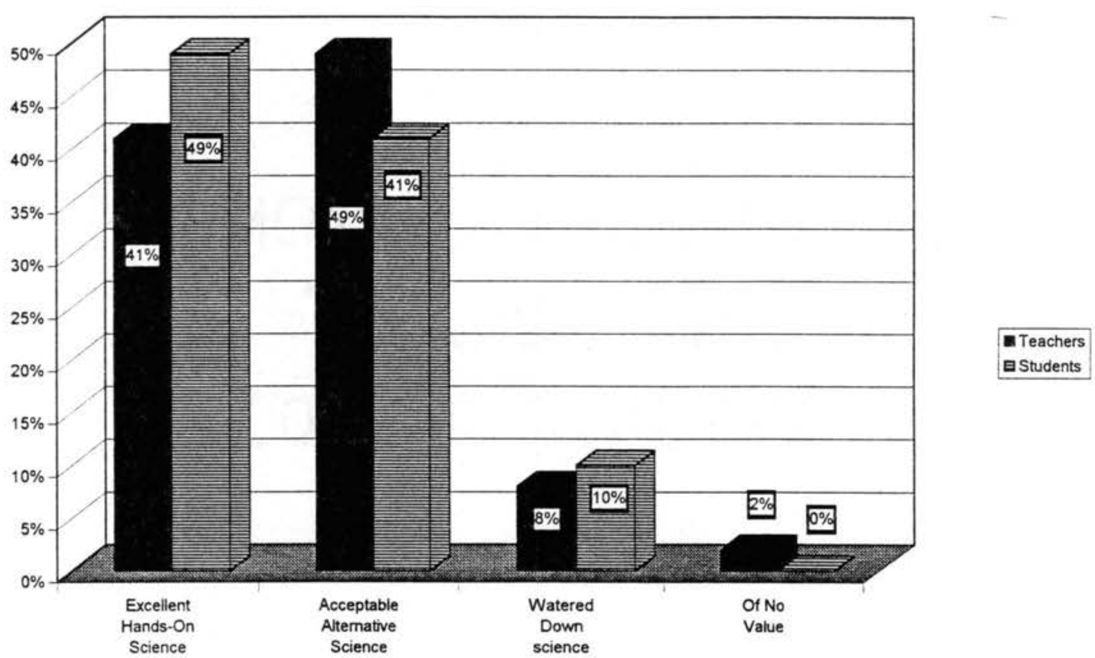

Figure 1. Superintendents' Perceptions of Teacher and Student Assessments of Applied Science

This figure shows the percentile responses of the respondents. Forty-nine percent or 24 of the 49 interviewees felt that teachers thought of applied science as being an "acceptable alternative science". Noteworthy, was the (41%) or 20 superintendents that stated teachers found applied science to be an "excellent hands-on science". Only 5 superintendents chose a lesser value with 4 or (8%) choosing "watered down science" and 1 or (2%) picking "of no value".

The figure also indicates that (49%) or 24 superintendents felt students thought of applied science as being an "excellent hands-on science". Coming in second, 20 respondents or (41%) chose "acceptable alternative science" as their response. Ten-percent or only 5 superintendents stated students perceptions of applied science would be considered "watered down science". No administrator said applied science might be considered "of no value" by students.

Table 2 was designed to report on the level of satisfaction superintendents had toward applied science (Survey Question 6). The question had four forced choice answers and used the following response categories and point scale values to facilitate the calculation and interpretation of combined means:

Response Category	Scale	Range Limits
Very Satisfied	4	3.50 - 4.00
Somewhat Satisfied	3	2.50 - 3.49
Somewhat Dissatisfied	2	1.50 - 2.49
Very Dissatisfied	1	1.00 - 1.49

Superintendents' responses showed (53%) or 26 of them were "very satisfied". Close behind 21 superintendents or (42%) were found to be "somewhat satisfied", leaving only (4%) or 2 respondents "somewhat dissatisfied". None of the superintendents chose "very dissatisfied". The combined calculated mean was discovered to be (3.49) or "somewhat satisfied".

TABLE 2

SUPERINTENDENTS' SATISFACTION WITH APPLIED SCIENCE COURSES

Very Satisfied		Somewhat Satisfied		Somewhat Dissatisfied		Very Dissatisfied		Total	Mean	Response
n	%	n	%	n	%	n	%	n		
26	53.00	21	42.00	2	4.00	0	0.00	49	3.49	Somewhat Satisfied

Enhancement of Learning by Applied Science

The questionnaire contained six questions pertaining to superintendents' perceptions of the enhancement of learning through the use of applied science courses compared to traditional science courses. Superintendents were asked to give their perceptions of the following topics:

-What students benefit from applied science courses

-In which course do students learn more

-What course better prepares students

In Figure 2 the distribution of superintendents' perceptions of what students benefit most, college bound or non-college bound, from applied science courses (Survey Question 10), is recorded.

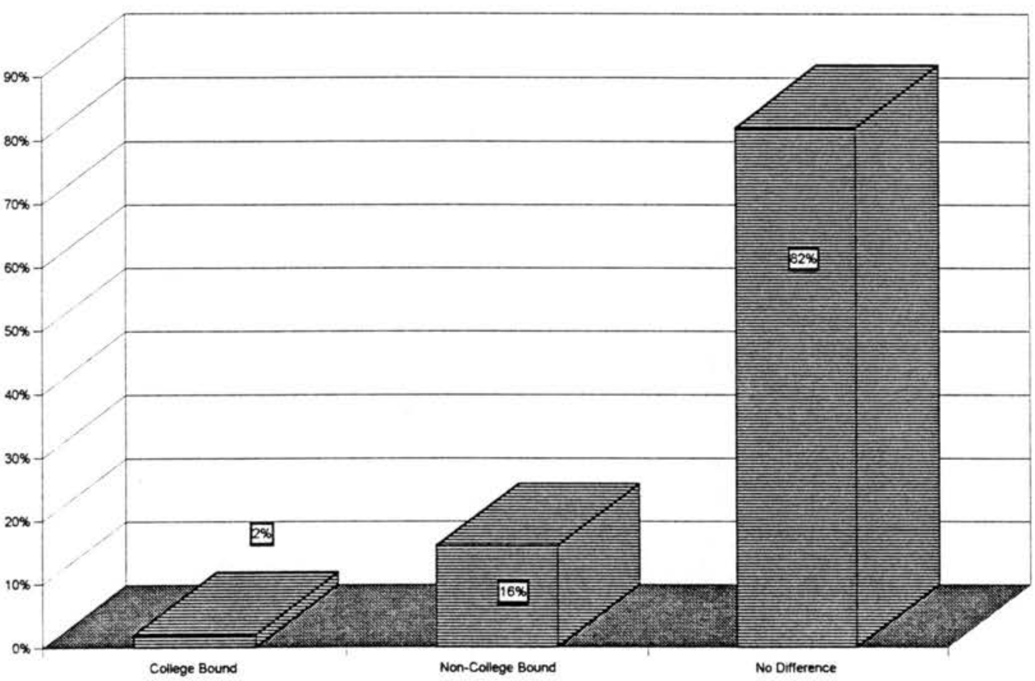

Figure 2. Superintendents' Perceptions as to What Type of Students Benefit From Applied Science

When asked what students benefit most from applied science courses, 40 superintendents or (82%) stated that there is "no difference" between "college bound" students or "non-college bound" students when benefitting from the course. Only 8 superintendents or (16%) believed "non-college bound" students would benefit most from applied science courses. Only one of the respondents or (2%) felt that "college bound" students benefit from applied science courses.

