A model teacher center and the inservice education of middle and high school science teachers: a study of four teacher centers.

Mary Campbell Nash

University of Massachusetts Amherst

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A MODEL TEACHER CENTER AND THE
INSERVICE EDUCATION OF MIDDLE AND
HIGH SCHOOL SCIENCE TEACHERS: A
STUDY OF FOUR TEACHER CENTERS

A Dissertation Presented

By

Mary Campbell Nash

Submitted to the Graduate School of the
University of Massachusetts in partial fulfillment
of the requirements for the degree of
DOCTOR OF EDUCATION
February 1985

Education
A MODEL TEACHER CENTER AND THE INSERVICE EDUCATION OF MIDDLE AND HIGH SCHOOL SCIENCE TEACHERS: A STUDY OF FOUR TEACHER CENTERS

A Dissertation Presented
By
Mary Campbell Nash

Approved as to style and content by:

Leverne J. Thelen
Leverne J. Thelen, Chairperson

R. D. Konicek
Richard Konicek, Member

William B. Nutting, Member

Mario D. Fantini, Dean
School of Education
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Abstract

A MODEL TEACHER CENTER AND THE INSERVICE EDUCATION OF MIDDLE AND HIGH SCHOOL SCIENCE TEACHERS: A STUDY OF FOUR TEACHER CENTERS

February 1985

Mary Campbell Nash, B.Sc., St. Francis Xavier University
M.A., The University of Texas at Tyler
Ed.D., University of Massachusetts
Directed by: Professor Leverne Thelen

The study was specifically designed to develop a graphic model of a teacher center that serves middle and high school science teachers and to (a) determine the characteristics of such a teacher center, (b) compare the graphic model so developed to the professionals' perception of what such a teacher center should be, and (c) compare a selected sample of established teacher centers with the proposed model. A non-random sample of science teachers and other professionals was surveyed to determine: (a) the extent the graphic model fit their perceptions of what a science teacher center should be, and (b) the characteristics such a center should have.

Five teacher center directors were interviewed to determine the extent the proposed model compared with their perceptions of a teacher center, and the teacher center described in the teacher center's literature was compared with the proposed model. The study also included a survey
of the history of inservice education, past to present, and the development of teacher centers.

The following conclusions were drawn:

a) A teacher center designed to meet the needs of science teachers should focus on the teaching related concerns of science teachers. A part of the model but somewhat removed from the central focus of the teacher center are the concerns that professional educators believe science teachers should be aware of; still further removed in the graphic model are local, national and world concerns.

b) Middle and high school science teachers' and professional inservice educators' perceptions of a teacher center compared favorably with the proposed graphic model.

c) The teacher centers studied were not of the comprehensive level favored in the model.

d) The graphic model had as a central focus, whatever they might be, the teaching related concerns of science teachers. Surrounding this central concern were the concerns of professional educators: education for scientific literacy, education of hard to teach, how to teach, selection of concepts, how to individualize instruction, teaching processes and the nature of science, increasing effectiveness of instruction, how to evaluate, and educating the gifted. On the outer area of the model are vi
the concerns of local, national, and world communities: survival of planet earth, interaction with space, use of nuclear energy, conservation of natural resources, environmental control, future energy sources, world agricultural needs, minority group concerns, control of pollution, and race for technological survival or supremacy.
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CHAPTER I

INSERVICE EDUCATION

"The consensus, among science educators, is that quality inservice education is the most important factor in the health of science teaching as a whole and the factor most in need of continuous attention" (Science Education: Accomplishment, 1978, p. 29). Edelfelt (1977) has stated that inservice education should not be considered in isolation:

It is a part of a total preservice and inservice teacher education scheme. It interrelates (or should) with curriculum development, the improvement of instruction, and creation of an environment for productive, constructive living and learning. It is demonstrable accountability: it illustrates in action a profession ensuring that its members maintain satisfactory levels of competence. (p. 11)

Times have changed in the sense that economic, social, and political realities of our society have changed, but education in the classroom has not changed. Sirotnik (1983) reported that "the 'modus operandi' of the typical classroom is still didactics, practice, and little else" (p. 17). What step or steps must be taken to educate teachers to be more cognizant of teaching practices that
could be implemented in their classrooms? Particular consideration should be focused in the science classroom where Sirotnik (1983) reported little time was spent in learning science at the elementary level while at the junior and senior level the science teaching was mainly teacher centered with little student interaction.

Perhaps not a panacea for inservice education, but one that shows real promise is the teacher center. Schmeider and Yarger (1974) state that:

The teacher or teaching center is one of the hottest educational concepts on the scene today—that is no mean compliment, given the rapid ascendency of career education, competency-based education, the open classroom, schools, and universities without walls, and a myriad of other outstanding new educational alternatives. (p. 5)

The authors further stated that most innovation in education takes over 20 years to get into the mainstream of American education, but that the teacher center has taken less than half a decade to become a focus for some new approaches to inservice and preservice educational development.

Based on the belief that something must be done to further the effective teaching of science at the middle and high school level, a model of a teacher center that serves science teachers will be proposed. While the teacher
center seems to work toward meeting inservice needs of teachers, Yarger and Yarger (1978) have reported that very little research has been done nor has theory been developed for the teacher center. Yarger and Yarger stressed a need for teacher center research as most teacher center reports are descriptive in nature. Dhand and Murphy (1977) have stated:

The most important difference between in-service education provided by a teachers' centre and that provided by the traditional institution lies mainly in the attitude to the task in hand. Traditional approaches to in-service education are usually "solution-centred" while the teachers' centre's approach is usually "problem-centred". (p. 20)

Hopefully, the model proposed and the research undertaken for this study will further the use of teacher centers as an effective source of inservice education.

Inservice Education

Throughout the public school systems of the United States, a number of inservice days are set aside on the schools' calendars. Changing methods, strategies, materials, curricula, and resources have necessitated updating teachers' education and these inservice days are one way of helping teachers keep abreast of changes. Along with these inservice days, renewal and growth have been available
to teachers through such mechanisms, often termed inservice education, as courses, degree, or certification programs, workshops, summer or year-long institutes, and lately, teacher centers. Some of these mechanisms have been relevant to the teachers' needs, while others have made little impact on the teacher and their students.

Harris and Bessent (1969) related some of the key reasons for inservice education: (a) preservice education may only be an introduction to professional preparation, (b) changes have occurred in the areas of knowledge, methods, and techniques as well as the tools of teaching, (c) changes in instruction have been necessitated in people by a change in coordination and articulation of instruction, and (d) inservice education has been a morale booster for teachers. In the literature and in a recent paper by Hansen (1980), these same reasons were offered as the basis for establishing inservice education programs.

**Definition**

Inservice education does not have one specific definition, but is defined in many different ways by different educators. Goddu, Crosby, and Massey (1977) have defined inservice education as "an on-going, flexible needs-responsive emerging program designed by multirole groups to improve each person's job competency" (p. 30). Harris and Bessent (1969) defined in-service education as "planned
activities for the instructional improvement of staff members" (p. 2). Along with these two definitions might be added another unique definition for inservice education by Stephens (1975) which stated that inservice education meant "the development of the individual which arises from the whole range of events and activities by which serving teachers can extend their personal academic or practical education, their professional competence and their understanding of educational principles and methods" (p. 37). Harris (1980) defined inservice education as "any planned program of learning opportunities afforded staff members of schools, colleges, or other educational agencies for purposes of improving the performance of the individual in already assigned positions" (p. 21). Taking into account the various definitions of inservice education, it might be stated that inservice education is the continuing professionally job-related education of teachers.

**Early History**

Modern day attempts at inservice education grew out of some early mid-eighteen hundred efforts aimed at bridging "the gap between what they the teachers were expected to know and do and what were in fact their level of knowledge and their teaching competencies" (Tyler, 1971, p. 6). Inservice education in that period usually took the form of institutes of two or three days duration or short evening
courses. By the end of the nineteenth century, it was the established practice to train teachers at normal schools; their further inservice education was provided on a county-wide basis at institutes of one or two days duration during the school year or during summers through programs of longer duration at the normal schools. At first, the primary purposes of these institutes was to extend the teachers' knowledge of their subject matter but this was later broadened to include "the principles of discipline and techniques of instruction" (Edelfelt and Lawrence, 1975, p. 11).

In the early nineteen hundreds, after it was decided that the quality of teaching in the American public schools would show major improvement when teachers had bachelor degrees, inservice education became concerned with concentrating on courses that practicing teachers needed to complete prior to earning their degrees. As the number of students enrolled in high school grew, and the irrelevance of the high school curriculum to everyday life became more apparent, new directions for inservice education emerged. The change in emphasis of inservice efforts resulted in programs aimed toward curriculum development and centered around ways of improving teaching methods, improving the understanding of students, and relating subject matter to students. The Eight-Year Study, which began in 1933 was
an attempt to demonstrate that alternative programs, alternative curricula, and alternative strategies were just as good for preparing students for college as the traditional programs. It was during these years that teachers were brought to university campuses for workshops to develop and evaluate curricula (Tyler, 1971, 1981).

During the World War II years, when teachers were expected to help students understand the situation, it became apparent that education wasn't preparing students to deal with society in the job-field or armed services. Following World War II as the number of students enrolled in schools increased and a concurrent shortage of teachers occurred, inservice education reversed itself and its primary aim again became remediation of teacher deficiencies. However, in recent decades, a more professional conception of inservice education has begun to emerge that is more in line with the author's beliefs: inservice education, more broadly conceived, whatever the content, is the continuing professionally job-related education of teachers.

**National Science Foundation Establishment**

In 1950, the National Science Foundation (NSF) was established with "the improvement of science education to be a basic and significant mission" (The Encyclopedia of
Education, 1971, p. 55). The year 1953 saw the establishment of NSF institutes for college teachers followed in 1954 by institutes for secondary school teachers, and in 1959, the establishment of institutes for elementary personnel. These institutes were established to achieve the following goals:

(a) to update the subject matter preparation of teachers who were adequately prepared in science or mathematics when they entered the teaching profession, (b) to provide remedial training for teachers whose undergraduate preparation was inadequate, (c) to equip teachers with specific background to teach newer curricular materials, (d) to enable teachers to study a subject in greater depth and to meet new, higher standards which might or might not entail an advanced degree, and (e) to provide advanced specialized training for individuals holding or desiring to hold positions of leadership in science education, such as science supervisors. (Blosser, 1969a, p. 9)

When Russia launched Sputnik in 1957, the public outcry led to increased support for science education. Additional millions of dollars were channeled to the support of science education by NSF with other monies being provided by the Elementary and Secondary Education
Act (ESEA) and the National Defense Education Act (NDEA). Two main concerns were curriculum development with an emphasis on concepts and processes of science and teacher education activities. Previous to this time, the teaching of science relied heavily on a series of Holt textbooks (Ronneberg, 1970; Summary of NSF, 1979; Yarger, 1981).

National Science Foundation Institutes

For nearly twenty years, spanning the 50's, 60's, and 70's, NSF was the major provider of inservice education for science teachers. The original institutes were given in the summer, but as time went on, institutes were given throughout the academic year as well. The institutes utilized a variety of names, usually signifying the time offering for inservice education: Summer Institutes, and Academic Year Institutes.

Compared with teachers not accepted, it is interesting to note that studies showed that teachers selected to attend these institutes had better grade point averages, more scientific preparation, more teaching responsibility for teaching science, more interest in further education, and more interest and activity in professional organizations. Participant self-selection appeared to occur as not all science teachers applied for institutes and workshops (Blosser, 1969a; Helgeson, 1974; Schlessinger, 1977; Willson & Garibaldi, 1976).
Summer Institutes

Blosser (1969a) mentioned that most of the summer institutes involved a six to nine week summer program to improve a teacher's knowledge content in a particular science or in some cases, in more than one science. Study at the summer institutes led to a master's degree for some of the participants. It was found in some studies, which Blosser labelled as descriptive, that the summer institutes attained the goal of increasing subject knowledge, while other studies also revealed an increased understanding of scientific processes and understanding of scientists and science.

Inservice Institutes

These institutes, like the summer institutes, concentrated on increasing the content knowledge of teachers in one or more of the sciences, but these institutes took place during the school year, while the participating teachers were teaching. In two of the studies reported by Blosser (1969a), the institutes did achieve that goal while one study also reported significantly higher scores for participants' pupils in their ability to identify and define scientific problems when given the Sequential Test on Education Progress (STEP) in science. When administered the Iowa Test of Educational Development (ITED) in science, participants' pupils scored higher than the control
groups in their ability to understand scientific literature.

Academic Year Institutes

Academic Year Institutes were instituted in 1956-1957 and provided teachers a year of intensive study at a college or university. The institutes lasted for a little more than 10 years with their prime being in the early 60's. Although the institutes set out to meet the same goals as other NSF institutes, the spin off went a step further when many of the teachers involved in the Academic Year Institutes decided to go on for a masters and doctoral degrees. Some of the Academic Year Institutes were planned with the idea that the participants would receive M.S. degrees. While most of the teachers involved in Academic Year Institutes did return to science teaching in the schools, others moved into supervisory positions and college teaching positions (Blosser, 1969a; Schlessinger, 1978).

National Science Foundation Institutes

for Elementary School Teachers

Science at the elementary grade level has not been regarded as very important in the curriculum of students in comparison with what is called the basics--reading, writing, and arithmetic. Whatever science had been taught prior to the sixties, usually involved instruction utilizing a single textbook. Students had little chance
at "hands-on" work and were expected to memorize and give back the facts as they were taught by the teacher. Little effort was used to actively involve students in the lessons, and little time was set aside for science instruction each day—usually 19 minutes on the average for grade K-3, and 35 minutes on the average for grades 4-6 (Weiss, 1978).

National Science Foundation institutes in the form of Summer Institutes and Inservice Institutes began in 1959 for elementary school teachers and supervisors.

Early NSF programs for elementary school teachers were designed to provide orientation toward the theory of arithmetic and to introduce the unifying ideas of the physical, biological and earth sciences. Emphasis was placed on the selection of "key" teachers and supervisors who might be able to spread the influence of the program to several classrooms. (Blosser, 1969b, p. 4)

These programs did not expand as the secondary school science and mathematics teacher programs expanded, but the "key" teachers and supervisors were able to effect changes in science education in their schools or school districts by inservice activities, curricular changes, or the teaching of teachers (Blosser, 1969b).

Elementary teachers' attendance at NSF institutes averaged about 10%, and half of these teachers surveyed in
the NSF studies indicated the need for assistance in implementing "hands-on" science activities and using the inquiry method of teaching. With the demise of NSF institutes and funding, and with the passage of time, few of the elementary teachers were still teaching who had been trained to implement the NSF curricular materials. When teachers were surveyed as to their feelings of being well qualified to teach science, only 22% responded that they felt well qualified. State science supervisors and elementary principals rated as serious problems, inadequate teacher preparation in science, and the teachers' lack of interest in science. With the emphasis on "basics", and with science not considered as a "basic", school districts have not generally allotted funds for improving science instruction including the materials and equipment needed by students and teachers.

Elementary school teachers surveyed in the early 70's, indicated that the barriers to teaching science paralleled the barriers identified by Paul Blackwood in the 60's. These barriers were: (a) lack of consultant services, (b) lack of supplies, (c) lack of room facilities, (d) insufficient funds, (e) lack of sufficient knowledge, (f) lack of inservice opportunities, (g) inability to improvise, and (h) unfamiliarity with methods for teaching science (Summary of NSF, 1979, p. 3). Some research has
shown that when these barriers were reduced or removed, there was a difference in teaching, but little effort has been made to reduce or remove these barriers.

After identifying in forty studies the four broad goals for inservice education in science for elementary school teachers as: (a) skill training, (b) acquisition of information, (c) attitude change, and (d) general self improvement, Patricia Blosser (1969b) recommended that more reproducible research methods be attempted.

National Science Foundation Curricular Material Development for Elementary Grades

During the 1960's, new curricular materials were developed with federal funds. These new curricular materials effected more "hands-on" instruction and more emphasis on the processes of science but still there was little emphasis on laboratory activities. This may be the result of elementary teachers lacking laboratory facilities or science rooms for good science instruction (Helgeson, Blosser & Howe, 1977).

Thirty-one percent of the districts claimed to be using one or more of the NSF developed elementary curricular programs. The three most mentioned elementary programs in use were Science Curriculum Improvement Study (SCIS), Elementary Science Study (ESS), and Science--A Process Approach (SAPA). With feedback from teachers
using the NSF elementary programs, "hybrid" materials were produced such as: Modular Activities Program in Science; Science, People, and Concepts and Processes; Ginn Science Program; Elementary Science, Learning by Investigation; and Space, Time, Energy, and Matter.

Research indicated that the psychological and structural organization of the post-1960 curricula were influenced by the ideas of Bruner, Piaget, Gagne, and Ausubel (Helgeson et. al, 1977).

National Science Foundation Institutes for Junior High School Teachers

More effort to upgrade science education has been expended at the elementary and high school levels even though there are more students enrolled in junior high school science classes. A number of the efforts to upgrade science education at the junior high school level have been included in secondary school studies and reports. Even though the literature is not rich in studies for this age group, some reports have been cited, especially studies funded by the NSF and utilized here as the source of information.

Even though professional associations have called for more science content in the educating of elementary and junior high school science teachers, state certification requirements do not reflect criteria proposed by the
professional associations. Junior high school science teachers generally are regarded as perhaps among the least qualified for teaching science as there are few programs designed for teachers working at this level. Most of these teachers are trained in one area—mainly biology—but must teach life, earth, and physical science. Teachers often find materials irrelevant to students' needs and generally find a lack of facilities, equipment and storage space. The NSF developed materials were also found to be irrelevant for preparing students at this age to deal with everyday life. Teachers at this level need special preparation and help in implementing materials (DeRosa, Lockard, & Paldy, 1979; Helgeson, 1977).

National Science Foundation Curricular Material Development for Junior High School

Following Sputnik's launch, the National Science Foundation funded the development of instructional materials for the junior high school grades. Projects specifically designed for junior high school level included: Earth Science Curriculum Project (ESCP), Intermediate Science Curriculum Study (ISCS), and Introductory Physical Science (IPS). It was reported that during the year of 1976–1977, 33% of science teachers in grades seven to nine, were using one or more of the federally funded curricula (Helgeson et. al., 1977).
National Science Foundation Institutes for High School Science Teachers

As mentioned in the beginning, some of the earliest NSF institutes were those established for secondary school teachers in 1954. The number of institutes increased substantially subsequent to this and this occurred simultaneously with the development of new instructional materials funded by the NSF, ESEA, and NDEA. Funding was provided not only for new curriculum programs and for teacher education programs designed to familiarize teachers with the use of new curriculum programs, but also for the purchase of new science equipment.

New curriculum materials were designed to emphasize inquiry as well as concepts and processes of science. Prior to Sputnik I, the major concern of science teachers was the preparation of students to become scientists, mathematicians, and engineers, with respect to the national security and to the attributed progress of Russia in scientific and technological advancements. As stated previously, instruction in biology, chemistry, and physics, as well as the science curriculum materials utilized in junior high school, centered around textbooks produced by Holt, which emphasized the memorization and recitation of facts (Helgeson et. al., 1977; Ronneberg, 1970; Summary of NSF, 1979).
Most students will have taken their last science course, which is usually biology, in the 10th grade. In some schools, newer elective courses such as oceanography, marine biology, genetics, plants and space science have given students a choice other than biology. Chemistry and physics remain courses that are chosen by students who are labelled as academically elite. In recent years, there has been an increase in students choosing advanced science classes at the high school level, even though most states only require one to two years of science for graduation (Melton, 1979; Summary of NSF, 1979; The State of School Science, 1979).

National Science Foundation Curricular Materials Development for High Schools

Among the NSF curriculum projects that were developed in the late fifties and dubbed "first generation" texts were: Biological Sciences Curriculum Study (BSCS), Chemical Bond Approach (CBS), and Physical Science Study Committee Physics (PSSC). Problems arose with these new projects as the primary developers were science specialists in a single discipline and sometimes the new curricula were developed without significant input from science educators, psychologists, sociologists, and practicing secondary school teachers. Ronneberg (1970), discussing the
inadequacies of the first generation texts, identified the inadequacies as follows: (a) were written with the ideas and needs of single discipline scientists in mind such as biology for biologists, chemistry for chemists, and physics for physicists, (b) lacked an interdisciplinary approach, (c) were planned to be intellectually stimulating and for this reason was not utilizable with a large percentage of the students as well as having teachers unprepared to teach the courses or interested in teaching the courses, (d) omitted whole areas of modern science such as heat in PSSC physics, (e) were not utilizing as teaching tools, machines and devices that are an important part of students' lives, (f) were oriented toward students who will more than likely become scientists, (g) were encyclopedic in content, and (h) emphasized end products with little or no consideration as to how scientists arrived at these end products.

Feedback from the use of "first generation" texts led to the development of second generation texts such as Harvard Project Physics where "the needed changes included greater emphasis on the social sciences and greater awareness of pressing national needs that require integrated, interdisciplinary experimental responses" (p. 71).
National Science Foundation Programs

Along with the institutes mentioned in the above paragraphs, it is worthwhile mentioning three programs funded by NSF. These three programs were: Cooperative College—School Science Program, The Traveling Science Demonstration Lecture Program, and the Research Participation Program.

Cooperative College--School Science Program

Grants were usually awarded to colleges who made use of their resources to assist school systems within their geographical region in the improvement of their science and mathematics courses. Selected teachers attended summer instruction followed with further instruction during the academic year. Concentration was usually on a single scientific discipline. As an example, one specific program involved the San Antonio Independent School District and the University of Texas in seeking ways to improve the teaching of earth science. Three professors at the University and four eighth grade science teachers developed curricula which were then presented to teachers at inservice workshops during the school year. Teachers implemented the curriculum materials with their pupils, thus allowing for feedback and the necessary rewriting of the materials (Blosser, 1969a; National Science Foundation Cooperative, 1968).
Traveling Science Demonstration Lecture Program

Classroom teachers, provided with special training, traveled to various schools in a station wagon provided with scientific equipment, giving lectures and demonstrations for a week at a time to science classes, as well as to special student, teacher, or civic groups. The demonstrators also spent time discussing science education problems with teachers and administrators. Teachers were reported to have responded favorably to this program as they felt that their teaching skills had been increased and that they had gained useful information as well. "The consensus was that the program was better than the usual summer institute for increasing classroom effectiveness" (Blosser, 1969a, p. 3).

Research Participation Program

Several different reasons for involving teachers in research programs were reported by Blosser (1969). It was thought that by involving teachers in research, they would change "from being individuals who know about science to people who know what science is about" (Blosser, 1969a, p. 3). It was also hoped that teachers would learn to use a critical thinking, problem solving approach with their science classes. Blosser mentioned Wittner's case study of secondary science teachers at the University of Wisconsin during the years 1959-1966 where supervising
professors felt that the majority of the participating teachers gained an understanding of the real nature of research, that a real contribution was made to the research discipline by approximately one-half of the teachers, and that a significant contribution was made to the professors' laboratories by about three-fourths of the participants.

**Effects of National Science Foundation Institutes**

Helgeson (1974) studied 138 documents to determine the impact of the NSF institutes. He first summarized the characteristics of institute participants between the years 1957-1962. Participants were found to be good academic students who were interested in further education and were actively involved in professional organizations. Rejectees and non-participants were found to be more likely to leave the teaching profession. Helgeson mentioned Dzara's study of participants at the University of Alabama institutes (1957-1962) which indicated that even though 49.4% of the participants held master's degrees, they were poorly prepared to teach science.

The second category studied by Helgeson covered subject matter competence. Teacher-participants subject matter competence was found to be significantly improved due to participation in the institutes. The teachers' increase in subject matter competence due to participation
in an institute was rated as a major factor in motivating students to choose college courses in science and mathematics.

The third category which concerned teacher attitudes found that teacher-participants were positive in their attitudes to their institute experience and felt the results to be beneficial.

In terms of the fourth category, teacher behavior, students, supervisors, and teachers themselves perceived a change in the desired direction following the institute, though it was not necessarily permanent.

In the fifth category, understanding of science, the evidence indicates that institute participants had an increased understanding of the nature of the scientific enterprise with respect to the methods and processes of science.

The final category studied by Helgeson was the effect on teacher-participants' careers. Most teachers who attended institutes continued their education, increased their professional activities, and joined professional organizations.

Helgeson et. al. (1977) and Willson and Garibaldi (1976) studied the same documents utilized in Helgeson's 1974 study of the impact of NSF institutes. Willson and Garibaldi (1976) had been interested in the effects of
teacher participation at NSF institutes on student performance. They had found sixteen documents that had investigated student performance and along with their own investigations found that students of teachers with high institute attendance performed better on the Test of Achievement in Science (TAS) than students of teachers who attended only one or two institutes.

Although the results of the NSF institutes appear to have a positive effect, it was reported in Weiss' survey (1978) that of the teachers in grades 10-12, 47% had attended one or more NSF sponsored workshops, institutes, or conferences. Thirty-two percent of junior high school teachers, grades 7-9, had attended NSF sponsored workshops, while only 12% of elementary level teachers had attended NSF sponsored workshops. In a nationwide survey of teachers, Schlessinger (1971) reported that over 50% of the teachers attended summer institutes, while 71.1% of the teachers surveyed had not attended an inservice institute. Thus, a sizeable number of students were not affected by NSF institutes. During the late sixties, funding for institutes decreased, but the effects of the continued use of curriculum projects were still reported.
Effects of NSF Curriculum Materials

It has been found that use by teachers of the NSF developed science curricula has declined substantially with little evidence that the process which was espoused by the developers was ever much in evidence. The NSF programs of these two decades were in many ways a failure as teachers were generally unprepared to teach the new curricula and institutes designed to familiarize the teachers with the new curricula were unsuccessful (Herron, 1971; Harms & Yager, 1981).

Many students instructed with the curricula have been "turned off" by science as the curricula reflect the interests of pure scientists with "little or no bearing on their (students') present day problems of living" (Ronneberg, 1970, p. 52). The emphasis of the new curricula was on the "end products of science--the so-called key principles and modern ideas of science" (Ronneberg, 1970, p. 54). The curriculum materials "have presented problems for average and below-average students due to high reading levels and difficulty of some of the concepts presented" (Summary of NSF, 1979, p. 3).

Hurd (1981) has stated that "there is little evidence that the goals of the federally funded supported science curriculum projects were ever translated into instructional
and testing practices, although these goals are advanced as justification for science teaching" (p. 20).

Shymansky, Kyle, and Alport (1983) in a meta analysis titled, "The Effects of New Science Curricula on Student Performance", reported on the impact on student performance of the new science curricula versus traditional courses. New science curricula were defined as those developed after 1955, and in which the emphasis was on the process, nature, and structure of science, with the laboratory activities an integral part of the class routine. An emphasis on the appreciation of science as well as cognitive skills was another defined difference. Traditional courses developed prior to 1955 emphasized scientific facts, laws, theories, and applications, and used the laboratory activity largely to verify concepts and principles covered in class and/or the textbook.

Shymansky, et. al. (1983) summarized the results: (a) The average student exposed to new science curricula exceeded the performance of 63% of the students in traditional science courses on the aggregate criterion variable. (b) Across all curricula, students exposed to new science programs showed the greatest gains in the areas of process skill development, attitude to science, and achievement. (c) By content area, students exposed to new
biology and new physics programs showed the greatest gains across all criteria measured, while new chemistry and earth science students showed the least positive gains. (d) Student overall performance scores were found to be more positive for mixed student samples than for either predominantly male or female groups with respect to the new science curricula studies. (e) Across all curricula, overall student performance scores were observed to be less positive in studies where teachers reported having received inservice training in the program. (f) No differences were observed in mean effect size values when studies were grouped by level of internal validity or type of test used. (p. 401, 402)

While early institutes emphasized science content, there is some question whether teachers were prepared to implement the new programs. Shymansky, et al, questioned whether teachers teaching the new curricula were teaching them in the manner intended or in a more traditional fashion. If they were not adequately trained to use the new curricula, it is possible that this fact may account for the decline in the use of the new curricula. While Willson and Garibaldi found that students of teachers with high institute attendance performed better than students of teachers who attended only one or two institutes.
Shymansky et. al. found the performance scores of students to be less positive where teachers had received inservice training in the program. Overall, an abundance of research literature credits the new science curricula with a successful attempt at improving science education.

Although Shymansky et. al. reported that inservice training in the program did not result in increased student performance, they caution that:

As a result it would be erroneous to infer anything about the value of current day inservice programs from these data, unless one were to infer that increased subject matter competency of the teacher does not lead to increased learning among students when new curriculum materials are used. (p. 402)

Needs of Teachers and Students in the 80's

A change in the emphasis in science education in the 80's for junior and high school science students has been recommended in What Research Says to the Science Teacher (1981), a recent publication of the National Science Teacher Association (NSTA), in a separate paper by Yager (1981), and recently in a NSTA position statement (1982). No longer should the emphasis be placed on "hard core" science alone, unless such academic preparation is necessary to prepare a student to enter a scientific field. Harms (1981) stated that attention in science teaching
today should be given to the personal needs of students, especially to the "increasing need to understand the way science and technology affect us as individuals" (p. 119). Students must be made scientifically aware citizens in areas such as environmental and energy-related issues. They should have the knowledge to make good judgments about pertinent issues that will affect their society (Harms, 1981; Yager, 1981). The NSTA position paper (1982) stated:

The scientifically literate person has a substantial knowledge base of facts, concepts, conceptual networks, and process skills which enable the individual to continue to learn and think logically. This individual both appreciates the value of science and technology in society and understands their limitations. (p. 2)

To meet these changing needs, a new breed of science teacher is needed. National curriculum projects aimed at meeting the needs of teachers have not been as effective as hoped, and although they were "a successful attempt to improve science education" (Shymansky, et. al., 1983, p. 402), as an approach such a strategy has lost its appeal. National curriculum projects do not meet the needs of teachers as they perceive them; nor have the variety of strategies employed, such as courses and institutes, been found effective in enhancing science teachers'
preparation to teach science. Thus, attention must be given to other means of making inservice education meaningful (Anderson, 1981).

Future Inservice Programs for Teachers

In one of the three NSF studies, it was recommended that local science and mathematics resource centers should be established to serve inservice needs of teachers. Teachers surveyed in the study expressed a desire for assistance in learning new teaching methods, learning about new instructional materials, learning how to implement discovery/inquiry teaching, and learning about manipulative materials (The State of School Science, 1979).

Although research is sparse and no theory has been established concerning teacher centers, descriptive studies as well as descriptive case studies are available. Yarger and Yarger (1978) have stated: "It seems that teacher centers are 'in'. People are excited about them and are anxious to both initiate and/or become involved with a teacher center" (p. 255).

Teacher center development began in England with the Nuffield Foundation funding a project for the instruction of teachers in implementing the new mathematics, followed very shortly by funding to improve the teaching of science and language (Redknap, 1977). The parallel development of teacher centers in Japan grew out of the "study circles".
The earliest Japanese teacher centers were established to improve the teaching of science within the country (Buxton, 1976). Teacher centers within the United States were modeled after the English centers with emphasis on teacher education improvement. During the seventies, some states mandated the establishment of teacher centers, two of which were Florida, used as a model state for a state-instituted teacher center, and Texas, the state in which the dissertation study was undertaken.

Since the teacher center has been proposed as an alternative system for meeting the inservice needs of teachers, a preliminary model of a teacher center that serves middle and high school science teachers will be proposed. For years, teachers have been expected to upgrade their professional competence through inservice education, but they traditionally were little involved in the development of the program and the rewards such as pay increases, certification or renewal of certification very often had little relationship to performance on the job. What then is the difference in inservice education that is provided by a teacher center and other inservice education programs? Dhand and Murphy (1977) claimed that the difference was mainly "In the attitude to the task at hand. Traditional approaches to in-service education are usually 'solution-centred' while the teacher centre's
approach is usually 'problem centred' (p. 20). In a study of 40 teacher centers Devaney and Thorn (1975) stated:

Long lasting improvements in education will come through inservice programs that identify individual starting points for learning in each teacher; build on teachers' motivation to take more, not less, responsibility for curriculum and instruction decisions in the school and the classroom; and welcome teachers to participate in the design of professional development programs. (p. 7)

Definitions

Many definitions have been given to a teacher center as each teacher center reflects the needs of the area in which it is located. With this in mind, Schmeider and Yarger (1974) stated:

When the term teaching center is mentioned in the United States, it might just as well refer to three teachers opening a store-front in Harlem as to a state-controlled network of centers designed to serve literally thousands of teachers and other educational personnel. (p. 6)

They prefer "teaching center" over the more common "teacher center", a term that the author of this paper prefers.

Schmeider and Yarger (1974) defined a teaching center as:
a place, in situ or in changing locations, which develops programs for the training and improvement of educational personnel (in-service teachers, pre-service teachers, administrators, para-professionals, college teachers, etc.) in which the participating personnel have an opportunity to share successes, to utilize a wide range of education resources, and to receive training specifically related to their most pressing teaching problems. (p. 6) Devaney and Thorn (1975) have offered another definition for a teacher center:

a program for the continuing education of practicing teachers (mostly elementary) which aims to be responsive to teachers' own definitions of their continuing learning needs rather than to school administrators', college professors', or curriculum committees' imposed agendas. Such a program can be a place where teachers come to work together and receive instruction, or share self-instruction, or it may be a staff of advisors who go out to help teachers in their schools, working in the same spirit of finding teachers' own starting points for improvement. (p. 3)

These two definitions correspond to how Zigarmi (1978) defined a teacher center and a definition adopted for this
dissertation. Zigarmi defined a teacher center as a "place" where teachers come together in a non-threatening atmosphere, and as a "concept" where teachers take an active part in staff development and where they, as well as the teachers' students, are the main concern of the center.

Some of the major concerns given consideration at a teacher center are in the development of curricula, improving the teaching skills of teachers, the professional growth and development of teachers, and meeting the needs of the teachers served by a particular center.

Statement of Problem

The problem undertaken in this study was the development of a model of a teacher center that serves middle and high school science teachers. Unstructured taped interviews along with a structured questionnaire that parallels the questions in the interview and administered two weeks after the interview were utilized with science teachers and professional inservice educators. Their suggestions for or criticisms of the model were considered for incorporation into the model. Four teacher centers were chose, and the revised model of a teacher center was submitted to the directors of each teacher center and an unstructured, taped interview was administered. Suggested changes for the model were
given consideration and a final revised model of a teacher center was proposed. A study of each centers' literature was then undertaken to determine if the proposed model of a teacher center that serves middle and high school science teachers was incorporated into each center's operation.

The proposed research in this study was designed to contribute to the body of theory about teacher centers in the following areas: (a) What are the characteristics of a teacher center designed to meet the needs of middle and high school science teachers? (b) How does the model of a teacher center that is designed to meet science teachers inservice needs compare with science teachers' and professional inservice educators' perceptions of what a teacher center should be? (c) In what ways does a selected sample of established teacher centers that serve middle and high school science teachers compare with the model proposed in the study?

Limitations of the Study

The number of interviews undertaken in this dissertation has been affected by time constraints, overall cost, and distance to be traveled. The sample of science teachers, professional inservice educators, and teacher center directors/personnel were a non-random sampling and
may not be representative of the population of the three groups interviewed. The relatively limited number of interviews undertaken in this dissertation may not offer a representative sampling of the beliefs and opinions of science teachers, professional inservice educators, and teacher center directors/personnel. The limited geographic area covered by the interviews may not be representative of a larger geographic area.

The format of an unstructured interview as the instrument used in the dissertation, allowed for relatively free responses while the researcher's interpretations of the interview materials were filtered through the researcher's preconceptions which consists of the researcher's beliefs, biases, and prejudices.

Definition of Terms

Junior high school--generally includes only grades seven through nine.

Middle school--generally includes only grades six through eight, but on occasion may include grades five and/or nine.

High school--generally includes grades nine through twelve or ten through twelve.

Inservice education--continuing professionally job-related education of teachers.
Teacher center—both a "place" and a "concept".

Model—a graphic representation of the major characteristics of a teacher center that serves middle and high school science teachers.

Outline of Dissertation

As the dissertation evolves, the second chapter will trace the early history of teacher centers, along with comparisons of teacher centers in different countries, funding available for teacher centers, classification of teacher centers, and examples of established teacher centers. A rationale for the proposed model will be included. The third chapter will be concerned with the design of the study and will include descriptions of all developed materials necessary to carry out the study such as the proposed model of a teacher center that serves middle and high school science teachers, structure for the interviews to be utilized with science teachers, professional in-service educators and teacher center directors and structure of the questionnaire to be utilized with science teachers and professional inservice educators. The third chapter will also include the methods utilized and the rationale for choosing these methods. Information concerning the population chosen as well as any background information in the interviews that is pertinent to the study will be included.
Suggestions or criticisms offered by the interviewed science teachers, professional inservice educators, and teacher center directors along with a description of the final proposed model of a teacher center that serves middle and high school science teachers will be included in chapter four. Results of similarities and differences between the final proposed model and selected teacher centers will also be reported in the chapter.

The final or fifth chapter will include conclusions drawn from the study, implications of this study for practice, along with suggestions for future research.
References


CHAPTER II

HISTORY OF TEACHER CENTERS

In reviewing the literature on teacher centers, one finds a great lack of research related to teacher centers. Yarger and Yarger (1978) have stated:

Very little research has come to the attention of the authors that attempts to explain the organization of teacher centers, the behavior of people within teacher centers, or the relationship of teacher centers to the larger structures of education. This type of research and theoretical work is sorely needed, and would provide scholars as well as policy makers with information that would enable them to better understand and thus better operate in the educational world of staff development. (p. 255)

What is found in the literature are descriptive studies of various teacher centers, early history of teacher center development, and identifying characteristics of teacher centers. If educators are to evaluate the effectiveness of teacher centers as a vehicle for inservice education for teachers, more theoretical studies and research needs to be initiated.
The following chapter relates the development of teacher centers in England, the United States, and Japan as well as their similarities and differences.

Teacher Centers in England

When tracing the early history of teacher centers, one usually starts with their development in England during the 1960's. Other countries, especially the United States, were quick to join the teacher center bandwagon, utilizing the British centers as models, but incorporating the needs and conditions of the local districts into their models. Yarger and Yarger (1978) implied that the early roots of the American teacher center are found in the teacher institutes established for inservice education in the mid-1800's. The institutes described by Yarger and Yarger had been available for inservice education for teachers down through the years, but the needs which the institutes addressed were almost always identified by administrators rather than by the teachers themselves. However, institutes were available only at certain times, such as one-, two-, or three-day periods during a school year, while a teacher center, sometimes defined as a "place" and a "concept", is always available, thus the origin of the "teacher center" is attributed to England by this author.
As early as 1944, recommendations for the establishment of education centers in England were made in the McNair Report published by the Board of Education. However, it would be 20 years before the first teacher center was established in England. What affected the establishment of such centers in England?

In 1962, a curriculum study group was established, but was shortlived, as teachers and local education administrators feared a centralized curriculum. A committee to review matters was then established under the direction of Sir John Lockwood and called the Lockwood Committee. This committee gave rise to the Schools Council, consisting of the Secretary of State for Education, local education agencies, and teachers acting as partners, with a majority of teachers on the more important committees. The Lockwood Committee, reporting on the aims and constitution of the School Council, stated that teachers should be free to choose their own curriculum. In two early papers issued by the School Council, Working Papers Nos. 2 and 3, it was recommended that "local development centres for the promotion and encouragement of school-based curriculum development" (Brand & Whitbread, 1975 p. 29) be established. In Working Paper No. 2, the recommendation was made for the development of teacher centers as a means of alleviating some of the problems associated with the raising of school-leaving age (ROSLA).
During this same period when the School Council was proliferating their "Working Papers," the Nuffield Foundation was proceeding with the development of a new mathematics curriculum in England. "The Foundation believed that classroom teachers should be centrally involved in curriculum development and set up regional centers where teachers could meet" (Hapgood, 1975, p. 13). Thus, the first teacher center appeared in 1964 under the auspices of the Nuffield Foundation.

In 1967, the School Council published Working Paper No. 10, dubbed the "little red pamphlet," which said that teacher centers were very good, and that every local education authority (LEA) should have one. The recommendations set forth in this paper were a major factor leading to an increase in teacher center numbers.

In 1970, the James Committee was established by Margaret Thatcher, then Secretary of State for Education, to investigate teacher training. A report issued in December of 1971 and called the "James tricycle" delineated three consecutive stages in which teachers should be educated: (a) personal education, (b) preservice training and induction, and (c) in-service education, with emphasis on the last stage. To meet the in-service needs, short-term activities at professional centers, "easily
accessible, these could be based on colleges and departments of education and expanded teachers' centres" (Thornbury, 1973, p. 37), were recommended. With the establishment of these centres, it was suggested that:

Each would have a full-time warden, of at least senior lecturer status, who would be selected by the centre's management committee, approved by the regional body, and paid by the LEA (Local Education Authority). He would have an independent role, and his chief responsibility would be to draw on all available sources to meet the training requirements of the teachers served by his centre (Thornbury, 1973, p. 37).

This centre therein described, focused on the training of first-year teachers, and on those released every seventh year for a sabbatical period, as compared with the earlier centers established by the Nuffield Foundation for curriculum development.