In Figure 3 the distribution of superintendents' perceptions of what students benefit most, more-motivated or less-motivated, from applied science courses (Survey Question 11), is recorded.

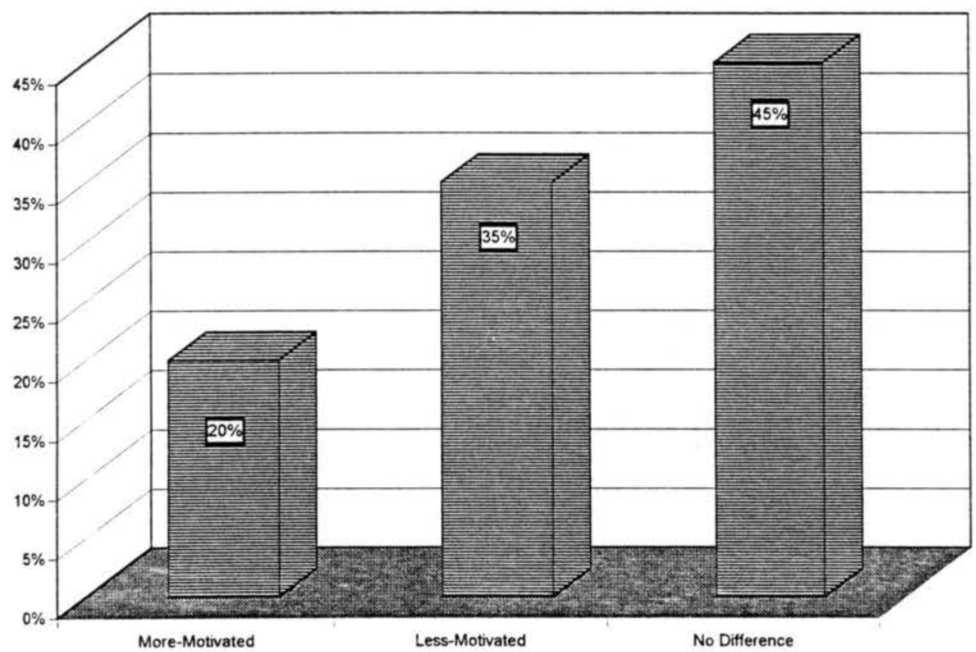

Figure 3. Superintendents' Perceptions as to What Motivated Students to Benefit From Applied Science

When asked what students benefit most from applied science courses, 22 superintendents or (45%) stated that there is "no difference" between "more-motivated"students or "less-motivated" students when benefitting from the course. Seventeen superintendents or (35%) believed "less-motivated" students benefit most from applied science courses, while 10 respondents or (20%) felt the "more-motivated" students are the ones that benefit most.

In Figure 4 the distribution of superintendents' perceptions, of what course students learn more in (Survey Questions 4 and 5) is recorded. Responses from superintendents concerning both concepts and "PASS Skills" are shown for analysis.

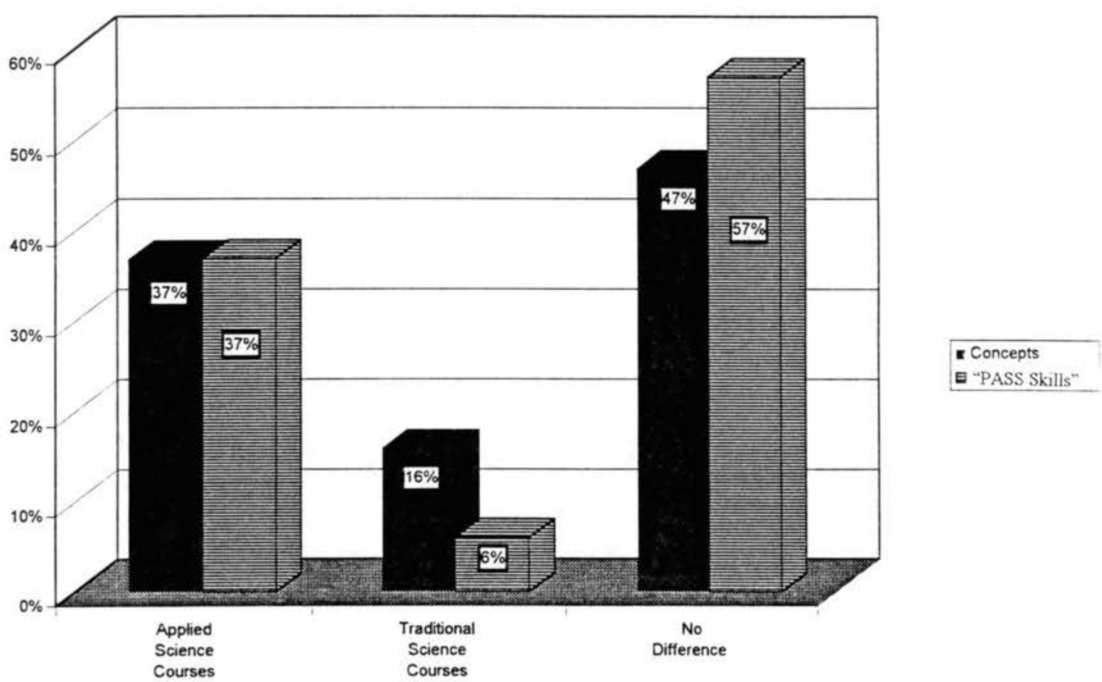

Figure 4. Superintendents' Perceptions as to What Course Students Learn More In

When asked to compare applied science courses to traditional science courses and determine in which course students learn more scientific concepts , 23 superintendents or (47%) of those interviewed said there was "no difference" in which course students took. Eighteen superintendents or (37%), believed students learned more in "applied science courses" rather than "traditional science courses", while the remaining 8 respondents or (16%) stated "traditional science courses" were the most effective learning environments for all students.

When asked to compare applied science courses to traditional science courses and determine which course students learn more "PASS Skills" in, 28 superintendents or (57%) of those interviewed said there was "no difference" in which course students took. Eighteen superintendents or (37%), believed students learned more "PASS Skills" in "applied science courses" rather than "traditional science courses", while the remaining 3 respondents or (6%) stated "traditional science courses" were the most effective learning environments for all students.

Overall, the majority of superintendents felt there was "no difference" when comparing traditional science courses to applied science courses when determining the amounts, of scientific concepts, or "PASS Skills" learned.

In Figure 5 the distribution of superintendents' perceptions of what course better prepares students (Survey Questions 14 and 15), is recorded. Questions concerning both college students and work employees are shown in the figure for analysis.