No two English centers are alike, but they do have some commonalities. Most of the English teacher centres are (a) supported by the local education authority (LEA), (b) governed by teachers, (c) concerned with the social interaction of teachers, and (d) not concerned with pre-service teachers, leaving their training in the hands of the University. The British "teachers' centre,"¹ which
implies that the center belongs to the teachers, leaves in-service education and curriculum development on a voluntary basis with teachers. It might be noted here that the American counterpart for teachers' centre is "teacher center" or "teaching center," which indicates a center for teachers, but not necessarily one belonging to teachers (Berg, 1978).

Function or Purpose

In stating the function or purpose of teachers' centres, three main functions or purposes are frequently mentioned: (a) providing inservice programs, (b) serving as a social center for teachers, and (c) functioning as a center for curriculum development (Bender, 1975; Caldwell, 1979), while a fourth function or purpose is added by Berg (1978), (d) affording resources and services. Of the above mentioned functions or purposes, curriculum development was perhaps the most important. The establishment of teacher centres as a "place" for curriculum development was fostered by the Nuffield Foundation through the curriculum development projects that they funded in science, mathematics, and language arts. Caldwell (1979) states:

Curriculum development in local teacher centers allows teachers to define their objectives, develop and test the effectiveness of methods and materials
that will help achieve those objectives, assess
the effectiveness of their work in actual class-
rooms, and inform other teachers about their
relative success. Theoretically, local curriculum
development, especially curriculum designed and
tested by teachers themselves, has the effect of
heightening the teacher's sense of professionalism.
As teachers begin solving problems for themselves,
they take on the roles of researchers and clinical
observers. (p. 518)

Although curriculum development has been identified
as the primary purpose of a teachers' centre, McKeegan
(1977) stated:

It was noted by the curriculum developers and by
other observers, however, that the teacher centers
not only were vehicles for achieving curriculum
objectives, but they also served to encourage the
general professional development of teacher
participants. (p. 1)

In the earliest years of the teachers' centre,
attention was focused on in-service training for teachers,
first-year teachers as well as teachers on sabbatical.
This in-service training for teachers, as suggested by
the James Committee, was to be carried out in professional
centers utilizing existing teacher centers for the purpose
of skill training for new teachers and skill updating for
teachers on sabbatical leave. Thus it can be seen that a
major concern was the in-service education of teachers.

Perhaps the second purpose of English teachers'
centres would be considered inconsequential to American
teachers, but is a serious matter for English teachers.
This purpose is the social aspect of teacher centres. It
is important for the English to belong to a club, and they
see the teacher center as a club where they can socialize
with one another. This is particularly true for primary
school teachers, who find that the teacher centers meet
their needs socially and professionally. However, secondary
teachers still tend to look towards the university for
professional development, with social interaction, as well
as scholarly discourse, being provided within the secondary
schools.

The fourth function that was suggested for teacher
centers was resources and services. Bender (1975) makes a
distinction between a teachers' center and a resource
center, stating that: "A Resource Center encourages the
production and utilization of a resource collection,
including local teacher and group production, the listing of
other available materials, the acquisition of materials as
to their present usefulness" (p. 5).
Bender (1974) defined teachers' centers as:
Run by teachers for teachers usually from an immediate geographic and educational area, more often they involve primary teachers rather than secondary teachers, they are involved with curriculum change and/or with curriculum development, and they tend to meet both professional and social needs of teachers. (p. 3)

In general, most teacher centers have some resources available, but the distinction made here would depend on the emphasis on resources.

Kahn (1974) stated that resources attract teachers to centers, that resources can lead to teacher involvement in other center activities, that it is difficult to separate resources from course work, and that a center without resources is not complete. Self (1977) has stated that with colleges of education becoming more involved in in-service education, and with less stress on curriculum development in teacher centres, it is feared that they may become centers for resources.

Wardens and Funding

The suggestion was originally made in School Council Working Paper No. 10 (1967) that a full-time operating centre needed a full-time leader. This was a beginning for the centre leader, or "warden" as he/she was called. The
warden of a teacher centre wears many hats, is especially tuned into the needs of his/her teachers, and has very flexible hours. The success of a centre may be determined by the way a warden runs a centre. The warden is paid a head teacher's wage and through the years has become a position sought after by mostly elementary school teachers, as head positions were few and far between, and the only way to rise in the system may be through appointment as warden. The change of the centre focus from mostly secondary teachers to elementary teachers also played an important role in appointing elementary teachers as wardens. Secondary teachers were promoted to higher positions within the system and sought out in-service education at colleges and universities, thus not seeking a warden's position.

Most teachers' centres are funded by the LEA's, whose financial assistance comes from the Department of Education and Science. The LEA's are generally run by an advisory committee, with the majority of their members being teachers. With this structure, it was hoped that teachers would run the centres; but it has been noted that, in some areas, the wardens hold sway, or the LEA may effectively be in control of the centres. Some centres have been able to finance themselves by selling the materials developed at the centers.
Teacher Centers in the United States

Perhaps the greatest influence in the development of the American teacher center was the development of the British "teachers' centre." The transplant of British teachers' centres into the United States has not really been a transplant, but a modeling.

Berg (1978) cites a report by Stabler (1975) which identified three main reasons for the development of teacher centers in the United States:

a) the problem and anxieties felt by teachers
b) the search by universities, colleges, school systems and state departments of education for ways to improve teacher education
c) the enthusiastic support of the U.S. Office of Education to carry out a 'Plan for Education Renewal' . . . (p. 78).

A study by an NDEA National Institute created in 1966 to assess long-range needs in teacher education led to the involvement of the Federal government in the development of teacher centers. In the resultant publication from this study, Teachers for the Real World, the establishment of a national network of training complexes was recommended, because it was felt that neither the universities nor the schools were providing theoretical knowledge of teacher education or training in the skills of teaching. These
training centers would be a joint effort of the universities, schools, and communities. A committee was established, pilot projects launched, and the recommendation made for the establishment of an advisory group to do a feasibility study of training centers. The resultant advisory group, Task Force '72, endorsed competency-based teacher education and certification, with the training centers being the appropriate vehicle for accomplishing this task (Feiman, 1978).

The training centers took on many tasks, but the early emphasis was on preservice training, and later the emphasis was on in-service training. A proposed modification of the training complex concept was recommended, that called for establishment of State renewal centers, with each site being served by a teacher center where the size and the function would be dependent on local needs and plans. The word "teacher" emphasized the recognition that the teacher would play a big role in bringing about changes. In 1971 when the National Teacher Center Project was established by the Office of Education, four sites were funded to develop teacher centers. Covert, Radzikowski, & Seigel (1974) stated that these sites were funded with four purposes in mind: 
(a) deliver validated practice and processes from educational research to public schools, (b) improve the quality and delivery of inservice education (c) promote better needs assessment and priorities assignment in local education, (d) create some form of collaboration in training programs for all school personnel . . .(p. 1, 2)

Following the November, 1971 appearance of Stephen Bailey's article "Teachers' Centres: A British First," there seemed to be an acceleration in the growth of the number of teacher centers that were in operation in the United States. The teacher was recognized as the missing link to effect change in the classroom (Berg, 1978).

Schools of education that developed competency-based teacher education became frontrunners in the establishment of teacher centers. Florida was the first state to enact a law for the establishment of such centers, followed by Texas, California, and Vermont. The centers established by these states, deviated from the original model of the British teacher center; their emphasis was on teacher training and less on the idea of an informal center.

New National Teacher Center Program

President Ford signed into law in 1976 the New National Teacher Center Program, and the regulations for the establishment of teacher centers was published in
January, 1978. By January, 1979, there were 53 fully operational teacher centers.

The basic purpose of the new Federal Teacher Centers Program is to enable teachers to have a greater voice in determining and meeting their own needs for inservice training and curriculum development in relation to the needs of the students whom they serve. (Lovett and Schmieder, 1978a, p. 3, & 1978b, p. 4)

Lovett and Schmieder (1978a, 1978b), list the major characteristics of the National Teacher Center Program as: (a) requires teachers to plan, develop and implement projects; (b) uses the classroom teacher as innovator, researcher, developer, and trainer; (c) helps the teacher with classroom instructional problems; (d) directs in-service training of teachers within a project area; (f) responds quickly to immediate needs by developing programs; (g) provides for individual and system needs; (h) develops sites for the center as near as possible to the classroom of participants; (i) establishes released time for daytime involvement; (j) encourages voluntary participation; (k) facilitates instructional improvement; (l) concerns mainly in-service, but able to include preservice; (m) has facility in obtaining resources; (n) generates ideas that may eventually serve all the nation's teachers; (o) varies in size and program; (p) disseminates statements concerned
with major staff development needs on national and state levels; (q) supports a generic model of in-service; (r) has concerns for collaboration of many teachers and teaching-related organizations; and (s) provides support for state involvement in areas of technical assistance and dissemination. New teacher centers supported the idea that teachers meet their needs by having a greater responsibility in determining their classroom changes and improvements, curriculum program development and training.

Patricia Weiler (1970), from a study of Federally funded teacher centers, concluded that:

The New Teacher Centers have made a positive impact on teachers in the United States. If given an opportunity, Teacher Centers can help develop a more positive atmosphere in schools. Instead of contributing to the "downward whirlpool" of the early 1970s, Teacher Centers of the 1980s might enable the public to perceive new trends and behaviors in schools. They can help demonstrate that teachers are trying to change their teaching strategies and to improve student achievement against some difficult odds. Through Teacher Centers, through sharing and disseminating the viable practices of teachers, and through finding out what does in fact work in schools, over a period of time teachers can
develop the same expertise developed in other fields of competent practice. (p. 93)

The point was made by Lovett and Schmieder (1978a) that without direct teacher involvement in staff development and acceptance of new curriculum by teachers, there would be no more success in introducing new curricula into the system than was experienced with new curricula in the 1960s.

Classification of Teacher Centers

Teacher centers have been classified in different ways by various authors. Schmieder and Yarger (1974) classified teacher centers on their organization level as well as the function served by the center. Classifications by Bell and Peightel (1976), as well as by Van Fleet (1977), parallel the organizational classification of Schmieder and Yarger. Feiman (1977) classified teacher centers according to ideological differences: (a) behavioral, which looks at the outcomes of teaching defined in specific teaching behaviors with performance being considered a valid measure of teacher competence; (b) humanistic, where teachers take over their own professional development; and (c) developmental, which would have teachers study and assess their styles of teaching.

Schmieder and Yarger (1974), classified teacher centers according to organizational types of teacher centers: (a)
the independent teaching centers which have no affiliation with an established institution; (b) the "almost" independent teaching centers, which are linked with an education institution or a school system, but have a considerable degree of autonomy, and like to think of themselves as independent; (c) the professional organizational teaching center which is either "negotiated" from formal bargaining procedures with a school system or "subject" focused; (d) the single-unit teaching center which forms an association with and is administered by a single educational institution (the most common American type); (e) the free partnership teaching center which is a simple type of consortium usually between a school system and a university or college; (f) the free consortium teaching center which has three or more institutions involved; and (g) the legislative/political consortium teaching center which is prescribed by legislation or political influence.

Van Fleet (1977) simply says that there are two types of teacher centers: either single-agency centers or multi-agency centers. Bell and Peightel (1976) describe four organizational types of teacher centers: (a) special-focus, which corresponds to Schmeider and Yarger's professional organization teaching centers; (b) autonomous, which corresponds to the single-unit teaching centers; (c) partnership, which is described above as the free
partnership teaching center; and, finally, (d) consortium, which fits the description of the free consortium teaching center.

Schmieder and Yarger (1974) also looked at the functional types of teacher centers which they considered to be independent from organizational classification. Four types were identified: (a) the facilitating-type teaching center, which focuses on the teacher's personal and professional development; (b) the advocacy-type teaching center, where professionals have a particular philosophical or programmatic commitment; (c) the responsive teaching center, which responds to either teachers' specific needs or institutional needs; and (d) the functionally unique teaching center, which serves limited unique functions, such as research or material development.

Funding a Teacher Center

As numerous and diverse as types of teacher centers are the sources of funding for teacher centers. James Collins (1974) gave some insight into different means utilized to finance teacher centers. Collins' examples ranged from centers funded by a "shoestring" budget consisting of modest donations and service fees all the way to well financed, federally supported centers. Sources of funding included: (a) university and school systems; (b) State Department of Education, along with participating schools
and colleges; (c) the school system alone; (d) university and State Department of Education; (e) university, State, and Federal sources; (f) United States Office of Education; and (g) a national or private foundation. Collins further stated that "center proponents are among the more creative of educational fund raisers" (p. 15). With the recent withdrawal of Federal funds for support of teacher centers, centers certainly will have to be more creative in seeking financial backing. Berg (1978) used Collin's identification of funding sources.

Governance of Teacher Centers

Just as there is great variety in types and financing of teacher centers, there is also great variety in the governing of teacher centers. Collins (1974) named a number of different ways of governing teacher centers, which ways were again quoted in Berg's paper (1978): (a) governance by school systems; (b) governance by the university, (c) governance by teachers and parents; (d) governance by university and school systems (for example, the Syracuse-West Genesee Teacher Center with equal representation from among the teaching and administrative staffs of both institutions, along with a university student, three representatives from the Teachers Association, and a jointly appointed coordinator); (e) governance by an advisory board (for example, the Dallas Teacher Education
Center, whose council is composed of two Dallas Independent School District representatives, representatives from each of the seven universities, the regional service center, the professional organizations, and selected community agencies); (f) less structured governance, such as by storefront centers which may be governed by one person; and (g) consortia governance, which has emerged in states such as New York and those that have mandated teacher centers such as Florida and Texas.

Teacher Centers in Japan

Study circles, informal and voluntary groups of teachers who met (and still meet) periodically for study concerning content, method, field trips, or personal skills and interests, were an early forerunner of the established Japanese teacher centers. Teachers who were involved with a study circle would often continue to meet with the same circle for years. Some of these teachers also belonged to more than one study circle. It was a request from members of a science study circle to the chief school officer, for facilities in which to meet and for the opportunity to share their results, as well as, to have equipment available for their use that led to the first Japanese teacher center (DeVault, 1974; DeVault, Egan, & Olmsted, 1978). Bender (1976) considered the study circle to be the
teacher center, while he classified the establishment centers as resource centers.

Other factors contributed to the growth and establishment of teacher centers in Japan, whose early development began in the 1950's. Following World War II when Japan became a democratic nation, a new educational system was organized which considered a new course of study and standard curricula. In 1947, the goals for science education were identified as: "... the attainment of scientific skills, attitudes and knowledge in order to enable one to live a richer life in society and to solve many social problems" (Taira, 1978, p. 585).

Two years later, in 1949, the American model for science education was adopted. An experimental curriculum whose major concerns were the environment and students' needs was instituted in 1950. Japan's economy, which had been ruined during World War II, was given a boost by the Korean War, and Japan's leaders in the emerging industrial-technological field, through education, wanted to prepare Japanese society for an industrial economy. Two other factors--the 1956 plan of the Ministry of Education to increase the number of students in the fields of science and technology, and Russia's launching of Sputnik in 1957--also affected Japan's science education.
The Law for the Development of Science Education in the early 1950's led in 1960 to the development of science education centers for retraining teachers in science education. Introduction of newly developed science programs, especially those from the United States and Great Britain in the 1960's, also had an effect on Japanese science education.

Japan also established centers for other disciplines, but the science centers which increased in numbers and spread throughout Japan are perhaps best known because so much emphasis was placed on science and mathematics and "a recent comparison of 19 western nations showed that Japanese students scored highest on tests in these two areas" (Schmieder and Lovett, 1980, p. 7).

Comparison of British, American, and Japanese Teacher Centers

As in Great Britain, the Japanese teacher center is usually controlled by the local education authority, which is not usually true of American centers. British centers are more concerned with in-service teachers, leaving the training of preservice teachers to the university, while American centers are concerned with both in-service and preservice teachers. Japanese centers are concerned with upgrading teachers' skills and knowledge in science education. Thus we see a relationship between Japanese and
American teacher centers which both focused on inservice education while British centers were primarily concerned with curriculum development. Japanese teachers cannot attend a teacher center at any time, but must work on a rotation schedule with other teachers at their school, unlike American or British centers, which are "drop-in" centers. Centers in Japan, as well as some centers in Great Britain, require a product of some kind from participants, while the centers in the United States do not require a product. Socializing is downplayed in Japanese centers, while British and some American centers tend to look upon socializing as a characteristic of their centers. The Japanese centers, especially the science centers, service more secondary teachers than elementary teachers, while the American and British centers have evolved to meet the needs of elementary teachers. Japan has established massive centers, while the American and British centers are on a smaller scale. Again, little or no evaluative work on any of the centers of these three countries, or the centers of other countries such as Germany, France, the Netherlands, or Sweden, has been undertaken.

Development of Science Teacher Centers

With the emphasis of mathematics and science curriculum development in the 1960's in England, both
single-science and multi-science centers, were established in England. Michael Binyon (1969) described a successful "back alley centre" which focused on research, teacher training, and in-service courses. Single discipline science centers such as the "Chemistry Teachers' Centres" and the "British Physics Centres" have been established as well as centers for biology teachers. The goal of all of these centers was to meet the teachers' needs. An effort has also been made in these centres to involve universities, technical schools, industry, as well as teachers.

Japan has also established science centers which focus on the teachers' needs. Japanese centers are usually housed in very large buildings, are well staffed, and deal with large numbers of teachers. Voelker (1977) noted that concerns of Japanese teacher centers were "(a) a belief that professional growth is continuing education, (b) teachers are expected to engage in professional growth, usually without salary increments, and (c) the national government has placed a high priority on inservice education" (p. 71).

Within the United States, science teacher centers have been established, some supported by NSF funds, while others have not been so supported. David Butts, in one of the few evaluative studies, has reported that teachers in NSF
supported teacher centers work on self-initiated curriculum development, with opportunity for in-depth feedback from colleagues or center staff. This in-depth sharing may be an important factor in the success of these "NSF supported Teachers' Centers in nurturing the professional growth of teachers and in helping them to be professional rather than middle level civil servants" (Butts, N.D., p. 2). Butts also reported that NSF supported centers deal mostly with in-service teachers, while non-NSF supported centers service preservice as well as in-service teachers. Butts concluded that NSF supported centers have been a successful delivery system for these teachers.

Other centers have emerged, such as the "Pacific Science Center" in Seattle, Washington, which is not only a center for teachers, but is also an exploritorium and learning center for students. In Muskego, Wisconsin, the Lutheran Church becomes a Math Teacher Center each week. This particular center has provided activities and guest speakers, as well as facilitated teachers visiting teachers at another school during their in-service days. It has also given members an opportunity to gain a credit at the University of Wisconsin for each eight-week session.

The Eastern North Carolina Science Teaching Resource Cooperative aimed at upgrading science education in rural North Carolina, provides an example of another organizational
type. Although the NSF provided some funds and assisted in the initial stages of development, along with the science and science education departments of East Carolina University and representatives from the North Carolina State Department of Public Instruction, the basic philosophy was that the cooperative would be governed by, financed by, and composed of the schools. Some of the activities were: visiting science programs, teacher workshops, student workshops, honor students' seminars, a film festival, a film library, equipment repair service, and culture centers.

As stated previously and exemplified above, whether they be in England, Japan, or the United States, no two teacher centers are alike; but all have shown a commonality—a bright hope for the local school teachers and students. Schmieder and Lovett (1980) sum up the teacher center movement most appropriately: "Few educational ideas introduced in modern times have sparked as much interest and excitement throughout the education community" (p. 3).

Teacher Center Model

A proposed graphic model of a teacher center that serves middle and high school science teachers was the central focus of the dissertation. After researching the literature, the major characteristics of a teacher center
Figure 1

Model of a Teacher Center that serves Middle and High School Science Teachers

Concerns of Local, National, and World Communities

Concerns of Professional Educators

Teaching Related Concerns of Science Teachers

- Increasing effectiveness of instruction
- How to individualize instruction
- Selection of concepts
- How to teach
- Use of nuclear energy
- Conservation of natural resources
- Environmental control
- Future energy sources
- Teaching processes and the nature of science
- How to educate the gifted
- How to evaluate
- Minority group concerns
- Control of pollution
- Technological survival or supremacy
- Race, ethnic supremacy
- Survival of planet Earth
- Interaction with space
- Education for scientific literacy
- Education of hard to teach
were determined and incorporated into the proposed graphic model. The characteristics are those believed to have an effect on science teachers in their professional growth and development, in curriculum development in their field, on research of pertinent problems in their teaching field, and in resources available for middle and high school science teachers. Joyce, Hersh, and McKibbin, (1983), have stated: "The primary task in staff development is to develop a professional, growth-oriented ecology in all schools" (p. 149).