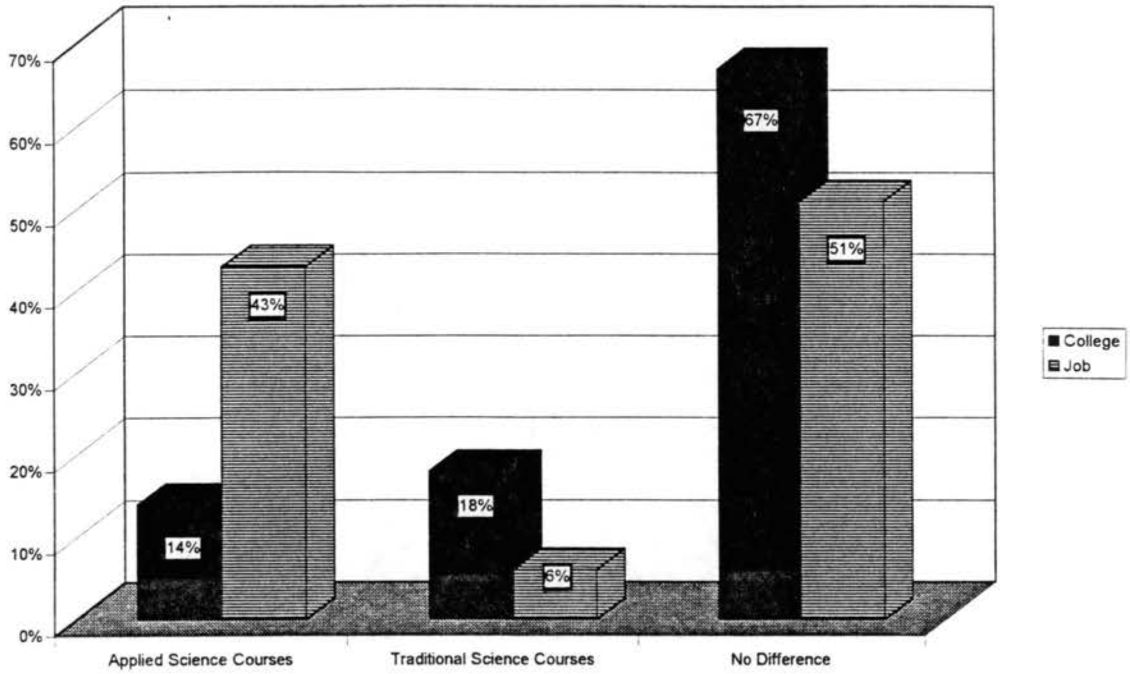

Figure 5. Superintendents' Perceptions as to What Course Better Prepares Students

When asked what course, applied science or traditional science, better prepares students for college, 33 superintendents or (67%) stated there was "no difference". "Traditional science courses" came in second with 9 superintendents or (18%) making it their choice, while 7 superintendents or (14%) felt "applied science courses" better prepare students for college.

When asked what course, applied science or traditional science, better prepares students for a job, 25 superintendents or (51%) stated there was "no difference". "Applied science courses" came in second with 21 superintendents or (43%) making it their choice, while 3 superintendents or (6%) felt "traditional science courses" better prepare students for a job.

Overall, the majority of superintendents felt there was "no difference" when comparing traditional science courses to applied science courses when determining what course better prepares students for college or a job.

The Future of Applied Science

The questionnaire contained seven questions pertaining to superintendents' perceptions as to the future of applied science. Superintendents were asked to give their perceptions of the following topics:

- Cost of Applied Science Courses Compared to Traditional Science Courses
- Additional Training Applied Science Teachers Need
- Amount of Credit Assigned to Applied Science Courses
- What Courses Utilize Facilities Better
- How Should Applied Science Courses be Offered in the Future?
- What is the future of high school applied science courses?

In Table 3 the distribution of superintendents' perceptions of the cost of applied science courses compared to the cost of traditional science courses (Survey Question 17) is recorded. The question had five forced choice answers and used the following response categories and point scale values to facilitate the calculation and interpretation of combined means:

Response Category	Scale	Range Limits
Much Greater	5	4.50 - 5.00
Somewhat Greater	4	3.50 - 4.49
About The Same	3	2.50 - 3.49
Somewhat Less	2	1.50 - 2.49
Much Less	1	1.00 - 1.49

TABLE 3

SUPERINTENDENTS' PERCEPTIONS OF THE COST OF APPLIED SCIENCE COURSES COMPARED TO THE COST OF TRADITIONAL SCIENCE COURSES

Much Greater		Somewhat Greater		About The Same		Somewhat Less		Much Less		Total	Mean	Response
n	%	n	%	n	%	n	%	n	%	n		
0	0.00	20	41.00	28	57.00	1	2.00	0	0.00	49	3.39	Somewhat Greater

Superintendents' responses showed that (57%) or 28 of them believed the cost of an applied science course to be "about the same" as the cost of a traditional science course. Twenty or (41%) of the superintendents interviewed felt applied science courses cost was "somewhat greater", while only 1 superintendent or (2%) stated the cost was "somewhat less". No respondents chose "much greater" or "much less". The overall calculated mean response figured out to be (3.39) or "somewhat greater".

In Figure 6 the distribution of superintendents' perceptions of additional training needed by teachers who teach applied science courses (Survey Question 3), is recorded. This Figure shows the percentile responses of the respondents. Twenty-four superintendents or (49%) stated the additional training needed by teachers to teach applied science should be presented in the form of a "seminar". Eleven superintendents or (22%) believed the additional training should be a "college course" and another 10 superintendents or (20%) felt it should be made available as a "staff development program". The remaining 4 superintendents or (8%) chose "other" as their response.

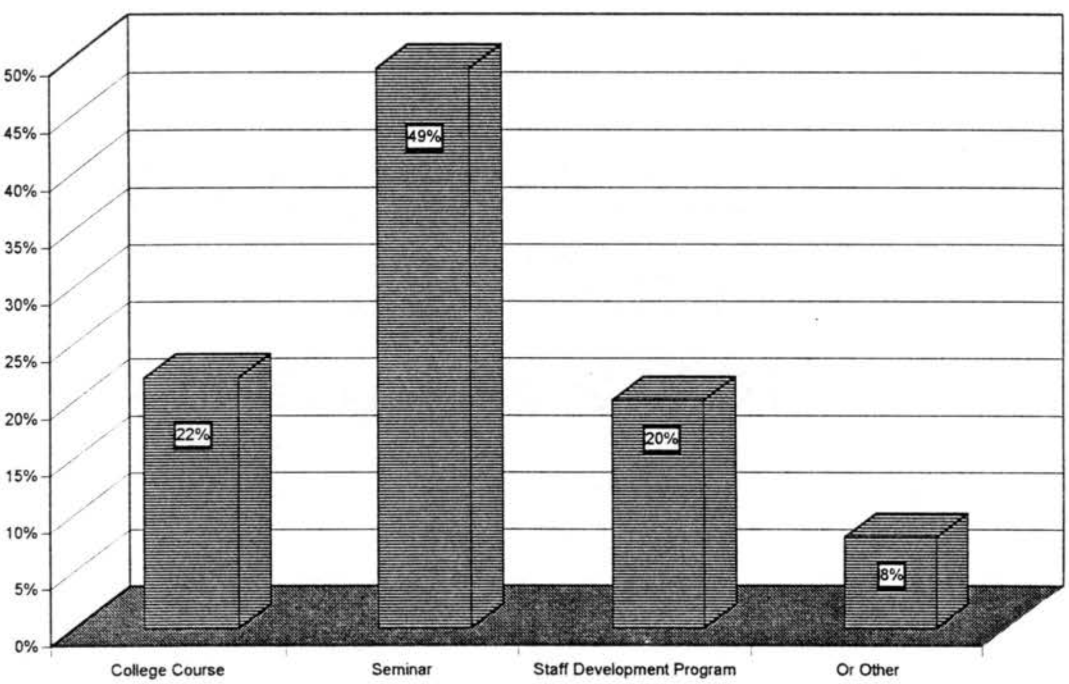

Figure 6. Superintendents' Perceptions of What Additional Teacher Training is Needed

In Figure 7 the distribution of superintendents' perceptions of the amount of credit an applied science course should be assigned when concerned with high school graduation requirements and college entrance requirements (Survey Questions 7 and 8), is recorded. This figure gives the percentile responses of the respondents and shows both categories for analysis. All 49 respondents or (100%) stated the need for applied science courses to receive credit "the same as traditional science courses (full credit)" when fulfilling high school graduation requirements. "Partial credit" and "no credit" was not considered a choice by any participates.

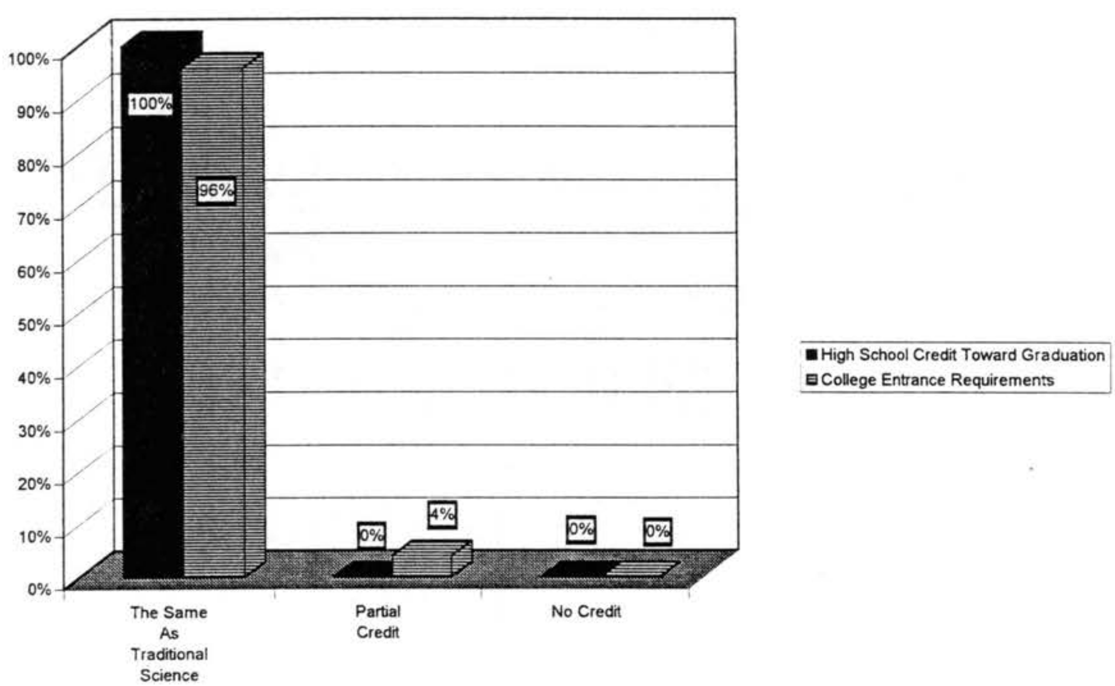

Figure 7. Superintendents' Perceptions of Applied Science Credit

When superintendents were asked what amount of credit applied science courses should be given when formulating college entrance requirements, an outstanding majority of 47 superintendents or (96%) said students should receive credit "the same as traditional science courses (full credit)". Only 2 superintendents or (4%) wanted students to receive "partial credit" for applied science courses, while no respondent, chose "no credit".

In Figure 8 the distribution of superintendents' perceptions of the use of facilities in applied science courses compared to the use of facilities in traditional science courses (Survey Question 16), is recorded. Thirty respondents or (61%) felt there was "no difference" in the use of facilities in applied science courses compared to traditional science courses. Sixteen superintendents or (33%) stated "applied science courses" utilized facilities better than traditional science courses, leaving the remaining 3 superintendents or (6%) choosing "traditional science courses" as making the best use of facilities.

In Figure 9 the distribution of superintendents' perceptions of how applied science courses should be offered in the future (Survey Question 9), is recorded. Twenty-three superintendents or (47%) felt applied science courses should be offered as an "alternative class for all students". Seventeen superintendents, or (35%) wanted applied science to be offered as an "elective class" for whatever students that desire to enroll in it. Eight superintendents or (16%) believed applied science should be a "required science class for non-college bound students", while only 1 respondent or (2%) felt it should not be offered, by choosing "not at all".