Looking at the graphic model, (Figure 1), one visualizes the effects of the local, national, and world communities' concerns such as future energy sources, pollution control, use of nuclear energy, and conservation of natural resources on the concerns of professional educators. Some of the concerns of professional educators are: how to evaluate, increasing effectiveness of instruction, and education of the gifted, which in turn will have an effect on the teaching related concerns of science teachers. Joyce et. al., (1983), went on to state, "Teachers who are heavily involved in in-service education have a more positive attitude toward it than those who are less involved" (p. 158). What then is the rationale for such a graphic model development?
Rationale

"In a world changing so rapidly that an education program is often obsolete before the teacher begins his/her career; . . . an ongoing education program is a necessity" (Weiler, 1980, p. 91). If inservice education is indeed considered an ongoing education program, how actively involved should teachers be in the inservice education process? Ngaiyaye and Hanley (1978) have recommended:

The teachers need to be actively involved at inservice meetings and to have topics geared to their interests. Thus inservice meetings may need to be organized for teachers with similar responsibilities as far as possible where teachers can exchange information with those who are likely to have encountered similar problems--or experienced similar successes with ideas, materials, or techniques that worked with students. (p. 310)

One way to meet such inservice needs of teachers is the development of a teacher center model for science teachers at the middle and high school level. Pendergrass (1980) has stated: "The prospects of the collision of the phenomena of teacher centers and in-service education cannot be avoided. Indeed, the collision can even be anticipated with some degree of enthusiasm" (p. 173).
Teacher centers do not exist as a single ideal model, but should be responsive in its development to the needs of its clientele. Yarger and Yarger (1978) have listed three essential criteria that should be taken into consideration in the development of a teacher center: (a) have participation by teachers at all levels, (b) have the teacher as the number one client, and (c) have programs designed that will improve the instruction of students. In Britain, teachers' centres:

serve many significant functions such as linking pre-service educational training and in-service staff development, bringing different educational groups (teachers, administrators, university faculty and the community) together, providing consultative services, acting as a clearing house of information, and lending equipment and resource materials. They assist in reprographic and educational technology, offer a convenient and neutral venue for meetings, exhibitions and displays, and, above all, they create an atmosphere in which teachers explore curriculum materials and help one another think about approaches to teaching. (Dhand & Murphy, 1977, p. 19)

In the statements of Part B of Public Law 94-482 of the Higher Education Amendments of 1976, and in the
development of the graphic model, correlations can be seen and considerations for such a model are substantiated. Teacher centers were defined as:

A site operated by a local educational agency (or a combination of such agencies) which serves teachers, from public and non-public schools of a state, or an area or community within a state, in which teachers with the assistance of such consultants and experts as may be necessary, may--

A. develop and produce curricula design to meet the education needs of the persons in the community, area, or State being served, including the use of educational research findings or new or improved methods, practices, and techniques in the development of such curricula; and

B. provide training to improve the skills of teachers to enable such teachers to meet better the special education needs of persons such teachers serve, and to familiarize such teachers with developments in curriculum development and educational research, including the manner in which the research can be used to improve their teaching skills. (Kaplan, 1978, p. 143)
Within these statements describing the characteristics of what teacher centers in Britain and the United States should have as concerns, can be seen the rationale for the development of the graphic model proposed in this study.

The major focus is on the innermost circle of the graphic model, the teaching related concerns of science teachers. These concerns which teachers have and to which they are committed, will likely spur science teachers to action. Without a deep belief and a commitment to resolve these concerns, changes will not be brought about in their classrooms. When teachers' concerns are not the concerns others feel important, then the second level of the model is brought into play. It becomes the role of professional educators, specifically administrators, principals, curriculum developers, science specialists, and university educators to bring these concerns to the attention of science teachers. Yager, Hofstein, and Lunetta (1981) have indicated how the concerns of professional educators will have an effect on the teaching related concerns of teachers. "In contrast to the goals of science teaching in the '60s, which were limited to specific disciplines, the goals of the '80s must derive from the interaction of science, technology, and society" (p. 12).

These concerns, found on the second level of the model, include the need for education of the gifted and hard to teach, particularly students that have been mainstreamed because
of Public Law 94-142, individualizing instruction, educating for scientific literacy, increasing the effectiveness of instruction, how to teach, and how to evaluate. Influencing the concerns of professional educators and further brought to the attention of professional educators in the book *What Research Says to the Science Teacher* edited by Harms and Yager (1981) are the concerns of local, national, and world communities. Survival of the planet earth, use of nuclear energy, conservation of natural resources, race for technological survival or supremacy, minority group concerns, pollution control, environmental control, future energy resources, and future agricultural needs are problems of the now and future that students must be taught to deal with rationally. Whether it is the concerns of local, national, and world communities, which effect the concerns of professional educators which in turn effect the teaching related concerns of teachers, these concerns can be dealt with individually or together in a teacher center that serves middle and high school science teachers.

Joyce et. al., (1983), nicely sum up the purposes for staff development which relate to the proposed Model:

(a) To enrich the lives of teachers and administrators so that they continuously expand their
general education, their emotional range, and their understanding of children.

(b) To generate continuous efforts to improve schools. School faculties, administrators, and community members need to work together to acquire the knowledge and skills necessary to bring those improvements into existence.

(c) To create conditions which enable professional skill development to be continuous. Every teacher and administrator needs to be a student of learning and teaching and to engage in a continuous process of experimentation with their behavior and that of their students. They need to study alternative approaches to schooling and teaching, to select ones which will expand their capabilities, and to acquire the understanding and skills necessary to make fresh alternatives a part of their ongoing professional repertoire. (pp. 149-50)
Footnotes

1. Teacher center—the term chosen to be used throughout the dissertation rather than teacher's center or teaching center.
References


Butts, D.P. (ND). A report on NSF-supported teachers' centers. Athens, Georgia: The University of Georgia, Department of Science Education.


CHAPTER III

DESIGN OF STUDY

The study will attempt to determine what should be the characteristics of a teacher center designed to meet the needs of middle and high school science teachers. A model based on a review of the literature of desirable characteristics was shared with selected middle and high school science teachers who were interviewed to determine the extent the proposed model meets their perceptions of what a teacher center should be that is designed to meet their inservice needs. (Appendix A) Professional inservice educators were interviewed to determine the extent the proposed teacher center model met their perceptions of the desired characteristics of a teacher center designed to meet the needs of middle and high school science teachers. Following a two week interval, both the science teachers and professional inservice educators answered a questionnaire that paralleled the questions asked in the interviews. Four teacher center personnel were interviewed to determine how the proposed model compared with their perceptions of a teacher center. Teacher center literature was studied to determine to what extent the characteristics of the proposed model and the characteristics of the established center were similar.
Design of Interviews and Questionnaires

Teachers' Interview

An unstructured interview was designed to elicit responses from middle and high school science teachers. Questions included in the interview concerned the feasibility of utilizing a teacher center with the characteristics as proposed in the model. What were hypothesized to be desireable characteristics of a teacher center model and emphasized during the interviews were factors that facilitate attending to the concerns of science teachers such as: the development of curriculum, availability of resources, useful courses for professional growth and development, and the possibility for research and investigation of problems that would have an effect on their instruction. (Appendix B)

Teachers' Questionnaire

Once the interview format was developed, a structured questionnaire paralleling the questions utilized in the interview was constructed. It was hoped that the questionnaire that was administered two weeks following the interview, by frequently forcing teachers to make choices between responses would help clarify the information garnered from them during the unstructured interview. (Appendix B) Questionnaires were judged by a panel of three judges prior to their utilization. Three criteria
were used to judge each question. The criteria were: (a) the question addresses an issue related to the professional life and work of teachers, (b) the meaning of the question is clear and unambiguous, and (c) the question addresses an issue related to the present or possible future use of teacher centers. (Appendix C)

Professional Inservice Educators' Interview

A second unstructured interview was designed for persons labeled professional inservice educators who were identified as instructors at the university level and who were or had been associated with the area teacher center. The interview was very similar to the interview utilized with middle and high school science teachers. What were hypothesized to be desirable characteristics of a teacher center model and emphasized during the interviews were factors that facilitate attending to the concerns of science teachers such as: the development of curriculum, availability of resources, useful courses for professional growth and development, and the possibility for research and investigation of problems that would have an effect on their instruction. (Appendix D)

Professional Inservice Educators' Questionnaire

Following the development of the interview, a structured questionnaire paralleling the questions utilized in the interview was constructed. The questionnaire was
administered two weeks following the interview with the hope that answers elicited in the questionnaire, by frequently forcing teachers to make choices between responses would help reinforce the information garnered from them during the interview. (Appendix D)

The questionnaire was judged by a panel of three judges prior to its utilization. The three criteria used to judge each question were the same as the criteria utilized to judge the questionnaire designed for administration to teachers. The criteria were: (a) the question addresses an issue related to the professional life and work of teachers, (b) the meaning of the question is clear and unambiguous, and (c) the question addresses an issue related to the present or possible future use of teacher centers. (Appendix C)

**Teacher Center Directors' Interview**

A third unstructured interview was designed which closely paralleled the other interviews but because it was designed to be implemented with teacher center directors, some of the questions were directed at teacher use at the respective teacher centers utilized for the study. The interview was implemented with four different teacher center personnel and the literature of each teacher center was collected, studied, and analyzed. (Appendix E)
Rationale for Interview and Questionnaire

One of the earliest forms of an interview survey was no more than observational in nature and was used in an attempt to determine the needs and attitudes of the people. Early census taking might also be classified as a form of interviewing. During the late eighteenth century census study, the U.S. Government adopted a more systematized form of interview (Adams, 1958). Interviews are often used in studies where information concerning people's attitudes, interests, and social perceptions are to be studied. The interview may be unstructured (open-ended) or structured (closed), where subjects are given a choice of stated answers (Butts, 1983; Interviewer's Manual, 1976; Skager and Weinberg, 1971, Sowell & Casey, 1982b; Tuckman, 1972; Wierma, 1975). Today, many types and forms of interviews and questionnaires are utilized in survey research.

The research undertaken for this study elicited information by means of interviews and questionnaires from teachers, professional inservice educators and teacher center directors/personnel as to the usefulness of a teacher center that serves middle and high school science teachers. The interviews and questionnaires were also used to gather information related to the interests and attitudes of teachers, professional inservice educators and
teacher center personnel concerning the needs of science teachers.

The unstructured taped interview was utilized with the teachers, professional inservice educators, and teacher center directors/personnel. This process allowed for a more open answer concerning their views of what a teacher center's characteristics should be and how it can best serve their needs. The questionnaire that was utilized with teachers and professional inservice educators was structured and paralleled the questions in the unstructured interviews so that the interviewer could determine if the information given during the interview paralleled the information elicited by the questionnaire.

Tuckman (1972) has stated that "questionnaires and interviews are used by researchers to convert into data the information directly given by a person (subject)" (p. 173). Butts (1983) has indicated that:

survey research is a significant way of generating knowledge of what is. Today this is especially needed in areas where our knowledge is limited as in how students develop concepts or interests in science or how teachers facilitate their development of ideas or interest. (p. 192)

In an earlier published paper, Yager (1982) made a case for qualitative research in science education when he stated:
The emergence of qualitative synthesis in science education research suggests a new maturity for the discipline. It suggests that we are now able to use our research more directly in affecting practice as well as future research activity. We have the beginning of theory bases for our efforts. Some science education researchers now see qualitative synthesis studies as providing a necessary ingredient for moving our discipline from its current state of crisis. (p. 349)

Population

Tyler, Texas teachers and professional inservice educators were chosen for the study because there is an established teacher center in this area and it can be expected that teachers and professional inservice educators are familiar with the teacher center idea. Texas law mandates a teacher center where there is a school of education and with such a school at The University of Texas at Tyler, a young eleven year old upper division university, it was a good place for the research undertaken for this dissertation. Two predominantly black colleges with schools of education, Texas College and Jarvis Christian College, are included within the umbrella of the teacher center and professional inservice educators
from these institutions were included in the study. (Appendix F)

Tyler Independent School District

Dr. Henrietta Grooms, assistant superintendent of the Tyler Independent School District, arranged for accessibility to Tyler teachers by writing a letter to the principals at the six middle schools and two high schools. Contact was made with each principal. Teachers to be interviewed at the middle schools were suggested by the middle school principals. The principals at the high schools suggested contact be made with the heads of the science departments who in turn asked for volunteers to be interviewed. Middle school teachers suggested by the principals were contacted and readily agreed to an arranged interview while three volunteers from each of the two high schools were contacted and agreed to an arranged interview. One middle school principal suggested that two teachers at his school be interviewed, one categorized by the principal as being structured, and the other as being unstructured in the methods of teaching, thus giving seven interviewed middle school teachers and six interviewed high school teachers. Arrangements were made to interview the teachers during their conference periods over five school days as the school year was coming to a close. Two middle school teachers were not able to complete the
interview in a single conference period, so arrangements were made to finish the interview during another conference period. One middle school teacher chose to be interviewed in the morning before school began. Seven of the teachers interviewed were administered the questionnaire exactly two weeks following the interview while the six remaining teachers were given the questionnaire with instructions to answer the questionnaire on a set day and mail it in the envelope provided. This was necessary as school was finished for the summer on Friday and the questionnaires were to be administered at the beginning of the next week.

Professional Inservice Educators

Arrangements were made to interview five professional inservice educators during the month of June, three from The University of Texas at Tyler, and one from Texas College, and a former administrator and university instructor from Tyler Independent School District. The last professional inservice educator to be interviewed was from Jarvis Christian College and being unavailable during the summer months, the interview was completed in September. Questionnaires were administered to each interviewee exactly two weeks following the interview except for one professional inservice educator at The University of Texas at Tyler who was leaving town and completed the questionnaire a day earlier than planned.
Teacher Center Personnel

Arrangements to interview four teacher center directors were a little more complicated than the arranged interviews with teachers and professional inservice educators. Texas teacher centers are mainly involved with student teachers in the field and their cooperating teacher so an effort was made to locate teacher centers that would more closely resemble the proposed graphic model. Tom Ryan's help at the Texas Education Agency was enlisted and he suggested three area teacher centers—Dallas, Fort Worth, and Austin. Contact was made with all three school districts and arrangements were made for interviews during October. The term teacher center personnel is utilized because the teacher center directors in Fort Worth and Austin had just been relieved of their appointments and alternate people were suggested. At the Dallas Independent School District, two teacher center personnel with equal standing were interviewed together. At the Fort Worth Independent School District, the interim teacher center director who is also the curriculum director was interviewed. In the Austin Independent School District where the teacher center director had just been replaced, a professor at St. Edwards University, a long standing member of the Austin Teacher Center was interviewed. The fourth teacher center person to be interviewed was the field experience
Definition of Terms

1. Science Teacher(s)—person or persons who instruct students in the study of science at the middle or high school level.

2. Professional Inservice Educator(s)—person or persons who were or have been associated with a teacher center and are or have taught at the college or university level.

3. Teacher Center Personnel—person or persons who are staff members or directors of established teacher centers.

4. Model—proposed graphic representation of a teacher center that serves middle and high school science teachers.

5. Interview—unstructured format used to elicit information from teachers, professional inservice educators, and teacher center directors/personnel by a taped interview between the interviewer and interviewee, which allows the interviewee an open-ended response.

6. Interviewer—person conducting the research.

7. Interviewee—teachers, professional inservice educators and teacher center directors/personnel.
8. Questionnaire—structured list of statements that teachers and professionals responded to by choosing one of the statements which best expressed their feelings.

9. Middle School—generally a school that serves students from grade six to grade eight, but on occasion may include grades five and/or nine.

10. High School—generally a school that serves students from grade nine to grade twelve.

Analysis of Data

Most of the data collected for this study were audio-taped interviews which were later transcribed for individual analysis. Pertinent responses to interview questions along with reported responses on the questionnaire for teachers and professional inservice educators were reported in a qualitative method. Questionnaires were collated and statistically analyzed using chi-square analysis.

Transcribed taped interviews with teacher center personnel were qualitatively analyzed question by question. A comparison of the teacher center's literature with the proposed graphic model was undertaken and reported.
References


CHAPTER IV
RESULTS

In this chapter are compiled the results and analysis of the interviews and questionnaires utilized with science teachers and professional inservice educators. Answers to the questionnaires are given and pertinent statements from the interviews which add emphasis to the questionnaire answers are included. A chi square analysis of the results of the questionnaires with the teachers and professional inservice educators is reported. Any additions to the proposed graphic model by either the teachers or the professional inservice educators are included and discussed.

Results of interviews with teacher center directors/personnel are reported in another section of this chapter. Following the results of these interviews, a section that deals with the study of the literature of the four teacher centers is reported. Characteristics of the four teacher centers and characteristics of the proposed graphic model are compared.

Background information about teachers, professional inservice educators, and teacher center directors/personnel is listed in the appendix section. Following the completion of the interviews and questionnaires,
a written consent form was sent to all subjects of the study for permission to release the information. One science teacher chose to withdraw the information from the study. (Appendix G)

Teacher Interview-Questionnaire

The interview question will be stated, followed by the questions and responses to the questions on the questionnaire. The number of teachers answering out of a group of twelve teachers will be given in brackets following the choice of answers. An analysis of the answers given during the interview will be stated followed by teacher comments from individual teacher interviews that are considered particularly relevant.

Interview Question 1. Through the years, a variety of methods have been utilized to help teachers improve their professional inservice development, such as... professional education courses (which are offered after school hours, in the evening, or during the summer), inservice days, workshops, etc. Would you comment briefly on how effective you believe these to have been in the past? Were there long lasting effects or were they shortlived? Did you prefer one over the other? For what reason(s)?
Questionnaire 1. To what extent has the professional inservice development of teachers been affected by attendance:

...at inservice days?


...at workshops?


...at professional education courses?


Generally, workshops and professional education courses were regarded as more effective in the professional inservice development of teachers than were inservice days though only a small minority of the teachers regarded any of the options as very effective.

Seven teachers indicated that inservice days in the past were not very effective while three teachers spoke to the effectiveness and ineffectiveness of some inservice days. One teacher indicated that in the past two years teachers were given opportunity to participate in planning inservice days which led to more effective inservice days. A twelfth teacher was a first year teacher and could not speak to the past.
The workshops preferred by teachers would focus on issues and problems that would help them be more effective teachers of science. Meetings where science teachers come together with an opportunity to discuss and share pertinent science teaching information were also mentioned as a preference for inservice days.

Interview Question 2. In the past it has been suggested that teachers have been little involved in the development of curriculum for the classes that they teach. Has this been your experience? How in your opinion, has curriculum been determined in the past? Has this been a satisfactory procedure? Why or why not? If teachers were to be involved to a greater extent, what form would their involvement take?

Questionnaire 2. To what extent should teachers be involved in the development of the curriculum for the classes that they teach?

a) very much [12 of 12] b) some [0 of 12] c) little [0 of 12] d) very little [0 of 12] e) none [0 of 12]

The teachers were unanimous in their belief that teachers should be very involved in the development of curriculum for the courses that they teach.

During the interviews, six teachers felt because they were able to implement the material in a curriculum guide
in any way that they choose, that they then had input into development of curriculum. Only one of the teachers in this group actually developed curriculum to be used for advanced and gifted science classes. Of the remaining six teachers, five expressed the feelings that teachers were not involved to any great extent in the past while the remaining teacher, a newcomer to the field, did not express an opinion.

Some of the teachers mentioned that the development of curriculum in the past has followed state guidelines with the district issuing guidelines in the form of curriculum guides. Most teachers felt that the curriculum guides were just that - curriculum guides. T-9 stated, "...I was handed a curriculum guide, and ever since I've been here, we've continued to improve on the curriculum guide--add and delete from the curriculum guide." In referring to curriculum development before teachers' recent involvement, T-6 related receiving a guideline outlining what was to be taught and each teacher implemented their own curriculum. When asked if the determination of curriculum was satisfactory in the past, T-3 commented,

I think it's been effective, but from my own personal point of view, I think it would be better if we had a chance [to develop it ourselves], or it has been better since the teachers have had an opportunity to
put more input into it themselves, rather than just a small committee of a select group.

Comments from two teachers who are fairly new to the district were: T-9 "...I think as far as our curriculum guide is established and has been maintained under the past four years, it's very satisfactory." These thoughts were expressed by T-1, "I wasn't involved directly in the making of it, but as far as the outlines and the content of the curriculum, it seems to be pretty adequate." One teacher T-2, expressed dissatisfaction with curriculum development stating that not enough thought has been applied to bring teachers together or to give a conciseness to what should be taught.

Two teachers felt that they were involved in curriculum development and did not know what more teachers could do, while the other ten teachers believed teachers should become more involved in curriculum development.

At this time, the proposed graphic model was introduced and a brief explanation of the model was given. Teachers had time to study the model and to clarify any parts of the model they felt needed further explanations.

Interview Question 3. In recent years, Americans have adopted the British Teacher Centre idea, an environment for teachers' professional development,
which takes into consideration teachers' individual needs and the educational conditions of the area in which they are located. As a science teacher, can you elaborate on any feasible goals or educational needs that could be met by a teacher center that serves middle and high school science teachers? (ex. sharing of ideas, development of curriculum, increased content knowledge)

Questionnaire 3. To what extent, in your opinion, would a teacher center that serves middle and high school science teachers, meet the following goals and educational needs:

...sharing of ideas?