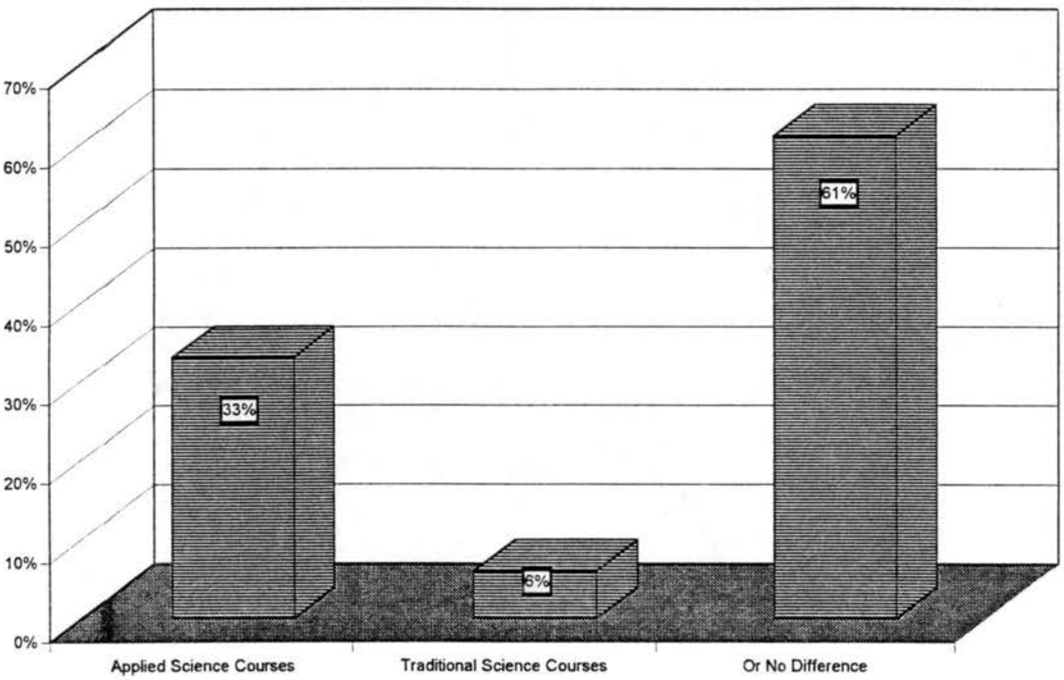

Figure 8. Superintendents' Perceptions of Faculty Utilization

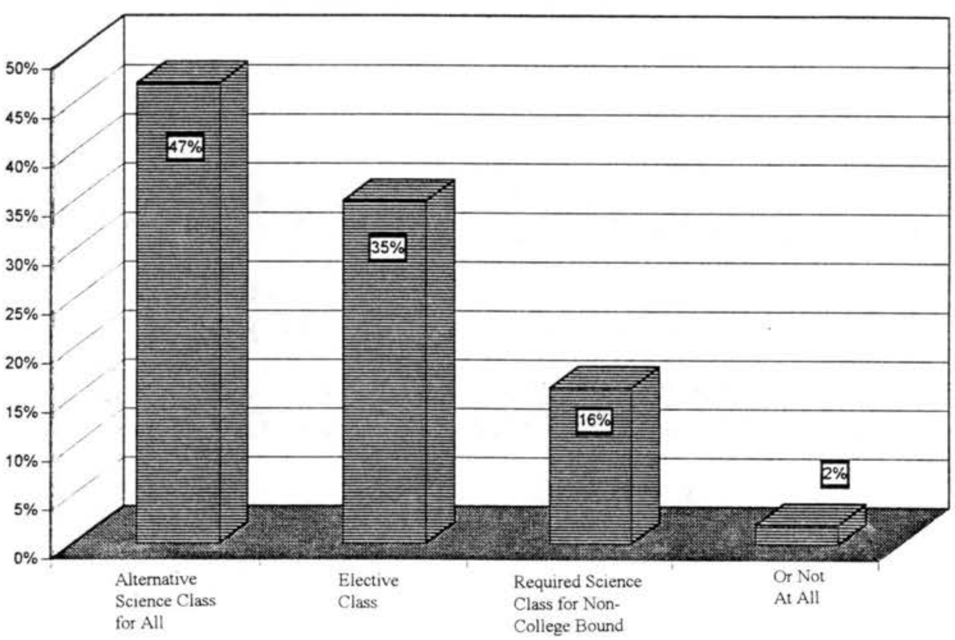

Figure 9. Superintendents' Perceptions as to How Applied Science Courses Should be Offered

All superintendents were asked to give their opinion on the future of applied science in high schools (Survey Question 18). The opened ended question yielded many responses. All "like" responses were grouped for examination. The researcher grouped the responses into four categories. The responses were grouped according to the level of future they indicated. The categories were defined as "excellent future," "good future," "future", and "no future."

The following distribution indicates the percent of total responses, not necessarily one response per superintendent. Out of 57 responses 22 or (39%) of them indicated they believed applied science courses had an "excellent future". Nineteen responses or (33%) indicated a "good future". Fifteen responses or (26%) showed a "future" for applied science courses. Only 1 response or (8%) gave the impression there was "no future" for applied science courses in high schools.

Comparison of Perceptions by Types of Applied Science Courses Offered

Table 4 was designed to report superintendents' perceptions of teacher acceptance of applied science courses (Survey Question 1) by types of applied science courses offered. The question had four forced choice answers and used the following response categories and point scale values to facilitate the calculation and interpretation of combined means:

Response Category	Scale	Range Limits
Excellent	4	3.50 - 4.00
Good	3	2.50 - 3.49
Fair	2	1.50 - 2.49
Poor	1	1.00 - 1.49

Superintendents' responses showed the following combined means: superintendents whose schools offer both ABC and PT indicated a (3.22) or "good" response, superintendents whose schools offer ABC indicated a (3.26) or "good" response, while superintendents whose schools offer PT indicated a (3.41) or "good" response.

TABLE 4

SUPERINTENDENTS' PERCEPTIONS OF TEACHER ACCEPTANCE OF APPLIED SCIENCE COURSES

School Offering	Excellent		Good		Fair		Poor		Total	Mean	Response
	n	%	n	%	n	%	n	%	n		
ABC/PT	4	44	3	33	2	22	0	0	9	3.22	Good
ABC	9	39	12	52	1	4	1	4	23	3.26	Good
PT	7	41	10	59	0	0	0	0	17	3.41	Good

Table 5 was designed to report superintendents' perceptions of student acceptance of applied science courses (Survey Question 2) by types of applied science courses offered. The question had four forced choice answers and used the following response categories and point scale values to facilitate the calculation and interpretation of combined means:

Response Category	Scale	Range Limits
Excellent	4	3.50 - 4.00
Good	3	2.50 - 3.49
Fair	2	1.50 - 2.49
Poor	1	1.00 - 1.49

Superintendents' responses showed the following combined means: superintendents whose schools offer both ABC and PT indicated a (2.88) or "good" response, superintendents whose schools offer ABC indicated a (3.08) or "good" response, while superintendents whose schools offer PT indicated a (3.23) or "good response".

TABLE 5

SUPERINTENDENTS' PERCEPTIONS OF STUDENT ACCEPTANCE OF APPLIED SCIENCE COURSES

School Offering	Excellent		Good		Fair		Poor		Total	Mean	Response
	n	%	n	%	n	%	n	%	n		
ABC/PT	0	0	8	89	1	11	0	0	9	2.88	Good
ABC	7	30	11	48	5	22	0	0	23	3.08	Good
PT	5	29	11	64	1	6	0	0	17	3.23	Good

Table 6 was designed to report superintendents' satisfaction with applied science (Survey Question 6) by types of applied science courses offered. The question had four forced choice answers and used the following response categories and point scale values to facilitate the calculation and interpretation of combined means:

Response Category	Scale	Range Limits
Vert Satisfied	4	3.50 - 4.00
Somewhat Satisfied	3	2.50 - 3.49
Somewhat Dissatisfied	2	1.50 - 2.49
Very Dissatisfied	1	1.00 - 1.49

Superintendents' responses showed the following combined means: superintendents whose schools offer both ABC and PT indicated a (3.77) or "very satisfied" response, superintendents whose schools offer ABC indicated a (3.39) or "somewhat satisfied" response, while superintendents whose schools offer PT indicated a (3.47) or "somewhat satisfied" response.

TABLE 6

SUPERINTENDENTS' SATISFACTION WITH APPLIED SCIENCE

School Offering	Very Satisfied		Somewhat Satisfied		Somewhat Dissatisfied		Very Dissatisfied		Total	Mean	Response
	n	%	n	%	n	%	n	%	n		
ABC/PT	7	78	2	22	0	0	0	0	9	3.77	Very Satisfied
ABC	10	43	12	52	1	4	0	0	23	3.39	Somewhat Satisfied
PT	9	53	7	41	1	6	0	0	17	3.47	Somewhat Satisfied

Table 7 was designed to report superintendents' perceptions of the cost of applied science courses compared to the cost of traditional science courses (Survey Question 17) by types of applied science courses offered. The question had five forced choice answers and used the following response categories and point scale values to facilitate the calculation and interpretation of combined means:

Response Category	Scale	Range Limits
Much Greater	5	4.50 - 5.00
Somewhat Greater	4	3.50 - 4.49
About the Same	3	2.50 - 3.49
Somewhat Less	2	1.05 - 2.49
Much Less	1	1.00- 1.49

Superintendents' responses showed the following combined means: superintendents whose schools offer both ABC and PT indicated a (3.33) or "about the same" response, superintendents whose schools offer ABC indicated a (3.39) or "about the same" response, while superintendents whose schools offer PT indicated a (3.41) or "about the same" response.