...development of curriculum?
- a) very much [4 of 12] b) some [7 of 12] c) little [0 of 12] d) very little [1 of 12] e) none [0 of 12]

...increased content knowledge?
- a) very much [5 of 12] b) some [6 of 12] c) little [0 of 12] d) very little [1 of 12] e) none [0 of 12]

Generally teachers were very supportive of the idea that a teacher center that serves middle and high school science teachers should be a place for the sharing of ideas, the development of curriculum, and increased content
knowledge while the teacher center as a place for the sharing of ideas was the most popular concept.

Some of the suggestions offered by the teachers for feasible goals or educational needs that could be met at a teacher center were: sharing of ideas, teachers meeting together, development of a sequencing of science coursework through the grades, educating and evaluating the gifted, familiarization of new teachers with a science classroom, and teachers arranging cooperative field trips. T-6 has expressed thoughts on why a teacher center can be a positive factor in meeting long range educational goals.

I think emphasis should be placed on science. For too long, we've gone without it, seemingly, since we sent man to the moon. Science has taken a background. I think if we're going to be technologically competent, we're going to have to place more concern on these youngsters starting at the middle school age, or really, at the elementary school age. We're loosing a lot of good students because we're not placing emphasis on science anymore. I can see where a teacher center would really serve a prime purpose. It's going to take something like this, where science teachers can come together, share ideas, map out a program, and then not only call it to the attention of the local people, but nationally. And I think it's going to come from something such as a teacher center.
Interview Question 4. A number of ways have been proposed that a teacher center could be helpful to teachers. For example, it has been suggested that at a teacher center, teachers could get help in improving their teaching skills. What kinds of teaching skills would you suggest teachers need help in improving? Would teachers be interested in learning how to use guided inquiry in their classroom, a strategy designed through the use of structured questions to lead students to an answer? Would teachers seek help for ways to teach concepts such as the concepts of equilibrium in chemistry, genes in life science and biology, electricity in physical science, and magnetism in earth science? Do teachers need assistance in implementing games, role playing, and simulations in teaching? Would teachers seek help in implementing higher level questions in their teaching? How would a teacher center be helpful to you?

Questionnaire 4. To what extent would a teacher center be helpful to teachers in improving their teaching skills?

a) very much [7 of 12]  b) some [4 of 12]  c) little [1 of 12]  d) very little [0 of 12]  e) none [0 of 12]
Teachers were generally positive in thinking that a teacher center could be helpful to teachers in improving their teaching skills.

Eleven teachers offered suggestions of various teaching skills that they or other teachers need help in improving. The suggestions from T-1 included help with public speaking which would allow teachers to better explain procedures and the sharing of ideas. T-5 identified relating to your students effectively and learning how to meet students' individual needs as skills to be improved. T-10 recommended that more can be learned just talking with other teachers and that all teachers could benefit from computer work. T-9 suggested that teachers need help in making science applicable to everyday life. T-12 was concerned with the skill of learning how to formulate tests that are more concept oriented than fact oriented. T-11 expressed a need for improving skills in laboratory procedures while T-4 would seek help for alternative ways to teach chemistry concepts without involving mathematical computations which tend to make students fearful.

The two remaining teachers mentioned closely related skills that they would need help in improving. T-6 mentioned the skill of matching concepts to grade level and T-3 suggested implementing a variety of techniques for presentations to insure maximum learning of students.
When asked if teachers would be interested in learning how to use guided inquiry, nine teachers indicated that they would like to learn this method. T-4 stated that "if a teacher masters that, he's going to be definitely a good teacher." T-7 expressed the thought that the more variety or strategies you're able to use in a classroom, the better for students' learning. The three remaining teachers were using guided inquiry and were pleased with the method as it makes the student think.

The majority of the teachers felt that teachers would seek help for ways to teach concepts, while T-9 stated that teachers who have taught for extended periods of time and felt they have all the answers or clear-cut methods, may not seek help.

When teachers were asked if they needed assistance in implementing games, role playing, and simulations in teaching, seven teachers answered that they would. T-8 stated that some teachers would not use these methods to teach and added, "I'm not going to role play, because I don't function that way." T-11 gave a definite "no" while T-9 felt that teachers who are strict disciplinarians would not use these methods because they would loose a certain amount of control. This particular teacher went on to state that these teachers need to become more relaxed with these ideas and more familiar with them. T-10 believed
that if you could get into a classroom to see what other teachers are doing, this would be the biggest help. T-12 felt that instead of using games developed by teachers, more effective learning for the students would have students developing their own games as they must learn the information necessary to develop the game.

Teachers expressed mixed ideas about seeking help in implementing higher level questions. T-1 thought that teachers who want to do a good job would seek help. T-3, T-6, and T-11 would seek help while T-8 felt that teachers right now might be hesitant. T-12 would also seek help in implementing higher level questions but doubts others would. T-4, T-5, T-7, T-9, and T-10 placed higher level questioning with the more able students such as gifted and honor students. T-2 stated that the major concern was getting material across to students reading below the reading level of the textbook and that using higher level questions would have negative results.

Teacher centers would be most helpful to teachers as places to share ideas and as T-11 stated, a place to gain information from people with experience in your discipline. T-12 would like teacher centers to be places where one has access to games and lab animals that are difficult to keep in a classroom. T-8 thought that a teacher center would
be helpful as long as it wasn't mandatory while T-5 thought a teacher center would be helpful in all ways.

Interview Question 5. It has also been suggested that at a teacher center, teachers would have the opportunity to share with each other teaching experiences that they have had in their own classrooms. Some have suggested that specific techniques that they utilize in their classrooms might be shared. Do any specific techniques come to your mind? Would sharing units of study that they have developed be worthwhile? What would you suggest that other teachers might do that you would be interested in having them share with you? What kind of things do you do that would be of interest to other teachers?

Questionnaire 5. To what extent would teachers utilize a teacher center as an opportunity?

...to share teaching experiences that they have had in their own classrooms?

a) very much [6 of 12] b) some [5 of 12] c) little [1 of 12] d) very little [0 of 12] e) none [0 of 12]

...to share specific techniques that they utilize in their own classrooms?

a) very much [7 of 12] b) some [3 of 12] c) little [0 of 12] d) very little [2 of 12] e) none [0 of 12]
...to share units of study that they have developed?

a) very much [4 of 12]  b) some [6 of 12]  c) little [0 of 12]  d) very little [2 of 12]  e) none [0 of 12]

In general, most teachers were in agreement that teachers would utilize a teacher center as an opportunity to share teaching experiences that they have had in their own classroom, to share specific techniques that they utilize in their own classrooms, and to share units of study that they have developed.

T-1 and T-9 mentioned that they would share their lab work, particularly their outdoor labs. T-9 extended the laboratory work to students' interests such as one student's interest in doing a study of bacterial cultures from the bacteria on the school's band instruments. T-1's lab strength is outdoor labs but would like teachers to share laboratory procedures concerned with the dissection of various organisms. T-3 would like teachers to share dissection techniques for life science and how to keep the students interested in dissection. In turn, T-3 would share activities utilized during the study of the human body.

T-10 indicated that other teachers have asked that lab procedures in a lab book developed by this teacher as well as games developed by the same teacher be shared with them. T-12 was particularly interested in T-10's games and would share techniques for role playing and student written
or developed games. T-5 would share techniques for lab practicals for biology with other teachers. T-4 and T-6 would share techniques that involved word games particularly chemistry symbol word games utilized by T-4, and genetic and oxidation/reduction word game sheets used by T-6.

The majority of teachers thought sharing units of study to be worthwhile. T-9 expressed it this way, "I think that everybody who has had success would love to get up and say, 'I've succeeded. Let me tell you about it.'"

Interview Question 6. As a teacher interested in your own personal and professional growth, do you think that it would make a difference if a university credited course was offered at the university or on-site at a teacher center? When considering that the Tyler Independent School District requires teachers to take additional credits every five years, what factors become important in making your selection of a course or courses? Does time make a difference in your course choice? If you elected to take your courses at a teacher center, what times would be convenient for you—during school hours, after school, evenings, or weekends? Do you want science content courses or would you prefer to have specific education courses? What science courses or what specific education courses would you consider? Would you suggest some science content courses or specific education courses that
might be geared to meeting teachers' specific needs? Would courses such as the following generally fit the needs of a sizeable number of teachers—"New Developments in Science Curricula", "New Equipment for Use in a School Laboratory", "Computers in Science Education", "Career Education in Science", and "Analysis of Instructional Strategies"?

Questionnaire 6. Would offering a course at a teacher center rather than on-site at a university influence teachers to choose the teacher center rather than the university?

a) very much [5 of 12] b) some [5 of 12] c) little [2 of 12] d) very little [0 of 12] e) none [0 of 12]

In general, teachers felt that offering a course at a teacher center rather than on-site at a university would influence teachers to choose the teacher center rather than the university.

Surprisingly, only seven teachers spoke about taking a course at the teacher center during the interview with three teachers indicating no preference and two teachers choosing the university. A difference in their choice of answers was seen two weeks later on the questionnaire.

Teachers were primarily concerned with taking a course that would be of interest to them and a course that will aid in their teaching. Two teachers, T-2 and T-12, said
that time was a factor in their choice of courses while T-3 would choose a course in his/her specific field of teaching because it otherwise might not be approved at the administration level for professional growth.

In general, teachers would take their professional growth courses in the summer while T-7 stated no time preference for courses. If courses were to be offered at a teacher center, four teachers preferred "weekends", six teachers mentioned "after school", and two teachers chose "during school hours".

When given a choice between science courses or specific education courses, eleven teachers chose science courses while the twelfth teacher (T-12) would "like to see a combination of science content with educational...As a scientist, most of the scientists say that education has no value. I don't say that. I learned, when I did my workshop, that there are a lot of things that the educational people say that dovetails with what we do." Nine teachers mentioned science courses that would benefit their teaching, while T-9 suggested a reading course for teachers to judge the readability of their textbooks. T-10 suggested courses in general topics which would aid teachers in areas where they have trouble getting the materials across to students. Another suggestion by T-3 looked to "a refresher educational course as far as techniques, approaches, methods and things
like this." This same teacher thought that teachers should stay with courses in their own particular disciplines.

While all teachers did not choose all the courses given as examples, the first three courses, "New Developments in Science Curricula", "New Equipment for Use in a School Laboratory", and "Computers in Science Education", were perhaps the most favored, especially the computer course. Two teachers expressed their thoughts on the equipment course; T-8 said that they couldn't even get the old equipment while T-12 thought that the course would be good if one could get the new equipment.

Interview Question 7. It has been suggested that teacher centers can provide help and direction to teachers as they investigate and seek answers to problems and issues that confront them. At a teacher center, teachers would have access to various resources such as literature related to the problem(s) to be investigated, access to teachers who have investigated similar problems, or university professors knowledgeable in areas of problems to be investigated. What are some problems and issues that you and other teachers recognize that you believe the resources available at the teacher center could be helpful in finding better answers? Some problems that might be investigated are: How can individualized instruction be
implemented in my classes? What are some evaluative methods for judging achievement of higher level objectives, i.e., after reading information on the earth's solstice and equinox, the learner will be able to compare the earth's solstice and equinox; or the learner will be able to elaborate on the pros and cons of nuclear energy after thoroughly researching the issue? What can I as a teacher do to integrate "special needs" children into my classroom, i.e., physically or mentally handicapped, slow learners, or students who cannot read? In what ways can science teachers instruct their students in the art of writing?

Questionnaire 7. With resources such as literature related to the problems, university professors, and other teachers available at a teacher center, to what extent would science teachers utilize these resources in investigating problems and issues related to the teaching of science?


Almost all of the teachers felt that teachers would utilize resources such as literature related to the problem, university professors, and other teachers available
at a teacher center in investigating problems and issues related to the teaching of science.

During the interviews, eleven teachers suggested problems/issues that could be investigated with the one remaining teacher unable to come up with a definite problem/issue but reaffirming that the examples given were good problems/issues to be investigated.

Two suggestions by T-6 of problems/issues to be investigated were: "how to get students interested in science again", and "how to remove the stigma that science is hard." In T-6's particular teaching situation, students are not grouped according to their ability as they are in other disciplines which poses a problem for higher ability students, an issue T-6 felt could be investigated. T-8 also expressed a need for help in reaching students that are grouped in mixed abilities classes while T-4 stated the same thoughts in a different way--making sure that you meet the needs of all students in the classroom. Teachers identified students who have trouble reading or students who are reading below level as a problem to be addressed. T-5 and T-9 would like professional help to be available in identifying and teaching mainstreamed and physically handicapped students. These same two teachers along with T-1, expressed their concern that lack of adequate
materials was a problem that could be addressed at a teacher center.

Three more problems/issues that were mentioned were how to motivate students, how to teach the gifted, and how to distinguish in children learning disabilities that were not as serious as had been previously thought.

Interview Question 8. It is thought by some educators that the teacher center can offer assistance to teachers carrying out small research projects in their own classrooms. Do you believe that it is feasible for teachers to do research related to the effectiveness of instruction? Some suggested examples of such research projects are: concrete evidence of a teacher's effectiveness, strategies to implement different methods of teaching and indicators of the effectiveness of each method, and comparison of two different curricula at the same level. Do you think these are feasible topics to research? What are some other research projects that the personnel at a teacher center might assist a teacher in carrying out?

Questionnaire 8. To what extent would teachers utilize a teacher center that offered assistance to teachers in carrying out, in their own classrooms, research such as that related to the effectiveness of instruction?
The majority of teachers answered during the interviews and on the questionnaires that teachers would utilize the assistance offered at a teacher center for carrying out research.

Teachers stated the following views concerning the feasibility of doing research related to the effectiveness of instruction. T-8 remarked, "When you do something like that, you don't know whether the teacher is really being effective or they're training the student to answer so that they'll look effective." T-6 thought if the class was small enough, it would be feasible, but in a larger class, you'll teach only what you are supposed to teach. T-12 commented that teaching strategies were effective if the students were motivated and contended that one could not prove that one teaching strategy was more effective than another because it was affected by the students' particular motivations.

Teachers offered various suggestions concerning assistance for research projects by personnel at a teacher center. Responses included suggestions for different evaluation methods, curriculum comparisons between regular classes and classes with mainstreamed students, information concerning different ways to group students, techniques
Interview Question 9. A suggestion has been made that a teacher center should be a place where a teacher could consult with informed personnel on educational issues, where curriculum units from other schools would be available for inspection and study, where live materials such as plants or animals and apparatus that your lab lacks would be available on loan or at very low cost, some of which would have to be reserved, picked up and returned. How useful do you believe each of these services would be to you and your fellow teachers? What kinds of equipment would you suggest that a teacher center might stock that would be useful to you, i.e.,:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics:</td>
<td>oscilloscope, car motor, Van de Graaf generator, cathode ray tube</td>
</tr>
<tr>
<td>Biology:</td>
<td>dissecting microscope, specimen models</td>
</tr>
<tr>
<td>Chemistry:</td>
<td>atomic models, centrifuge</td>
</tr>
<tr>
<td>Earth Science:</td>
<td>rock collections, geiger counters</td>
</tr>
<tr>
<td>Life Science:</td>
<td>live or preserved specimens</td>
</tr>
<tr>
<td>Physical Science:</td>
<td>telescope, barometer, thermometers</td>
</tr>
</tbody>
</table>
Questionnaire 9. To what extent would a teacher utilize a teacher center that made available:

...informed personnel on educational issues for consultation?

a) very much [2 of 12] b) some [8 of 12] c) little [2 of 12] d) very little [0 of 12] e) none [0 of 12]

...curriculum units from other schools for inspection and study?

a) very much [1 of 12] b) some [10 of 12] c) little [1 of 12] d) very little [0 of 12] e) none [0 of 12]

...live materials such as plants and animals?

a) very much [7 of 12] b) some [4 of 12] c) little [0 of 12] d) very little [1 of 12] e) none [0 of 12]

...equipment or apparatus, some of which would have to be reserved, picked up, and returned?

a) very much [8 of 12] b) some [2 of 12] c) little [2 of 12] d) very little [0 of 12] e) none [0 of 12]

The teachers in general indicated that they would utilize a teacher center that made available: informed personnel on educational issues for consultation, curriculum units from other schools for inspection and study, live materials such as plants and animals, and equipment or apparatus, some of which would have to be reserved, picked up, and returned.
Each teacher had a list of equipment that would be helpful in their individual disciplines. T-4 suggested that curricula be available, while T-10 stated that educational consulting and college curricula be made available for advanced science classes for students wishing to take the test for advanced placement. Some teachers made the suggestion that expensive equipment or little used equipment be shared with other schools, even school districts.

Interview Question 10. What factors might interfere with your use of a teacher center? Would the location of the teacher center have an effect on your use of such a center? If you had a part-time job or coaching job, would this also affect your decision about using a teacher center? If the school district did or did not provide released time for using the teacher center, would this also have an affect on your decision about using a teacher center?

Questionnaire 10. To what extent would factors such as the following discourage teacher use of a teacher center?

...a teacher center located 20 miles away?

a) very much [8 of 12] b) some [2 of 12] c) little [2 of 12] d) very little [0 of 12] e) none [0 of 12]
...a teacher center located 50 miles away?
a) very much [10 of 12] b) some [1 of 12] c) little [1 of 12] d) very little [0 of 12] e) none [0 of 12]

...a coaching or part-time job?
a) very much [4 of 12] b) some [7 of 12] c) little [1 of 12] d) very little [0 of 12] e) none [0 of 12]

...failure of the district to provide released time?
a) very much [3 of 12] b) some [5 of 12] c) little [4 of 12] d) very little [0 of 12] e) none [0 of 12]

Teachers were in agreement that distance and a coaching/part-time job would discourage teacher use of a teacher center. On the questionnaire teachers did not agree as to what impact failure of the district to provide released time would have on their use of a teacher center. During the interviews, the majority of teachers said it would have no effect on their use of a teacher center.

While teachers felt that location was a factor in their use of a teacher center, most teachers expressed the opinion that the teacher center would be centrally located and thus it would be used. As T-9 stated, "If the teacher center is only going to be open from 8 to 5 or 8 to 3 or 8 to 12, that's going to limit the use of the teacher center." T-9 went on to address part-time/coaching job interference with teacher center use by stating if the teacher center was available at certain times on the
weekends, maybe from 8 to 11 on Saturday, or from 1 to 5 on Sunday, those of us who have extracurricular activities could go to the teacher center and utilize it.

Even though most teachers felt that a part-time/coaching job would interfere with the use of a teacher center, T-4 stated that these teachers could budget their time to utilize a teacher center. T-2 conveyed this thought, "I don't have any part-time [job], but I think if I did I could work around it because, number 1, this should be my main concern as related to my teaching a subject."

Seven teachers said that whether the school provided released time or not, it would not affect their use of the teacher center. A few of these teachers would like to use their conference period at the teacher center if the location was convenient. An eighth teacher expressed her thoughts about released time: (T-12) "I have come to the conclusion that released time is not a good solution for doing anything because it takes away too much from teaching in the classroom." T-5 didn't understand how released time would work but thought it would be wonderful if it were provided. Of the three remaining teachers, one was a definite "yes", that failure to provide released time would affect use while T-3 said, "It probably would, but I would probably also try to find some way, because teaching is my first position". T-2 had this statement concerning
released time, "Yes, it would. I feel like if I'm in the TISD [Tyler Independent School District] that they should provide the means for me to take advantage of it".

Interview Question 11. What characteristics do you believe that teacher centers should have that serve teachers interested in the teaching of science? Examples: a place for teachers to meet socially, a center governed by teachers, a place where resources are available, a center aimed at the professional growth and development of teachers, a place where curriculum units are available or can be developed, and a place where teachers can carry on research.

Questionnaire 11. To what extent do you believe that a teacher center should have the following characteristics:

...a place for teachers to meet socially?

...a center governed by teachers?
 a) very much [5 of 12] b) some [5 of 12] c) little [2 of 12] d) very little [0 of 12] e) none [0 of 12]

...a place where resources are available?
 a) very much [9 of 12] b) some [2 of 12] c) little [1 of 12] d) very little [0 of 12] e) none [0 of 12]
...a center aimed at the professional growth and
development of teachers?

a) very much [8 of 12] b) some [2 of 12] c) little
[2 of 12] d) very little [0 of 12] e) none [0 of 12]

...a place where curriculum units are available or
can be developed?

a) very much [9 of 12] b) some [1 of 12] c) little
[1 of 12] d) very little [1 of 12] e) none [0 of 12]

...a place where teachers can research?

a) very much [9 of 12] b) some [1 of 12] c) little
[1 of 12] d) very little [1 of 12] e) none [0 of 12]

In answering the questionnaire, teachers seemed to be
more concerned with the educational aspects of the teacher
center--research, curriculum, professional growth and
development--than with esoteric matters--social and
governance.