TABLE 7

SUPERINTENDENTS' PERCEPTIONS OF THE COSTS OF APPLIED SCIENCE COURSES COMPARED TO THE COST OF TRADITIONAL SCIENCE COURSES

School Offering	Much Greater		Some-what Greater		About the Same		Some-what Less		Much Less		Total	Mean	Response
	n	%	n	%	n	%	n	%	n	%			
ABC/PT	0	0	3	33	6	67	0	0	0	0	9	3.33	About the Same
ABC	0	0	10	43	12	28	1	4	0	0	23	3.39	About the same
PT	0	0	7	41	10	59	0	0	0	0	17	3.41	About the same

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this chapter is to present a summary of the study based on the data analysis related to the purpose and objectives. Based on the findings of the data analysis, conclusions and recommendations are presented.

Summary

Purpose of the Study

The purpose of this study was to gather specific information from Oklahoma Public School Superintendents perceptions when applied science courses such as Applied Biology/Chemistry and Applied Physics (PT) are compared to traditional science courses such as Biology, Chemistry, and Physics.

Objectives of the Study

The objectives of the study were as follows:

1. To determine the perceptions of comprehensive school superintendents in Oklahoma toward applied science courses verses traditional science courses.

2. To determine the perceptions of Oklahoma comprehensive school superintendents toward the incorporation of applied science curriculums as a way to enhance learning.

3. To describe the future use of applied science in Oklahoma secondary public schools as perceived by school superintendents.

4. To compare perceptions of comprehensive school superintendents by types of applied science courses offered in their schools.

Design and Conduct of the Study

Following a review of literature and research related to the study, procedures were established to satisfy the purpose and objectives of the study. The study population consisted of 69 Oklahoma Public School Superintendents actively employed by the state of Oklahoma during the 1997/1998 school year and whose schools offered some form of applied science such as Applied Biology/Chemistry or Physics. After careful development of an instrument (see Appendix) the data was obtained through phone interviews. Forty-nine superintendents (71% of the study population) participated in the study. The total number of responses was equal for each question because respondents answered all questions. For data analysis, descriptive statistics were used since the total population was surveyed.

Major Findings of the Study

Superintendents' Perceptions of Applied Science

1. More than half of the superintendents perceived teachers and students as having a good acceptance of applied science courses.

2. Almost half of the superintendents believe students think of applied science courses as excellent hands-on science. The same amount feel teachers think of applied science courses as acceptable alternative science. Very few find it to be less than acceptable.

3. Over half of the superintendents directly chose "very satisfied" with applied science courses as their response.

Enhancement of Learning by Applied Science

4. An overwhelming majority of superintendents believe there is no difference as to who benefits most from applied science courses, college bound students or non-college bound students.

5. A large percent of superintendents feel there is no difference as to who benefits most from applied science courses, more-motivated students or less-motivated students. A percentage of superintendents almost as high believe the less-motivated students benefit the most. Some felt that the more-motivated students will always benefit more because they always try harder.

6. Almost half of the superintendents felt there was no difference as to which course enhances the learning of scientific concepts. More than a third of the population

saw applied science courses as enhancing the learning of scientific concepts better than traditional science courses. And only a small group of superintendents, felt traditional science courses are better at enhancing the learning of scientific concepts than applied science courses.

7. Over half of the superintendents believed there is no difference as to which course enhances the learning of "PASS Skills". More than a third of the population saw applied science courses as enhancing the learning of "PASS Skills" better than traditional science courses. A very few superintendents felt traditional science courses are better at enhancing the learning of "PASS Skills."

8. A large majority of superintendents believe there is no difference as to which course prepares students better for college. Almost a fifth of the population saw traditional science courses as preparing students better for college. A small amount of superintendents, believed applied science courses prepared students better for college than applied science courses.

9. Over half of the superintendents believe there is no difference as to which course prepares students better for a job. Slightly below the majority, a large percentage of superintendents feel applied science courses prepare students better for a job than traditional science courses. Very few superintendents believe traditional science courses prepare students better for a job than applied science courses.

<u>The Future of Applied Science</u>

10. A large percent of the superintendents perceive the cost of applied science courses to be somewhat greater than traditional science courses. More than half of the

superintendents think the cost is about the same, but almost none find it to be any way less costly than traditional science courses.

11. Almost half of the superintendents want the additional training teachers need to present applied science courses to come in the form of a seminar. Slightly more than a fifth of the population thinks it should be more like a college course, while another fifth wants it to be less, such as a staff development program.

12. All superintendents indicated they feel applied science courses should receive full credit toward high school graduation, the same as traditional science courses.

13. Almost all superintendents feel applied science courses should receive full credit toward college entrance requirements, the same as traditional science courses.

14. Well over half of the superintendents believe there is no difference as to which course utilizes facilities better. A third of the population feel applied science courses utilize facilities better than traditional science courses, while only a very few superintendents feel traditional science courses better utilize facilities more than applied science courses.

15. Almost half of the superintendents believed applied science courses should be offered as an alternative science class for all students. Slightly more than a third of the population want it as an elective class. A few superintendents would like to see it required for all non-college bound students.

16. All but one superintendent indicated they believed there is a future for applied science courses in secondary schools.

Comparison of Perceptions by Types of Applied

Science Courses Offered

17. Almost all of the superintendents whose schools offer applied science courses felt teachers have at least a "good" acceptance of applied science. The superintendents whose schools offer PT feel teachers have a "good" acceptance of applied science. Mean ratings of superintendents' perceptions of teachers' acceptance were greatest for schools offering PT only, then ABC only, with ABC/PT being slightly lower. The range between means was very small, .19.

18. Over three-fourth of the superintendents whose schools offer both applied science courses felt students have at least a "good" acceptance of applied science. Again, mean ratings of superintendents' perceptions of students' acceptance were greatest for schools offering PT only, then ABC only, with ABC/PT being lower. The range between means was slightly larger, .35.

19. The mean rating for superintendents whose schools offer both ABC and PT was "very satisfied" with applied science. The mean ratings for superintendents whose schools offer only ABC or only PT were "somewhat satisfied" with applied science. The range between means was slightly larger, .37.

20. A majority of superintendents whose schools offer applied science courses felt the cost of applied science courses are "about the same" as the cost of traditional science courses. Mean ratings of perceptions of superintendents for schools offering only PT or only ABC were almost identical, while the ABC/PT mean was slightly lower, with a range of only .08.

Conclusions

Based on careful analysis of the data and findings, the following conclusions were formulated.

Superintendents' Perceptions of Applied Science

1. In general, superintendents perceive teachers and students as having a good acceptance of applied science.

2. Superintendents believe students think of applied science courses as excellent hands-on science and that teachers think of them as an acceptable alternative science.

3. Superintendents are satisfied with applied science courses.

Enhancements of Learning by Applied Science

4. Superintendents believe there is no difference as to whom benefits most from applied science courses, college bound students or non-college bound students.

5. Superintendents believe there is no difference as to whom benefits most from applied science courses, more-motivated students or less-motivated students.

6. Superintendents believe there is no difference as to which course, applied science or traditional science, enhances the learning of scientific concepts better.

7. Superintendents believe there is no difference as to which course, applied science or traditional science, enhances the learning of "PASS Skills" better.

8. Superintendents believe there is no difference as to which course, applied science or traditional science, prepares students better for college.

9. Superintendents believe there is no difference as to which course, applied science or traditional science, prepares students better for a job.

The Future of Applied Science

10. Superintendents believe the cost of applied science courses to be somewhat greater than traditional science courses.

11. Superintendents believe additional training that teachers need to teach applied science courses should be presented in the form of a seminar.

12. All superintendents believe applied science courses should receive full credit toward high school graduation, the same as traditional science courses.

13. Superintendents believe applied science courses should receive full credit toward college entrance requirements, the same as traditional science courses.

14. Superintendents believe there is no difference as to which course, applied science or traditional science, utilizes facilities better.

15. Superintendents believe applied science courses should be offered as an alternative science class for all students.

16. All but one superintendent indicated they believed there is a future for applied science courses in secondary schools.

Comparisons of Perceptions by Types of Applied Science Courses Offered

17. There is no notable difference in teachers' acceptance of applied science courses by superintendents whose schools offer ABC, PT, or both.

18. There is no notable difference in students' acceptance of applied science courses by superintendents whose schools offer ABC, PT, or both.

19. There is no notable difference in satisfaction with applied science courses by superintendents whose schools offer ABC or PT or both.

20. Superintendents whose schools offer ABC, PT, or both believe the cost of applied science courses are about the same as traditional science courses.

Recommendations

Resulting from the conclusions based on the analysis of the data and findings, the following recommendations were made.

Superintendents' Perceptions of Applied Science

1. Since superintendents perceived teachers and students as having a good acceptance of applied science courses, it is recommended that all public schools not only offer traditional science courses, but applied science courses as well.

2. Since almost half of the superintendents believe students think of applied science courses as excellent hands-on science and the same amount feel teachers think of it

as an acceptable alternative science, it is recommended that applied science courses be offered in public schools as an alternative to traditional science courses.

3. Since a large percentage of superintendents are satisfied with applied science courses, it is recommended that programs be developed to educate and entice other superintendents to add applied sciences to the list of curriculums taught at their schools.

Enhancement of Learning by Applied Science

4. Since an overwhelming majority of superintendents believe there is no difference as to whom benefits most from applied science courses, college bound students or non-college bound students, it is recommended that applied science courses be offered to both.

5. Since almost half of the superintendents feel there is no difference as to whom benefits most from applied science courses, more-motivated students or less-motivated students, it is recommended that applied science courses be offered to both.

6. Since almost half of the superintendents felt there was no difference as to which course enhances the learning of scientific concepts better, and more than a third felt applied science courses enhance scientific concepts more than traditional science courses, it is recommended that both courses be offered for students to choose from.

7. Since over half of the superintendents believe there is no difference as to which course enhances the learning of "PASS Skills" better, it is recommended that both courses be offered for students to choose from.

8. Since well over half of the superintendents believe there is no difference as to which course prepares students better for college, it is recommended that schools allow college bound students to choose applied science courses to fulfill their graduation requirements if they choose to do so.

9. Since more than half of the superintendents believe there is no difference as to which course prepares students better for a job, it is recommended that students who will seek out a job rather than go to college be offered both applied science courses and traditional science courses. Furthermore, since slightly less than half of the superintendents, feel applied science courses prepare students better for a job, it is also recommended that when a student is in doubt which class to take, teachers should recommend applied science courses.

The Future of Applied Science

10. Since more than half of the superintendents perceive the cost of an applied science course to be somewhat greater than a traditional science course, it is recommended that the cost of the course not play a large role as to whether it is offered or not, but rather if students benefit from the course.

11. Since the majority of superintendents believe the additional training needed by teachers to teach applied science courses should be offered in the form of a seminar, it is recommended that colleges and universities offer applied science training courses for teachers in a seminar format.

12. Since all superintendents feel applied science courses should receive full credit toward graduation, the same as traditional science courses, it is recommended that all schools give students of applied science courses full credit toward graduation.

13. Since almost all superintendents feel applied science courses should receive full credit toward college entrance requirements, the same as traditional science courses, it is recommended that all colleges and universities accept applied science courses the same as traditional science courses and give students of applied science courses full credit, toward college entrance requirements.

14. Since over half of the superintendents believed there is no difference as to which course utilizes facilities better, it is recommended that the use of facilities not play a role as to whether a school offers applied science courses or not.

15. Since almost half of the superintendents believe applied science courses should be offered as an alternative science class for all students and furthermore since more than a third believe it should be an elective class, it is recommended that applied science courses be offered in the future as either an alternative science course or elective course for all students.

16. Since a large percent of superintendents believe applied science courses have a good future, it is recommended that all school districts look into offering applied science courses in the near future if they do not have them in place already.

Comparison of Perceptions by Types of Applied

Science Courses Offered

17. Since superintendents whose schools offer ABC, PT, or both perceive teachers as having a good acceptance of applied science courses, it is recommended that all public schools not only offer traditional science courses, but applied science courses as well.

18. Since superintendents whose schools offer ABC, PT, or both perceive students as having a good acceptance of applied science courses, it is recommended that all public schools not only offer traditional science courses, but applied science courses as well.

19. Since superintendents whose schools offer ABC, PT or both are satisfied with applied science courses, it is recommended that programs be developed in education to entice schools not already offering some form of applied science to do so.

20. Since superintendents whose schools offer ABC, PT, or both perceive the cost of applied science courses as being about the same as traditional science courses, it is recommended that cost not be a major factor when deciding whether it is offered or not but rather if students benefit from the course.

21. It is further recommended that research be conducted to determine the perceptions that principals, teachers, and students have toward applied science courses.

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APPENDIXES

APPENDIX A

PHONE INTERVIEW INTRODUCTION SCRIPT

Hello, this is Stan Horn with Oklahoma State University, may I speak with Mrs./Mr.________.

Thank you.

Hello, my name is Stan Horn, and I am a graduate student at Oklahoma State University. I am working on a research study concerning Oklahoma administrators' perceptions of "Applied Science" such as Applications in Biology/Chemistry or Physics, sometimes known as Principles of Technology. The purpose of my study is to learn more about the value of these courses and how they can enhance student learning. This should take less than fifteen minutes. Would it be convenient to ask you a few questions now? If not when would be a more convenient time?

Thank you.

All information will be reported in the aggregate and no information will be identified with individuals or schools. All information will be anonymous and at the end of the study destroyed. If for any reason you may have a question or would like more information about my study, you may contact me at 405-324-5630, or Gay Clarkson, IRB Executive Secretary, Oklahoma State University, 405-744-5700.