While most of the teachers reiterated some of the
examples mentioned, T-4 stated, "I think if they [teachers]
have direct input into anything, they're going to work hard
at it to obtain results... Anything that's going to directly
affect their use of it and make it affective, I think
teachers need to have a say in it."

Interview Question 12. Teachers should be one of the
primary benefactors of a teacher center. What do you
believe would be some of the outstanding benefits to
teachers of a teacher center that serves science teachers? (i.e., improved teaching skills, opportunity for investigating problems in a classroom, specific courses that meet teachers' needs)

Questionnaire 12. To what extent, in terms of your understanding of a teacher center, do you feel that a teacher center would be helpful to teachers in:

...improving their teaching skills?
a) very much [6 of 12] b) some [4 of 12] c) little [2 of 12] d) very little [0 of 12] e) none [0 of 12]

...opportunity for investigating specific classroom problems?
 a) very much [5 of 12] b) some [7 of 12] c) little [0 of 12] d) very little [0 of 12] e) none [0 of 12]

...offering specific courses that meet teachers' needs?
 a) very much [10 of 12] b) some [2 of 12] c) little [0 of 12] d) very little [0 of 12] e) none [0 of 12]

The answers given on the questionnaire indicated that teachers are interested in improving their teaching skills, investigating specific classroom problems, and taking specific courses that meet their needs.

During the interviews, most teachers restated some of the previously mentioned benefits such as sharing ideas, improved teaching skills, resources, courses, investigating problems in a classroom, and availability of resource
people. T-9 expressed a different kind of concern that
the teacher center could also become a "dumping ground"
of problems.

Two teachers nicely summed up the benefits of a
teacher center for a teacher. T-2's summation read:

OK, you say teachers should be one of the primary
benefactors of a teaching center. I think this is
what the whole thing is about, is to help the teacher
do a better job and to avail themselves of the
opportunity, the possibilities, or the convenience
of a center, which right now, in several cases, that
we are limited in.

T-5's statement read:

Improved attitudes. To have a teacher center, to be
able to relate to other teachers, to have different
materials available, I think it would improve your
classrooms, so consequently if you're doing a better
job and you feel more comfortable with what you're
doing and you're enjoying what you're doing--if you've
got all these things that are available to you, then
it can be so exciting.

Interview Question 13. Students should benefit if
their teachers take advantage of the resources avail-
able at a teacher center. What would be some of the
major benefits to the students of teachers taking
advantage of such a teacher center? (i.e., increased understanding of what is taught, classes that are more interesting, being more highly motivated, scoring higher on tests, courses that are more relevant)

Questionnaire 13. When teachers take advantage of the opportunities offered by teacher centers, their students could be expected to benefit:

...by increased understanding of what is taught?

a) very much [7 of 12] b) some [5 of 12] c) little [0 of 12] d) very little [0 of 12] e) none [0 of 12]

...from classes that are more interesting?

a) very much [8 of 12] b) some [3 of 12] c) little [1 of 12] d) very little [0 of 12] e) none [0 of 12]

...by being more highly motivated?

a) very much [4 of 12] b) some [7 of 12] c) little [1 of 12] d) very little [0 of 12] e) none [0 of 12]

...by scoring higher on tests?

a) very much [2 of 12] b) some [9 of 12] c) little [1 of 12] d) very little [0 of 12] e) none [0 of 12]

...by courses that are more relevant?


Generally, teachers felt that students would benefit in all areas cited if teachers took advantage of the opportunities offered by teacher centers.
During the interviews, teachers spoke of the benefits to students of teachers that take advantage of the opportunities offered by teacher centers. T-5 summed up what all the other teachers said:

When your teacher is more enthusiastic and has fresh new ideas to share with you, then consequently it's a contagious behavior. Positiveness is contagious, negativeness is contagious. If your teacher is positive, then that's going to be passed on to your students, and I think all the way around, you're going to have a much more enjoyable situation. That is where we could start to improve the attitudes of our science students, and maybe bring more in. If they could hear, "Hey, we're having fun. We're doing a lot of different things in here. We're not just having to take notes and take tests. We're doing new and exciting things." I think that would be passed on. All of us right now are just sitting. We know this has to be done, but we're kind of scraping for different ideas on how to get started. I think you'd see a tremendous change in your classes.

Interview Question 14. If given an opportunity to meet the required inservice days in any professional manner that you chose, what ways would you choose? (Depending on answer, might mention: workshops,
professional meetings, lectures, courses, and teacher centers)

Questionnaire 14. If teachers had the opportunity to meet required inservice days in any professional manner that they chose, to what extent would teachers choose:

...workshops?

...lectures?

...professional meetings?

...teacher center?
  a) very much [8 of 12] b) some [4 of 12] c) little [0 of 12] d) very little [0 of 12] e) none [0 of 12]

...courses?
  a) very much [2 of 12] b) some [9 of 12] c) little [0 of 12] d) very little [1 of 12] e) none [0 of 12]

The results stated in the questionnaire parallels closely to what the teachers stated during the interviews. The favored choices for inservice days were the teacher center, courses, and workshops with lecture and professional meetings the least chosen.
Four teachers, (T-1, T-6, T-11, and T-12), chose workshops and teacher centers as ways to meet inservice day requirements. T-5 stated that workshops geared to a specific curriculum such as secondary biology would be a good way to meet inservice day requirements. T-7 and T-8 preferred professional meetings while T-7 would also choose a teacher center. T-2 and T-3 would meet inservice days at workshops where teachers had input while T-9 liked all mentioned ways of meeting inservice days if they were meaningful except for teacher centers as this particular teacher has not been exposed to a teacher center. T-10 commented on inservice days:

They're not treating you like a professional, and they're not really doing anything which can help you; they're just fulfilling the state requirement, which is really rather silly...I wish that were changed, and a teacher center might help if we had someplace that you could say, "Oh, but the science teachers are going to the teacher center and do something useful."

T-4 expressed satisfaction with the workshops now as the teacher felt that there has been input from teachers. This same teacher liked professional meetings, "because they approach dissemination of materials from other people, so I guess they would go hand in hand maybe with what you
might have at a teacher center." The teacher goes on to say that what they are doing now with workshops is in the right direction and that a teacher center would be a little further in the future.

Interview Question 15. Looking again at the graphic model, would you change the model in any way, and if so, what would be the changes?

Comments on the model were mostly positive. T-5 would add: "how to effectively utilize your laboratory time in relationship to the concepts that you cover in class, to keep it unified." T-11 would eventually like to add elementary teachers as "much needs to be done in the lower grades to motivate the children toward science." T-8 would like to work through the model before making changes while T-6 didn't see anything that should be changed but thought it was good that the model left room for additions. T-4 stated that the model "is something very similar to the model of curricula presentation of how we improved instructional leadership in the TISD" [Tyler Independent School District]. The teacher went on to state that the teacher should be at the center of the model "and if teaching related concerns of science teachers mean that they're the focal point, then I think you're on the right road there. That's where it's going to have to all happen." T-9 commented, "I think the model is by far set up fine,
from the general issues to 'how-to' achieve understanding of general issues, and of course the teacher related con-
cerns, because they all are concerns."

T-10 felt that being a science person and not an education person, that the model looked like something an education person put together for a class. The teacher would like a science center to "be a place for teachers to get together, for them to obtain specimens, for them to hear guest speakers, more than the less concrete type of ideas I see here." The teacher went on to state that "all of these things are topics obviously that would be nice to have material on, to have speakers on, things such as this...."

Professional Inservice Educator Interview-Questionnaire

At the completion of the teacher interviews and questionnaires, interviews were undertaken with six professional inservice educators with each of the interviews followed after a two week period with a related questionnaire. Results of the interviews and questionnaires will be reported using the same format as teacher interview-questionnaires.

Interview Question 1. Through the years, a variety of methods have been utilized to help teachers improve their professional inservice development, such as...professional education courses (which are offered
after school hours, in the evening, or during the summer), inservice days, workshops, etc. Would you comment briefly on how effective you believe these to have been in the past? Have you seen any long lasting effects or were they shortlived? Would you have a preference for one over the other? For what reason(s)?

Questionnaire 1. To what extent has the professional inservice development of teachers been affected by attendance:

...at inservice days?

- a) very much [0 of 6]  
- b) some [2 of 6]  
- c) little [2 of 6]  
- d) very little [2 of 6]  
- e) none [0 of 6]

...at workshops?

- a) very much [1 of 6]  
- b) some [1 of 6]  
- c) little [3 of 6]  
- d) very little [1 of 6]  
- e) none [0 of 6]

...at professional education courses?

- a) very much [0 of 6]  
- b) some [5 of 6]  
- c) little [0 of 6]  
- d) very little [1 of 6]  
- e) none [0 of 6]

The professionals felt that the effects of inservice days were shortlived but given a preference, the professionals would choose workshops that extended over a period of time and professional education courses over inservice days.

Three of the professionals spoke to the effectiveness of workshops, particularly those workshops that teachers
have direct input into themselves. P-4 stated, "Workshops, I think are the most effective. If they are discipline-related, that is if they are dealing exactly with what a teacher does, if a teacher is going to develop activities in a workshop that she can use in her classroom, she hasn't considered it a waste of time." P-3 expressed the thought that professional education courses were perhaps the most effective as they extend over a period of time and were not one-shot deals. P-5 emphasized that inservice days have not been effective because they weren't planned by the teachers but where teachers took part in the planning, effectiveness increased. For long lasting effectiveness, P-5 has suggested that there:

be some kind of period in which a reinforcement or recycling or reminding of...If you have instructional teams, or wing teams or grade level teams, and let them create their own goals, objectives, programs, and then set their own time line-up for review, or inventory; if you say "Where are we now with relation to classroom management techniques?" You know, we've learned this, or we're trying these. What do we need to know about it?" So you have a cyclic, repetitive, reinforcing system. You don't do it one shot and leave it.

Interview Question 2. In the past, it has been suggested that teachers have been little involved in
the development of curriculum for the classes that they teach. Has this been your experience? How, in your opinion, has curriculum been determined in the past? Has this been a satisfactory procedure? Why or why not? If teachers were to be involved to a greater extent what form would their involvement take?

Questionnaire 2. To what extent should teachers be involved in the development of the curriculum for the classes that they teach?

a) very much [6 of 6] b) some [0 of 6] c) little [0 of 6] d) very little [0 of 6] e) none [0 of 6]

Professional inservice educators were unanimous in their agreement that teachers be involved in the development of the curriculum for the classes that they teach. This same thought comes through in the following statements from interviews with the professional inservice educators.

"Well, see I wasn't aware that we had any at all when I was teaching," was the answer given by P-6 when asked about teacher involvement in curriculum development in the past. P-2 stated, "Well, I would not give a 'no' answer to that, but I would say they have not been involved enough." P-1, P-4, and P-5 also felt that there has been little teacher involvement in curriculum development. P-4 added:
I think we've seen more district imposed curriculum, stated mandated curriculum, and outright adoption of commercial curriculum or commercially prepared curriculum, in the last five years. I think there was a very exciting time during the late 60's up until 1975 with the open classroom and teachers were actively involved in developing curriculum on an ongoing basis in many, many districts; they were committed to what they were doing and they were excited and so forth and they did develop their curriculum.

When asked about curriculum development in the past, P-3 answered:

I think the primary determiner of curriculum in most public schools at the secondary level, more than a curriculum guide, which I think is seldom used; I think is the textbook company, you know, whichever textbook is purchased. In many secondary courses they simply go through the chapters in sequence.

Where curriculum guides are available, P-1 has stated, "I know that's one of the reasons teachers don't use curriculum guides very much, because they've not been involved in it."

With Texas House Bill 246 requiring a change in the state's curriculum and with meetings open to teachers, more teachers are having a chance to become involved in curriculum development. P-5 has also suggested that teachers be hired during summer
months to write curriculum, something P-1 has already done when involved with the school district. P-3 felt, "If the teachers thought that their involvement genuinely meant something, I think you'd see some major changes in curriculum, and so on."

Interview Question 3. As a professional educator associated with or having been associated with a teacher center, you are familiar with the teacher center concept, an environment for teachers' professional development, which takes into consideration their individual needs and the educational conditions of the area in which they are located. Can you elaborate on any feasible goals or educational needs that could be met by a teacher center that serves middle and high school science teachers? (ex. sharing of ideas, development of curriculum, increased content knowledge)

Questionnaire 3. To what extent; in your own opinion, would a teacher center in your area that serves middle and high school science teachers, meet the following goals and educational needs?

... sharing of ideas?

...development of curriculum?
...increased content knowledge?

In general, the professional inservice educators were positive in their opinions that a teacher center that serves middle and high school science teachers can meet the goals and educational needs for sharing of ideas, development of curriculum, and increased content knowledge.

P-3 stated that most teachers in the 20 school districts covered by the Northeast Texas Teacher Center are not aware that they belong to a teacher center. Once they are made aware, then one can bring in subject area people and find out the teachers' needs and what the teacher center can do for them. In order to show teachers that the teacher center means serious business, P-5 felt there must be a "wooing" period. P-5 continued, "And then I'll think, given the opportunity, you'll see some serious curriculum benefits, some really eye-opening thing occur." P-3 has stated that the nature of a teacher center will have a bearing on the outcomes:

The teacher center concept that I've seen work best tends to be one where there's a university, very often in a city, and lots of schools all within perhaps a
half hour or 20 minutes tops of that teacher center, and a rather large facility is used by the teacher center and a series of on-going kinds of workshops and courses and activities are constantly going year round. There's very dedicated leadership, there is incredible involvement on the parts of the teachers, there's all kinds of services being provided, etc.

Two of the professional inservice educators, P-1 and P-2 envisioned the teacher center as a place for material availability while P-4 would hope that the teacher center would be a vehicle for teachers to have an opportunity to visit exemplary programs at other schools.

At this time, the teacher center graphic model was introduced and an explanation of the model was given.

Interview Question 4. A number of ways have been proposed that a teacher center could be helpful to teachers. For example, it has been suggested that at a teacher center, teachers could get help in improving their teaching skills. What kinds of teaching skills would you suggest teachers need help in improving? Would teachers be interested in learning how to use guided inquiry in their classrooms, a strategy designed through the use of structured questions to lead students to an answer? Would teachers seek help for ways to teach concepts such as the concepts of...
equilibrium in chemistry, genes in life science and biology, electricity in physical science, and magnetism in earth science? Do teachers need assistance in implementing games, role playing, and simulations in teaching? Would teachers seek help in implementing higher level questions in their teaching? In what other ways might a teacher center be helpful to teachers?

Questionnaire 4. To what extent would a teacher center be helpful to teachers in improving their teaching skills?


The professional inservice educators were in general agreement that a teacher center would be helpful in improving teaching skills of teachers though not as positive generally that the teacher center would be as helpful as in the development of curriculum.

Suggestions for teaching skills offered by professional inservice educators were relating to students, being sensitive to students' needs, teachers' individual teaching needs, helping parents understand what you're doing, how to motivate students you don't understand, and how to individualize to meet students' needs. Some other skills mentioned were improving teachers' decision making ability,
making classes more interesting, developing inquiry skills, skills in teaching methods and strategies, utilization of a variety of resources, and the teaching of basic skills such as reading, studying, and writing.

In relation to the use of learning how to use guided inquiry, five professional inservice educators thought teachers would like to learn this method while P-4 responded "yes" and "no" depending on the teacher. Five professional inservice educators indicated that teachers would seek help for ways to teach concepts. P-5 stated that teachers would feel better about asking for help if this was fostered by administration. P-1 indicated that teachers would particularly seek help if given insight into how it would enliven the classroom. In relation to the teacher center, P-3, when asked about seeking help to teach concepts, stated that the teacher center should provide choices.

In general, the professional inservice educators indicated that teachers would seek assistance in implementing games, role playing, and simulations. P-5 stated that some people would never use these methods as they wouldn't feel comfortable. An interesting answer by P-3 indicated that people trained in content would certainly need help in these methods. The professional inservice educators indicated that once teachers are aware that there are higher level questions to be asked and utilized in a classroom,
then teachers would seek help in implementing higher level questions.

Suggestions for ways teacher centers would be helpful to teachers were as resource centers for material and people with expertise. It could possibly give an identity to science people by having people with common needs meeting together. Teacher centers could become a bridge in the gap between content and making the content come alive for students. A center could become a place that encourages science fairs. It might also provide substitutes over different periods of time to release teachers for teacher center utilization.

Interview Question 5. It has also been suggested that at a teacher center, teachers would have the opportunity to share with each other teaching experiences that they have had in their own classrooms. Some have suggested that specific techniques that teachers utilize in their classrooms might be shared. Do any specific techniques come to your mind? Would sharing units of study that have been developed be worthwhile? What would you suggest that teachers might do that they would be interested in sharing with other teachers?

Questionnaire 5. To what extent would teachers utilize a teacher center as an opportunity:
...to share teaching experiences that they have had in their own classrooms?


...to share specific techniques that they utilize in their own classrooms?


...to share units of study that they have developed?


In general, professional inservice educators answered positively that teachers would utilize a teacher center as an opportunity to share teaching experiences that they have had in their own classrooms, to share specific techniques that they utilize in their own classrooms, and to share units of study that they have developed.

P-6 mentioned how to motivate children and parent awareness as techniques to be shared. P-2 related that teachers were asked to share their techniques of evaluation after a guest speaker spoke on evaluation. P-1 has observed that science and math teachers are more apt to share techniques while P-4 felt that teachers who teach a class all the same way without taking into account individual learning styles, have little to share about that method.
P-3 and P-5 expressed a preference for a definite purpose or focus for sharing techniques. Three of the professional inservice educators indicated during the interview that it would seem worthwhile for teachers to share units of study that they have developed. P-3 again expressed the thought that there should be a definite purpose while P-5 thought sharing units to be worthwhile if the teachers were in teams such as curriculum teams. P-1 felt that in this area, teachers are very possessive of their units.

When asked what teachers do that they might share with others, the following were suggested by the professional inservice educators: different ways of presenting the same theme to different groups, sharing like problems and like difficulties in teaching certain materials, and focusing more on the sequencing of materials for students. P-5 would not discuss techniques as there are too many variables and P-3 thought sharing should be part of just about everything that happens at a teacher center. P-2 commented that teachers should register their expertise and skills at teacher centers for sharing with other teachers.

Interview Question 6. As a professional educator interested in the professional development of teachers, would you think that it makes a difference if a university credited course was offered at the university or on-site at a teacher center? Would you
be willing to teach a university credited course at a teacher center if teachers showed a preference for the teacher center? Would a time choice by teachers—during school hours, after school, evenings, or weekends—be a factor in your decision to teach a course at a teacher center? What other factors might influence your choice—e.g., hours credited towards your teaching load by the university, possibility of extra pay, association with a formally recognized teacher center?

Questionnaire 6. Would offering a course at a teacher center rather than on-site at a university influence teachers to choose the teacher center rather than the university?


The majority of professional inservice educators felt that offering a course at the teacher center rather than on-site at a university would influence the teachers to choose the teacher center rather than the university.

During the interviews, two professional inservice educators definitely chose the teacher center while P-2 thought if the situation was what the teachers needed and wanted, they would go to a teacher center. P-5 stated: "I don't think you can say one over the other without saying what's there and what makes it better." The
remaining two professional inservice educators declared that good experiences could be obtained outside a university experience, but never really indicated a preference for a teacher center over the university.

All the professional inservice educators would be willing to teach a credited course at a teacher center. P-6 stated, "Those people would be motivated and I would think that they would be enjoyable, because they did it because they wanted to do it and not because they were forced to do it."

Two professional inservice educators indicated that time choice by teachers would not be a factor in their decision to teach a course at a teacher center while two professional inservice educator's choice would depend on their schedules. P-6 indicated no specific time choice but speculated that the school district should allot time for teachers to go to a teacher center. P-3 declared that it would depend on what kind of course or workshop that was put together.

Beyond the examples given, factors influencing the professional inservice educators choice of teaching a course at a teacher center were interest and whether the course was worthwhile. P-3 thought that teacher centers should not ask professionals to participate for free, but there should be renumeration.
Interview Question 7. It has been suggested that teacher centers can provide help and direction to teachers as they investigate and seek answers to problems and issues that confront them. At a teacher center, teachers would have access to various resources such as literature related to the problem(s) to be investigated, access to teachers who have investigated similar problems, or university professors knowledgeable in areas of problems to be investigated. What are some problems and issues that you and other professionals recognize that you believe the resources available at a teacher center could be helpful to teachers in finding better answers? Some problems that might be investigated are: How can individual instruction be implemented in classes? What are some evaluative methods for judging achievement of higher level objectives, i.e., after reading information on the earth's solstice and equinox, the learner will be able to compare the earth's solstice and equinox; or the learner will be able to elaborate on the pros and cons of nuclear energy after thoroughly researching the issue? What can teachers do to integrate "special needs" children in the classroom, i.e., physically or mentally handicapped, slow learners, students who cannot read? In what ways can science teachers instruct their students in the art of writing?
Questionnaire 7. With resources such as literature related to the problems, university professors, and other teachers available at a teacher center, to what extent would science teachers utilize these resources in investigating problems and issues related to the teaching of science?