APPENDIX B

INSTRUMENT

OKLAHOMA ADMINISTRATORS' PERCEPTIONS OF APPLIED SCIENCE

1. How would you describe your teachers' acceptance of applied science courses ...

Excellent	(1)
Good	(2)
Fair	(3)
Poor	(4)

2. How would you describe your students' acceptance of applied science courses ...

Excellent	(1)
Good	(2)
Fair	(3)
Poor	(4)

3. The additional training your teachers need to teach applied science courses should be equivalent to a ...

College course,	(1)
Seminar,	(2)
Staff development program,	(3)
Or other	(4)

4. Comparing applied science to traditional science courses, students learn more ...

In applied science courses,	(1)
Traditional science courses,	(2)
Or no difference	(3)

5. Do students learn "PASS Skills" better ...

In applied science courses,	(1)
Traditional science courses,	(2)
Or no difference	(3)

6. Overall, how satisfied are you with your applied science course(s)?

Very satisfied	(1)
Somewhat satisfied	(2)
Somewhat dissatisfied	(3)
Very dissatisfied	(4)

7. Students should receive high school credit toward graduation for applied science courses ...

The same as traditional science courses (full credit),	(1)
Partial credit,	(2)
Or no credit	(3)

8. When formulating entrance requirements, colleges and universities should consider applied science courses as ...

The same as traditional courses (full credit),	(1)
Partial credit,	(2)
Or no credit	(3)

9. High school applied science courses should be offered in the future as a(an) ...

Alternative science class for all students,	(1)
Elective class,	(2)
Required science class for non-college bound students,	(3)
Or not at all	(4)

10. Students that benefit most from applied science courses are ...

College bound students,	(1)
Non-college bound students,	(2)
Or no difference	(3)

11. Students that benefit most from applied science courses are the ...

More-motivated students,	(1)
Less-motivated students,	(2)
Or no difference	(3)

12. How would you describe your students' perceptions of applied science ...

Excellent hands-on science,	(1)
Acceptable alternative science,	(2)
Watered down science,	(3)
Or of no value	(4)

13. How would you describe your teachers' perceptions of applied science ...

Excellent hands-on science,	(1)
Acceptable alternative science,	(2)
Watered down science,	(3)
Or of no value	(4)

14. Students perform better in college after being trained in ...

Applied science courses,	(1)
Traditional science courses,	(2)
Or no difference	(3)

15. Students perform better on the job after being trained in ...

Applied science courses,	(1)
Traditional science courses,	(2)
Or no difference	(3)

16. Facilities are utilized better in ...

Applied science courses,	(1)
Traditional science courses,	(2)
Or no difference	(3)

17. The cost of teaching an applied science course compared to a traditional science course is ...

Much greater	(1)
Somewhat greater	(2)
About the same	(3)
Somewhat less	(4)
Much less	(5)

18. What do you believe is the future for applied science curriculums in high school?

____

APPENDIX C

INSTITUTIONAL REVIEW BOARD

APPROVAL FORM

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 12-08-97 **IRB#:** AG-98-014

Proposal Title: VOCATIONAL ADMINISTRATOR'S PERCEPTIONS OF APPLIED SCIENCE

Principal Investigator(s): James P. Key, Stan J. Horn

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.
APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Disapproval are as follows:
The Principal Investigator(s) should consider using a 5 or 7 pt. Likert scale for the questions. This will speed up the interview and make it easier to compile the results.

Signature: John H. Wyckoff

Chair of Institutional Review Board

cc: Stan J. Horn

Date: December 9, 1997

APPENDIX D

LIST OF SCHOOLS OFFERING APPLIED PHYSICS/PT

OKLAHOMA COMPREHENSIVE SCHOOLS

OFFERING APPLIED PHYSICS/PT

DURING FY 1996-97

Arkoma Jr and Sr. High School
Bartlesville-Mid High School
Berryhill High School
Cache High School
Carnegie High School
Clayton High School
Comanche High School
Copan High School
Dewey High School
Edmond-North High School
Fort Gibson High School
Hobart High School
Kingston High School
Madill High School
Minco High School
Nowata High School
Pocola High School
Poteau High School
Tecumsee High School
Tulsa-Mcclain Carber Academy
Tulsa-Will Rogers High School

APPENDIX E

LIST OF SCHOOLS OFFERING APPLIED

BIOLOGY/CHEMISTRY

OKLAHOMA COMPREHENSIVE SCHOOLS OFFERING APPLIED BIOLOGY/CHEMISTRY DURING FY 1996-97

Agra High School
Bethal High School
Blair High School
Bowlegs High School
Broken Arrow-North Intermediate High School
Broken Arrow-South Intermediate High School
Catoosa High School
Clinton High School
Coalgate High School
Colbert High School
Deer Creek High School-Oklahoma County
Dibble High School
Eufaula High School
Geary High School
Grandfield High School
Hartshorne High School
Heavener High School
Lawton High School
Mannford High School
McCloud High School
Morris High School
Oklahoma Union High School
Olustee High School
Ponca City High School
Prague High School
Pryor High School
Purcell High School
Quapaw High School
Roff High School
Sand Springs-Page High School
Shawnee High School
Skiatook High School
Snyder High School
Sterling High School
Talihina High School
Union Intermediate High School

APPENDIX F

LIST OF SCHOOLS OFFERING APPLIED

BIOLOGY/CHEMISTRY AND

APPLIED PHYSICS/PT

OKLAHOMA COMPREHENSIVE SCHOOLS OFFERING APPLIED BIOLOGY/CHEMISTRY AND APPLIED PHYSICS/PT DURING FY 1996-97

Checotah High School
Choctaw High School
Duncan High School
Durant High School
Edmond-Santa Fe High School
Frederick High School
Grove High School
Lawton-Eisenhower High School
Marlow High School
Miami High School
Muldrow High School
Norman High School
Okmulgee High School
Tulsa Daniel Webster High School
Tulsa-East High School
Tulsa-Hale High School
Valliant High School
Wagoner High School

VITA 2

Stanley James Horn

Candidate for the Degree of

Doctor of Philosophy

Thesis: OKLAHOMA ADMINISTRATORS' PERCEPTIONS OF APPLIED SCIENCE

Major Field: Agricultural Education

Biographical:

Personal Data: Born in Oklahoma City, Oklahoma, May 1, 1957, the third child of Stanley and Elbie Horn. Married to Lisa Ann Rose on June 12, 1981. Father of Stanley Austin Horn and William Carson Horn.

Education: Graduated from Yukon High School, Yukon, Oklahoma, in May, 1975; received Bachelor of Science degree in Agricultural Education from Oklahoma State University in May, 1979; received the Master of Science degree in Educational Administration from the Southwestern Oklahoma State University, Weatherford, Oklahoma, in July, 1982; completed requirements for the Doctor of Philosophy degree at Oklahoma State University, Stillwater, Oklahoma, in July, 1998.

Professional Experience: Farmer, Canadian County, Oklahoma, 1980 to present; Secondary Science Instructor, Yukon Mid High, Yukon, Oklahoma, August, 1980 to August, 1997; Adjunct Science Instructor, Redlands Community College, El Reno, Oklahoma, January, 1989 to July, 1994; College Science Instructor, Federal Correctional Institution, El Reno, Oklahoma, August, 1990 to July, 1993; Research Farm Operation Manager/Coordinator, Langston University, Langston, Oklahoma, September, 1997 to present.

Professional Organizations: National Education Association, Oklahoma Education Association, Yukon Professional Education Association, Oklahoma Wheat Growers Association, Federal Land Bank Association, Farm Bureau.