Most of the professional inservice educators felt that science teachers would utilize the resources at a teacher center to some extent in investigating problems and issues related to the teaching of science.

Suggestions offered by the professional inservice educators were: learning styles of students, learning styles of teachers and how these two conflict. Another issue suggested concerned children who cannot read the textbook while another issue involved the problem of how could science teachers get together and design research that they could do together. P-1 has suggested the use of video taping of classes where teachers could get help from their peer group on improving classroom instruction.

After looking at the examples given, P-3 described this type of teacher center where resources and resource people would always be available.
Interview Question 8. It is thought by some teachers that the teacher center can offer assistance to teachers in carrying out small research projects in their own classroom. Do you believe that it is feasible for teachers to do research related to the effectiveness of instruction? Some suggested examples of such research projects are: concrete evidence of a teacher's effectiveness, strategies to implement different methods of teaching and indicators of the effectiveness of each method, and comparison of two different curricula at the same level. What are some other research projects that the personnel at a teacher center might assist a teacher in carrying out?

Questionnaire 8. To what extent would teachers utilize a teacher center that offered assistance to teachers in carrying out, in their own classrooms, research such as that related to the effectiveness of instruction?


The professional inservice educators were in general agreement that teachers would utilize a teacher center that offered assistance to teachers in carrying out, in their own classrooms, research such as that related to the effectiveness of instruction.
While one professional inservice educator stated that there was no problem with doing research projects in a classroom, another professional inservice educator stated "that teachers didn't perceive research as an effective method of instruction." P-3 postulated that if a person with expertise to help was available at the teacher center, this would be good, otherwise what is fostered is bad research.

Some areas suggested for research were the effectiveness of techniques used, learning styles of students, and research on recent articles in the literature. It was also inferred that teachers could share the findings in certain articles and discuss the implication.

Interview Question 9. A suggestion has been made that a teacher center should be a place where a teacher could consult with informed personnel on education issues, where curriculum units from other schools would be available for inspection and study, where live materials such as plants or animals and apparatus that a school lab lacks would be available on loan or at very low cost, some of which would have to be reserved, picked up, and returned. How useful do you believe each of these services would be to teachers? What other items might the teacher center have available? Would you, as a professional, be willing to act as a consultant to teachers through a teacher center?
Questionnaire 9. To what extent would a teacher utilize a teacher center that made available:

...informed personnel on educational issues for consultation?


...curriculum units from other schools for inspection and study?


...live materials such as plants and animals?


...equipment or apparatus, some of which would have to be reserved, picked up, and returned?


The professional inservice educators were of the belief that teachers would utilize a teacher center that made available informed personnel for consultation on educational issues, curriculum units from other schools for inspection and study, live materials such as plants and animals, and equipment or apparatus some of which would have to be reserved, picked up, and returned.
The professional inservice educators described such a center as being very useful. P-1 was concerned with teacher use because if it's not underfoot or brought to the teachers, they don't use it. P-3 described a curriculum fair where districts got together in a teacher center on a specific day to share curriculum materials. P-6 mentioned the availability of resource personnel from publishing companies or possibly other companies that produce science equipment who could be funneled through a teacher center.

Other resources and resource personnel suggested for teacher centers included exhibits, personnel to demonstrate equipment and how to teach certain concepts, films, copying machines, laminating machines, abundance of materials, specimens, pages of lab manuals for copying, and community resources. P-3 has suggested a lab such as a micro-computer lab within a teacher center, that includes a consortium of schools because of the equipment expense.

All the professional inservice educators indicated that they would be willing to act as a consultant to a teacher center.

Interview Question 10. What factors might interfere with teachers' use of a teacher center? Would the location of the teacher center have an effect on their use of such a center? If they had a part-time job or a coaching job, would this also have an effect on their
decision about using a teacher center? If the school
district provided or did not provide released time for
using the teacher center, would this also have an
effect on their decision about using a teacher
center?

Questionnaire 10. To what extent would each of the
following factors discourage teacher use of a teacher
center:

...a teacher center located 20 miles away?
a) very much [2 of 6] b) some [4 of 6] c) little
[0 of 6] d) very little [0 of 6] e) none [0 of 6]

...a teacher center located 50 miles away?
a) very much [6 of 6] b) some [0 of 6] c) little
[0 of 6] d) very little [0 of 6] e) none [0 of 6]

...a coaching or part-time job?
a) very much [2 of 6] b) some [4 of 6] c) little
[0 of 6] d) very little [0 of 6] e) none [0 of 6]

...failure of the district to provide released time?
a) very much [2 of 6] b) some [4 of 6] c) little
[0 of 6] d) very little [0 of 6] e) none [0 of 6]

Professional inservice educators were in full agree-
ment that a teacher center 50 miles away would discourage
teacher use of a teacher center. Generally, the profession-
al inservice educators agreed that a teacher center
located 20 miles away, a coaching or part-time job, and
failure of the district to provide released time, would discourage teacher use of a teacher center.

During the interviews, the professional inservice educators all agreed that location would have an effect on teacher use of a teacher center. One professional inservice educator even suggested each school as a center where teachers could have time during a school day to utilize the center. This same professional inservice educator, P-4, felt time was more important than location as the teachers' day is a full day.

When teachers have part-time or coaching jobs, professional inservice educators felt it would also affect teacher use of a teacher center. P-3 added that there are some teachers who would never go unless they got some benefit for their teaching from the teacher center. One thought proposed was that teachers can be instrumental in recruiting other teachers for the teacher center by relating the benefits of a teacher center.

When asked about released time, professional inservice educators thought it would make a difference if the district did not provide released time. It was mentioned by two professional inservice educators that whether given released time or not, some teachers would never use the teacher center while some dedicated teachers would even use the center during their vacation time. It was suggested by
P-3 that teachers be given one or two released time days so that they might become acquainted with a teacher center. A suggestion that would allow teachers time at the teacher center was to utilize graduate students, student teachers, or other teachers as substitutes.

Interview Question 11. What characteristics do you believe that teacher centers should have that serve teachers interested in the teaching of science?
Examples: a place for teachers to meet socially, a center governed by teachers, a place where resources are available, a center aimed at the professional growth and development of teachers, a place where curriculum units are available or can be developed, and a place where teachers can carry on research.

Questionnaire 11. To what extent do you believe that a teacher center should have the following characteristics:

...a place for teachers to meet socially?

...a center governed by teachers?
...a place where resources are available?


...a center aimed at the professional growth and development of teachers?

a) very much [6 of 6]  b) some [0 of 6]  c) little [0 of 6]  d) very little [0 of 6]  e) none [0 of 6]

...a place where curriculum units are available or can be developed?


...a place where teachers can research?


Professional inservice educators were in general agreement that a teacher center should have five of the mentioned characteristics—a center governed by teachers, a place where resources are available, a center aimed at the professional growth and development of teachers, a place where curriculum units are available or can be developed, and a place where teachers can do research, but they were very mixed in their answers for a sixth characteristic—a place for teachers to meet socially.

Two professional inservice educators definitely thought that teachers would not be interested in the teacher center
as a place to meet socially. P-3 in referring to all the examples, stated that potentially the teacher center should have all these characteristics, but in reality the center wouldn't. P-5 had difficulty with the whole structure unless it was part of the present teacher center, perhaps funded to some degree by the district, and specifically requested by the teachers.

Suggestions of other characteristics were: that exhibits be part of the teacher center for science teachers, and that it be a place where teachers can work and develop materials. P-6 suggested a needs assessment for each teacher center district as the characteristics and interests of teachers in one area are different from the characteristics and needs of teachers in another area.

Interview Question 12. Teachers should be one of the primary benefactors of a teacher center. What do you believe would be some of the outstanding benefits to teachers of a teacher center that serves science teachers? (i.e., improved teaching skills, opportunity for investigating problems in the classroom, specific courses that meet teachers' needs.)

Questionnaire 12. To what extent, in terms of your understanding of a teacher center, do you feel that a teacher center would be helpful to teachers in:
...improving their teaching skills?


...opportunity for investigating specific classroom problems?


...offering specific courses that meet teachers' needs?


Again, there is agreement amongst professional inservice educators that the teacher center would be helpful to teachers in improving their teaching skills, in an opportunity for investigating specific classroom problems, and in offering specific courses that meet teachers' needs.

Some additional benefits suggested by professional inservice educators that might accrue to teachers using a teacher center included appreciation of their field of science, resource persons, resources, a place to view media resources, community resources, helping parents become involved in the science program, additional preparation courses, identity, sharing, and support of administrators. P-3 offered the suggestion that the teacher center for science teachers could offer professional
development credit, or university extension credits, not necessarily for a degree but registered as graduate credits.

Interview Question 13. Students should benefit if their teachers take advantage of the resources available at a teacher center. What would be some of the major benefits to the students of teachers taking advantage of such a teacher center? (i.e., increased understanding of what is taught, classes that are more interesting, being more highly motivated, scoring higher on tests, courses that are more relevant.)

Questionnaire 13. When teachers take advantage of the opportunities offered by teacher centers, their students could expect to benefit:

...by increased understanding of what is taught?

...from classes that are more interesting?

...by being more highly motivated?
...by scoring higher on tests?

...by courses that are more relevant?

Professional inservice educators strongly agreed that when teachers take advantage of the opportunities offered by teacher centers that their students could be expected to benefit: by increased understanding of what is taught, from classes that are more interesting, by being more highly motivated, by scoring higher on tests, and by courses that are more relevant.

Additional benefits to students of teachers who take advantage of the resources available at a teacher center were offered by the professional inservice educators. The additional benefits included greater appreciation of science by students, benefits to students from the teachers' knowledge of community resources such as jobs, opportunities offered by the Kiwanis Club, and maybe a community resource adopting a science club. P-4 stated that with stimulation of the teachers at a teacher center, teachers should become more interesting people with more interesting ideas for students to consider. P-5 stated,
You give me a school that has an environment that is secure and encourages risk taking and in which there is a highly supportive administrative unit and a configuration of teachers who have bound themselves or wound themselves into support teams, I'm not too sure a whole lot of things couldn't happen.

Interview Question 14. If teachers were given an opportunity to meet the required inservice days in any professional manner that they chose, what do you think they are most likely to choose? (Depending on answer, might mention: workshops, professional meetings, lectures, courses and teacher centers.)

Questionnaire 14. If teachers had the opportunity to meet required inservice days in any professional manner that they chose, to what extent would teachers choose:

...workshops?


......lectures?


...professional meetings?

...teacher centers?


...courses?


Professional inservice educators agreed that teachers would be more apt to choose workshops and teacher centers as a way to meet inservice days with courses being a third choice followed by professional meetings and lastly lectures.

P-1 offered the thought that some teachers might choose professional meetings and conventions, if they had help with expenses. P-2 believed that teachers would prefer to meet inservice days at workshops offered at a teacher center while P-6 suggested teachers could meet their professional development by working a certain number of hours at a place like a plant nursery. P-4 mentioned workshops as the way teachers would choose for inservice days unless they came in contact with a teacher center which they might choose to meet their inservice days. Two more suggestions offered by P-5 included teachers choosing paid opportunities during the summer for example, a district paying teachers for curriculum development, and the second suggestion, exchange of faculty between a teacher center
Table 1
Chi Square Analysis on Teachers' and Professional Inservice Educators' Questionnaire

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<thead>
<tr>
<th>Division of Questions on Questionnaire</th>
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<th>b</th>
<th>c</th>
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and school district which could even involve exchange with university faculty so the school's classes would be covered while the teachers are doing inservice work. P-3 felt there are teachers who go for "format" or structure where they look for the easiest way out and the topic doesn't matter. Some other teachers choose "topic" where form doesn't matter, so that all the suggested examples can meet different teacher needs.

Interview Question 15. Looking again at the graphic model, would you change the model in any way, and if so, what would be the changes?

One major suggestion by P-4 was adding world or universal health care which was incorporated into the revised graphic model to be utilized with teacher center directors/personnel.

Chi Square Analysis of the Teacher and Professional Inservice Educator Questionnaires

The only significant difference in Table 1 for the answers given on the questionnaire between teachers and professional inservice educators occurred in the second part of question 1 (lb). The question which was posed sought to determine to what extent the professional inservice development of teachers has been affected by attendance at workshops. Teachers were more positive in their feelings in regard to this question. Interestingly,
professional inservice educators expressed a preference for workshops that extended over a period of time so that it must be assumed that their less positive answers toward this question was based on the idea of short-term workshops.

Total agreement between teachers and professional inservice educators can be seen in questions 2 and 12c. For question 2, both groups felt that teachers should be involved to a greater extent in the development of the curriculum for the classes that they teach. Teachers and professional inservice educators were also positive in their answer to question 12c which asked if a teacher center would be helpful to teachers in offering specific courses that meet teachers' needs.

Many of the results in Table 1 show a close correlation in thought between teachers and professional inservice educators with regards for the parallel questions asked on the questionnaire.

Teacher Center Director/Personnel Interview

The final set of interviews were conducted at four different teacher center sites throughout Texas. Originally, the interviews were to be with teacher center directors, but with a restructuring in administration and resignation of a couple of teacher center directors, the interviews were conducted with directors and administrative personnel or acting directors of teacher centers. At one
of the teacher centers, two people were responsible for
directing activities at the teacher center, so both joined
in the interview and will be identified as "TC-la" and
"TC-lb".

Interview Question 1. Through the years, a variety
of methods have been utilized to help teachers improve
their professional inservice development, such as...
professional education courses (which are offered
after school hours, in the evening or during the
summer), inservice days, workshops, etc. Would you
comment briefly on how effective you believe these to
have been in the past? Have you seen any long lasting
effects or were they short-lived? Would you have a
preference for one over the other? For what
reason(s)?

Teacher center directors/personnel, unlike the science
teachers and professional inservice educators, thought that
there were long lasting effects from inservice education.
TC-lb felt that the question of long lasting effects could
be answered both positively and negatively. TC-3 when
asked about long lasting effects for workshops expressed
this thought, "...it depends upon whether or not a teacher
is in a workshop that is designed to meet her specific
individualized needs."
Two of the teacher center personnel, TC-1B and TC-4 felt that all the inservice methods that had been enumerated were effective while TC-2 thought the most effective was professional education courses and TC-3 thought inservice workshops and professional education courses were the most effective.

Three of the teacher center directors/personnel thought that professional education courses were the most effective. TC-3 added workshops or inservice days particularly if they meet the teachers' needs. TC-2 commented that professional education courses "need to be earmarked and planned, not the traditional curriculum, but to meet the needs of those students they are dealing with in the inservice." The fourth teacher center director/personnel, TC-1b, chose inservice workshops because there are more hands-on materials.

Interview Question 2. In the past, it has been suggested that teachers have been little involved in the development of curriculum for the classes that they teach. Has this been your experience? How, in your opinion, has curriculum been determined in the past? Has this been a satisfactory procedure? Why or why not? If teachers were to be involved to a greater extent, what form would their involvement take?
Like teachers and professional inservice educators, the teacher center directors/personnel would opt for greater teacher involvement in curriculum development. Teacher center directors/personnel were divided in their opinion of teacher involvement in the past.

TC-3 and TC-4 believed that teachers have an opportunity to be involved with curriculum development. TC-2 stated that the teachers were involved in curriculum development in the state where the director's early training took place but not in Texas. Although TC-1b felt that teachers were little involved in curriculum development in the past, teachers now are helping to develop curriculum.

Three teacher center directors/personnel cited the state as the determinor of curriculum. When asked if it was a satisfactory procedure, TC-3, who claimed teachers are involved in curriculum development, responded that the system of state determination and teacher involvement was satisfactory. TC-1b, who stated that there was no teacher involvement in curriculum development in the past, indicated that determination of curriculum at this time was not a satisfactory procedure "because persons developing [curriculum] were not persons using it and were not aware of the real world." TC-1b stated that teachers have greater involvement in curriculum development "in the actual writing of the curriculum and the piloting of it, evaluating and rewriting."
Interview Question 3. As a professional educator associated with a teacher center, you are familiar with the teacher center concept, an environment for teachers' professional development, which takes into consideration their individual needs and the educational conditions of the area in which they are located. Can you elaborate on any feasible goals or educational needs that could be met by a teacher center that serves middle and high school science teachers? (ex. sharing of ideas, development of curriculum, increased content knowledge)

Generally, teachers and professional inservice educators were supportive of the idea that a teacher center should be a place for the sharing of ideas, development of curriculum, and increased content knowledge. The teacher center directors/personnel mentioned additional feasible goals or educational needs that could be met at a teacher center that serves middle and high school science teachers. TC-4 suggested that the teacher center be a supply place for materials even live materials particularly needed for biology. TC-1b would like to see a newly developed competency based type program, introduced to science and math teachers at their teacher center. Recent concerns at TC-2's teacher center included a newer focus on identifying teacher needs and retraining teachers to either update
their skills or creating an atmosphere to develop new skills. TC-3 thought that "the teacher center provides a beautiful opportunity to exchange ideas about meeting the needs of the people that come in." TC-3 articulated on two additional goals, how to meet the individual needs of children and how you can become a more effective teacher.

At this time the proposed graphic model with the suggested change by one of the professional inservice educators, was introduced to the teacher center director/personnel and an explanation of the model was given. (see Figure 2)

Interview Question 4. A number of ways have been proposed that a teacher center could be helpful to teachers. For example, it has been suggested that at a teacher center, teachers could get help in improving their teaching skills. What kinds of teaching skills would you suggest teachers need help in improving? Would teachers be interested in learning how to use guided inquiry in their classrooms, a strategy designed through the use of structured questions to lead students to an answer? Would teachers seek help for ways to teach concepts such as the concepts of equilibrium in chemistry, genes in life science and biology, electricity in physical science, and magnetism in earth science? Do teachers need assistance in implementing
Figure 2

Model of a Teacher Center
that serves Middle and High School Science Teachers
games, role playing, and simulations in teaching? Would teachers seek help in implementing higher level questions in their teaching? In what ways might a teacher center be helpful to teachers?

Many different ways that teachers need help in improving their teaching skills were given by the teacher center directors/personnel. Some of the suggestions were the same as those offered by teachers and professional inservice educators.

TC-2 indicated "that they [teachers] operate more from a positive frame of reference with the students rather than a negative [frame of reference]." TC-2 also expressed the thought that it would be better to work with people [teachers] who are catalysts and helpers rather than controllers. TC-1a has suggested teachers could use help in learning how to teach concepts using a deductive or inductive approach making use of various materials for instruction. Further skills that teachers needed help in improving were: how to use equipment in the classroom, how to teach students to do research, how to instruct teachers to teach writing. TC-4 spoke to the continuous explosion of knowledge in science and that "teachers need to develop skills in determining and selecting the knowledge areas that are most appropriate." Improvement in skills can also be made in the area of methodology and types of strategies. TC-3 has suggested many skills which are aimed at meeting
the needs of students. To meet these needs, teachers need help in improving skills for individualizing, adapting subject matter to the level of children, identification of good objectives, how to reinforce, motivation and how to maintain and sustain students' interest.

When asked about teachers being interested in learning how to use guided inquiry, the teacher center directors/personnel gave many different answers. TC-2 thought that teachers used different modes of teaching, with a mode that is effective for one teacher not being effective for another teacher. TC-2 stated further that teachers could try in a laboratory situation different modes of teaching so that they could determine the most effective mode for themselves. TC-3 thought teachers needed help in learning how to use guided inquiry as most teachers ask questions of a factual nature and not questions that lead to interaction and critical thinking on the part of the students. TC-1a answered the question by making a distinction between inquiry and discovery while TC-4 expressed an opinion that teachers should learn many strategies.

Three teacher center directors/personnel hoped that teachers would seek help for ways to teach concepts. TC-4 reiterated that with the knowledge explosion, science education should move to the conceptual area or science will be inundated with facts and that teachers would seek
help to enhance their own teaching and the learning of the students. TC-1b thought teachers would more likely seek help for ways to teach concepts at the university rather than at the teacher center while TC-1a hoped that teachers would already be trained in this area and if not that the district's director of science was addressing this issue during inservice education.

The teacher center directors/personnel thought and hoped teachers would seek assistance in implementing games, role playing, and simulations in teaching. TC-2 stated that teachers need to "be made aware of the possibilities and maybe given the opportunity to experience what and how these can be used and then be given the opportunity to select what, where, and how in their own teaching." TC-1b assumed that teachers needed assistance but in their district, this was carried out in school sponsored workshops and not at the teacher center.

When asked about teachers seeking help in implementing higher level questions in their teaching, three teacher center directors/personnel thought that they would seek help. As TC-4 stated:

We understand the importance of questioning as a means of helping kids to move through problem solving, critical thinking, strategies and so forth. Now whether or not teachers would seek this, I hope they
would, if not we need to someway help them to seek this or help them understand the importance of seeking higher level questioning strategies.

TC-1b did not think teachers would seek help as time has not been allotted for this type of training and would have to be sought after hours. TC-1a expressed the thought that teachers had recently been thoroughly schooled in higher level thinking.

When asked, in what other ways might a teacher center be helpful to teachers, TC-3 mentioned as a source of sharing with one another, a place of reinforcing previously learned methods and strategies, and a morale booster for teachers in need of help. TC-2 thought the teacher center could provide recent research findings and applications of research. TC-4 suggested that the teacher center could act as a clearing house for different types of information, audiovisual materials, and supplemental materials. TC-1a and TC-1b stated that what they dreamed for a teacher center and what was perceived by the administrators of the district was vastly different. The main concern of TC-1a's and TC-1b's teacher center is with the placement of student teachers and an inservice day for the supervising teachers.

Interview Question 5. It has also been suggested that at a teacher center, teachers would have the opportunity to share with each other teaching experiences
that they have had in their own classrooms. Some
have suggested that specific techniques that teachers
utilize in their classrooms might be shared. Do any
specific techniques come to your mind? Would sharing
units of study that teachers have developed be worth¬
while? What would you suggest that teachers might do
that they would be interested in sharing with other
teachers?

Teacher center directors/personnel agree with teachers
and professional inservice educators who felt that at a
teacher center teachers would share specific techniques that
teachers utilize in their classrooms, units of study
teachers have developed, and teaching experiences that
teachers have had in their classrooms.

TC-4 would like to see techniques in computer work and
video taping shared. TC-2 spoke of a tutorial system that
was very successful where the better students helped the
slower students. TC-3 referred again to meeting students'
individual needs, how to introduce a lesson, and what makes
a good lesson. TC-1a and TC-1b felt that the suggestions
would warrant a much larger staff for the teacher center
than was now available. TC-1a stated that a few of the
teachers of the gifted and talented in their district are
on a four day schedule

which means they have Friday available to go and
substitute for fellow teachers so that you have a
revolving type of inservice [education] and while the specialists may give a few teaching techniques and a part of a workshop, fellow teachers get up and share things they have done that have been successful so we are aware of this model, but because we don't have substitute money we don't do that.

One of the inservice training days at this teacher center, had supervising teachers paid to come in on a Saturday and first year teachers come to share their experiences with them. First year teachers also shared their thoughts about what they wished the universities had taught them before they entered the classrooms.

Again, the other three teacher center directors/personnel felt strongly about sharing units of study teachers developed. TC-4 qualified that it would be most helpful in sophisticated areas or sharing units of study unique to the teacher.

When asked what teachers might do that could be shared with others, one particular suggestion was offered: chromosome staining.

Interview Question 6. As a professional educator interested in the professional development of teachers, would you think it makes a difference if a university credited course was offered at the university or on-site at a teacher center? Have you found time, to be
a factor in the willingness of teachers to use the teacher center--during school hours, after school, evenings, or weekends? In your experience, what have been the most popular hours for teachers' use of a teacher center?

Only two teacher center directors/personnel were positive about offering a university credited course on-site at a teacher center. TC-4 was "torn between the 'ivory towerness' of a university and the lack of proper facilities and adjunct kinds of things that are on an on-site kind of situation." TC-2 felt that the teacher was the factor not the site. The findings do not correlate completely with the majority of teachers and professional inservice educators who chose a university credited course on-site at the teacher center.

All the teacher center directors/personnel were in agreement that the time was a factor in the willingness of teachers to use a teacher center. A number of different times were given that included inservice days, noon hours, regular hours, released time, after school, and summertime as the choices teachers prefer for teacher center use.

Interview Question 7. It has been suggested that teacher centers can provide help and direction to teachers as they investigate and seek answers to problems and issues that confront them. At the
teacher center, have middle and high school teachers had access to various resources such as literature related to the problem(s) to be investigated, access to teachers who have investigated similar problems, or university professors knowledgeable in areas of problems to be investigated? What are some problems and issues that you recognize, that you believe the resources available at a teacher center could be helpful to science teachers in finding better answers? Some problems that might be investigated are: How can individual instruction be implemented in classes? What are some evaluative methods for judging achievement of higher level objectives, i.e., after reading information on the earth's solstice and equinox, the learner will be able to compare the earth's solstice and equinox; or the learner will be able to elaborate on the pros and cons of nuclear energy after thoroughly researching the issue? What can teachers do to integrate "special needs" children in the classroom, i.e., physically or mentally handicapped, slow learners, students who cannot read? In what ways can science teachers instruct their students in the art of writing?

While teachers and professionals were asked if they would like access to various resources at a teacher center
and the majority answered in the affirmative, teacher center directors/personnel were asked if teachers had access to the various resources at their teacher centers. One teacher center director/personnel stated "yes" while one said "no" and another one commented that the teacher center in that area had access to college professors. The fourth teacher director/personnel felt that more research is carried out in the science field but accessibility of the research is not always possible so a teacher center could help in identification and dissemination of relevant research.

TC-1a thought that examples of problems and issues mentioned were all feasible for investigation but not at this particular teacher center as these problems are handled by the district's department of personnel development. TC-4 agreed with the feasibility of investigating these problems and issues at a teacher center and added that the teacher center could be a kind of bridge between the university and public school teacher or the public school environment. The bridge could help the teacher put theory into action. TC-4 went on to state that "a teacher center could bring professors, students, people from the textbook company, people from the material companies, and it would be kind of a melting pot/clearinghouse of a lot of things." TC-3 would look into accommodating a wide range of students in a
classroom and how can you use students to help other students within a classroom. Another issue that TC-3 addressed was helping teachers determine the reading and instructional level of students. TC-2 mentioned again the need for an awareness of new research. A major issue that TC-2 would investigate was the mainstreaming of special needs children.

Interview Question 8. It is thought by some educators that the teacher center can offer assistance to teachers in carrying out small research projects in their own classrooms. Do you believe that it is feasible for teachers to do research related to the effectiveness of instruction? Some suggested examples of such research projects are: concrete evidence of a teacher's effectiveness, strategies to implement different methods of teaching and indicators of the effectiveness of each method, and comparison of two different curricula at the same level. What are some other research projects that the personnel at a teacher center might assist a teacher in carrying out? Like the teachers and professional inservice educators, most of whom thought teachers would utilize a teacher center that offered assistance to teachers in carrying out research related to the effectiveness of instruction in their own classrooms, three of four teacher center directors/
personnel thought it feasible for teachers to carry out research related to the effectiveness of instruction in their own classrooms. TC-4 felt that teachers were always carrying on research when they try something and it doesn't work, so they try something else. Other areas mentioned by TC-4 for possible research were the best way to teach a concept, teaching writing, teaching reading, and ways of handling discipline problems.

Interview Question 9. A suggestion has been made that a teacher center should be a place where a teacher could consult with informed personnel on education issues, where curriculum units from other schools would be available for inspection and study, where live materials such as plants or animals and apparatus that a school lab lacks would be available on loan or at very low cost, some of which would have to be reserved, picked up, and returned. Have these services been available to middle and high school science teachers? How useful do you believe each of these services would be to teachers? What other items does the teacher center have available?

Teacher center directors/personnel were all very positive that the mentioned services would be useful to middle and high school science teachers. This correlates
with a large number of teachers and professional inservice educators who felt that teachers would utilize a teacher center that offered these services.

TC-3, TC-la, and TC-lb stated that these services were available for their middle and high school science teachers. The teacher center with which TC-3 is associated has the services directly available at the teacher center while the services for teachers in TC-la's and TC-lb's district were not available at the teacher center but within another division of the school district's administrative staff.

A suggestion of items that the teacher center might have available was offered by TC-2:

...videotapes of presentations by people not only in the science field but people in the education and psychology fields, on how to deal with individuals, not just how to deal with subject matter, and this might assist teachers to deal with the interaction of subject matter and with students being in a better position to deal more effectively with both.

Other suggestions included: sophisticated apparatus for science classes, film and film strips, and books.

Interview Question 10. What factors have you found that interfere with teachers' use of a teacher center? Has the location of the teacher center had an
effect on their use of such a center? If they have a part-time job or coaching job, has this also had an effect on their decision about using a teacher center? If the school district provided or did not provide released time for using the teacher center, has this also had an effect on their decision about using a teacher center?

Three of the teacher center directors/personnel felt "time" was the biggest factor to interfere with teachers' use of a teacher center. TC-3 felt that the school district's teacher center was well located and spoke to the fact that other administrative offices were moving into the teacher center which stymied the growth of the teacher center. TC-3 felt that a part-time coaching job would affect teacher use of a teacher center while the school district not providing released time would affect some teachers differently depending on their motivation.

According to the other three teacher center directors/personnel and in agreement with professional inservice educators but not the teachers, it would make a difference in teachers using the teacher center if they were given released time.

Interview Question 11. What characteristics do you believe that teacher centers should have that serve teachers interested in the teaching of science.
Examples: a place for teachers to meet socially, a center governed by teachers, a place where resources are available, a center aimed at the professional growth and development of teachers, a place where curriculum units are available or can be developed, a place where teachers can carry on research.

TC-3 and TC-4 thought that the characteristics listed were quite complete. TC-3 added that the teacher center in the district would broaden the concept of their teacher center by renaming it a staff development center which they hoped would serve the purpose of including more people from their school districts. TC-4 suggested a teaching laboratory set-up and audiovisual facilities for a teacher center. TC-1a was interested in financial backing and governance for a teacher center with these characteristics. TC-2 rephrased most of the characteristics mentioned to read center:

for science teachers, by science teachers, and I think it should be structured in such a way that all of the science teachers feel that they are professionally involved in this thing. They have both a right and responsibility for involvement.

Interview Question 12. Teachers should be one of the primary benefactors of a teacher center. What do you believe would be some of the outstanding benefits to teachers of a teacher center that serves science
teachers? (i.e., improved teaching skills, opportunity for investigating problems in the classroom, specific courses that meet teachers' needs.)

TC-4 felt that the examples were broad areas and covered the benefits to teachers of a teacher center. TC-1b and TC-3 would add that teachers could share ideas and have a chance to interact with one another. Keeping up with the latest discoveries, especially in science, was a major benefit that TC-1a would add. TC-2 felt strongly that the science center should be for science teachers and by science teachers and that this would be an outstanding benefit.

Interview Question 13. Students should benefit if their teachers take advantage of the resources available at a teacher center. What would be some of the major benefits to the students of teachers taking advantage of such a center? (i.e., increased understanding of what is taught, classes that are more interesting, being more highly motivated, scoring higher on tests, courses that are more relevant.)

TC-1b thought that the examples given covered everything while TC-1a added that students would benefit by having the newest material available to them. TC-3 again spoke to the fact that a teacher center can help teachers meet the individual needs of the students. In TC-4's opinion, a benefit to students would be the possibility
that: "...Problems that we experience in school settings could be alleviated to some degree through work in teacher centers."

Some more benefits to students of teachers taking advantage of a teacher center were expressed by TC-2:

Well, I think, courses would become more relevant if we structured teacher centers around what we were taught in college. And I think not only would they become more interesting to students...the faculty member would be at a higher level of motivation and they would be more enthusiastic in dialogue with students about what's available to them...if you have the science teachers who are doing the planning for the science teacher center there may be a student linkage that might be set up with the center which could create an enhanced learning...It could keep students up to date as well as the faculty members up to date. They could see a more positive frame of reference in the faculty members and I think they would relate more positively.

Interview Question 14. If teachers were given an opportunity to meet the required inservice days in any professional manner that they chose, what do you think they are most likely to choose? (Depending on answer, might mention: workshops, professional meetings, lectures, courses, and teacher centers.)
While TC-4 felt that teachers would choose good workshops, TC-1b felt that teachers would opt for a variety of inservice methods. TC-4 stated that we must think in terms of inservice education that would satisfy certification needs or requirements for job advancement, while TC-1a thought that inservice education should concern itself with something that would be practical for the teacher. TC-3 was of the opinion that teachers would choose inservice education that met their needs or inservice education based on the evaluation of the teacher's administrator. TC-2 thought it was a difficult question to answer because some teachers are very diligent about learning and some are just concerned with keeping their job which would influence their choice of inservice days. TC-2 mentioned financial reward or tuition and instructional supplies paid for as incentive for teachers to take courses. The same teacher center director/personnel felt that if a school district asks a teacher to take some courses or retraining, the school system should pay any tuition or fees as opposed to a teacher that takes a course or some retraining work of their own initiative.

Interview Question 15. Looking again at the graphic model, would you say that the teacher center with which you are associated parallels the graphic model
in any way? Would you change the graphic model in any way, and if so, what would be the changes?

While there were no changes suggested for the graphic model, each teacher center director/personnel had one or more parallels to their teacher centers. TC-1b mentioned that they touched on the concerns of professional educators—how to teach, how to individualize instruction, and how to evaluate. TC-3 stated that the graphic model parallels their perception of what a teacher center should do and stated that they are doing some of the same things. It was the feeling of TC-4 that the teacher center paralleled the graphic model in areas such as a program for the gifted and a program for special education. Through the past 10-15 years, TC-4 felt that the center had touched on all areas. The parallel for the teacher center that TC-2 is associated with is the inservice training for the supervisors of science student teachers. Planning for these inservice activities is done by an ad hoc committee of science teachers. TC-2 would like to see how the graphic model would fit in with the total situation; how can it be implemented within the different school systems, rather than just being a theoretical center.

Interview Question 16. How receptive have middle and high school science teachers been to the teacher
center idea compared to other teachers such as elementary school teachers or middle and high school teachers in the disciplines of history, social studies, English, physical education, languages, or business? What percentage of middle and high school science teachers within the teacher center boundaries have utilized the teacher center facilities? What percentage of these science teachers that have utilized the teacher center, have reported an impact on the curriculum and instruction of their students? What percentage of these same science teachers have returned to use the teacher center and continue to use the existing resources that are available at the teacher center?

TC-1b could not speak to a difference in whether middle and high school science teachers have been more receptive to the teacher center idea than elementary school teachers or middle and high school teachers in the disciplines of history, social studies, English, physical education, languages, or business. While TC-3 stated that the information was not known, the teacher center director/personnel was inclined to think that elementary teachers are more receptive to different ideas than middle and high school teachers. Although TC-4 felt there should be no difference, this teacher center director/personnel felt that secondary teachers used this particular center more
than elementary teachers perhaps because their hours are more flexible with preparation time and they need equipment of a higher sophistication level. TC-2 was inclined to think that the receptivity of middle and high school science teachers has been comparable to elementary school teachers and middle and high school teachers in the other disciplines.

Three teacher center directors/personnel stated that they had no percentages for middle and high school science teachers utilization of teacher center facilities. TC-2 does not have a "place" for a teacher center, so percentages could not be stated for usage of teacher center facilities. Instead, TC-2 addressed the linkage that has been established between one of the universities whose science faculty are released to teach in the public school while the public school faculty are released to teach at the university which gives each a greater perspective of what takes place at both levels.

While TC-1b reported on some research that was done which showed science teachers that have utilized the teacher center reported no impact on the curriculum and instruction of their students, TC-2 reported that in dialogues "with science teachers in planning inservice for secondary supervisors that they look at inservice in a positive way and I think that that is the key." TC-4 felt that an
impact was seen during the two or three years that they had a material center.

A small percentage of teachers have returned to use some materials, but most teachers do not return stated TC-1b. Remarks made by TC-4 seemed to address the teachers returning to the regional service center rather than the teacher center. TC-2 thought that teachers "have returned and been more productive and had a much more positive attitude in dealing with most students and in dealing with external resources and availability of resources."

Four Teacher Centers vs. Proposed Graphic Model

The final phase of research was the comparison of the proposed graphic model with literature from the four established teacher centers chosen for the study. The four teacher centers were the same ones from whom the teacher center directors/personnel chosen for the interviews were selected. At the time of the interviews, a request was made for literature concerning the teacher center so that the literature could be studied and the purposes of the teacher centers and proposed graphic model could be compared.

A recommendation by a staff member at the Texas Education Agency, led to three major teacher centers—Dallas, Fort. Worth, and Austin. A fourth teacher center located at Baylor University was suggested by one of the interviewed professional inservice educators.
Teacher centers in Texas have been mandated by law since 1973 with professional organizations, school districts and universities sharing equally in teacher center membership. Each college or university, public or private, must be involved in a teacher center. One of the earlier forerunners of teacher centers in Texas was the Texas Performance-Based Trainers of Teacher Trainers Project established in 1970. Better known as the TTT or Triple-T Project, it was administered by the Texas Education Agency and financed by the federal government. The TTT Project sought to improve the training of teachers to serve minority groups and to do it by improving college training of inservice and preservice teachers. Four colleges of education involved in the TTT Project agreed to begin the development of undergraduate competency-based teacher education programs that would involve both practicing professional educators and school settings. The name of the project was changed in 1971 to the Texas Teacher Center Project, an identity stemming for the U.S. Office of Education's proposal to utilize the teacher center for developing new ways to prepare college students for the teaching profession.

Senate Bill 8 passed in 1969, provided state funds for:

a) supervising teachers, b) school districts in which student teachers were placed, and c) inservice training at the local teacher center for the supervising teachers.
The next step involved determining ways the teacher centers were similar or dissimilar in purposes from the purposes of the proposed graphic model. First, the teacher centers studied generally limited their services to the placement and supervision of student teachers and the training of supervising teachers. Second, the teacher centers studied generally failed to address the purpose of the teacher center as explicated in the model which was the inservice education of all teachers.

While the major concern or purpose of the teacher centers in Austin, Dallas, and at Baylor University was the placement of student teachers and the inservice day(s) for supervising teachers, Fort Worth Teacher Center offered their teachers a center (place) with resources and resource people available. Even with these services available at the teacher center, an outside audit of the staff development department for the Fort Worth Independent School District pointed to the fact that the teacher center did not function as a staff development unit but concerned itself with placement of student teachers and preservice student teacher field experience. The audit team has recommended this task for the personnel department. The only staff development that the teacher center undertook was some inservice training for supervising teachers.
In its early development in the 70's, the Dallas Teacher Education Center was much larger, with satellite centers, funded by the federal government, and concerned with the education of minority students. With federal funding no longer available, the Dallas Teacher Education Center is still a "concept" with an office or "place" working with student teacher placement and inservice sessions for supervising teachers.

A final analysis establishes the proposed graphic model as a "place", very active in its usage, and a "concept" that deals with the areas of concerns for teaching science in future years while the four teacher centers are concerned with placement and supervision of student teachers and inservice training for supervising teachers only. The graphic model expresses an ongoing, continuous availability of inservice education which differs completely from the four established centers studied.
CHAPTER V

CONCLUSIONS

The major focus of this study was the development of a graphic model of a teacher center that serves middle and high school science teachers. After researching the literature, the major characteristics of a teacher center were determined and incorporated into the proposed graphic model. The characteristics were those believed to have an effect on science teachers in their professional growth and development, in curriculum development in their field, on research of pertinent problems in their teaching field, and in resources available for middle and high school science teachers. Middle and high school science teachers and professional inservice educators were interviewed to determine the extent the proposed graphic model fit their perceptions of what a teacher center should be that was designed to meet teachers' inservice needs. Five teacher center directors/personnel were interviewed to determine how the proposed model compared with their perceptions of a teacher center.

The research in this study was designed to contribute to the body of teacher center theory in the following areas: a) What are the characteristics of a teacher center designed to meet the needs of middle and high school science teachers? b) How does the model of a
teacher center that is designed to meet science teachers' inservice needs compare with science teachers' and professional inservice educators' perceptions of what a teacher center should be? c) In what ways does a selected sample of established teacher centers that serve middle and high school science teachers compare with the model proposed in the study?

General Plan of the Study

An unstructured interview utilizing hypothesized desirable characteristics of the proposed graphic model of a teacher center was used to elicit responses from both middle and high school science teachers and professional inservice educators. Two separate questionnaires that paralleled the interviews were administered two weeks following each individual interview to the same middle and high school science teachers and professional inservice educators to help clarify information garnered from the interviews. A third unstructured interview which closely paralleled the other interviews was administered to teacher center directors/personnel, but because it was designed to be implemented with teacher center directors/personnel, some questions were directed at teachers use of the teacher centers with which they were associated. A study of related literature for each of the teacher centers
utilized was also undertaken in order to compare the proposed model with the four established teacher centers.

Conclusions

The research in this study contributed to the body of teacher center theory in the following areas:

a) What are the characteristics of a teacher center designed to meet the needs of middle and high school science teachers?

The teacher's teaching related concerns should be the primary focus of the teacher center. (Appendix H)

The middle circle of the model identifies the professional educators' role in sensitizing teachers or making them aware, if there is a need, to the following concerns:

1) how to teach,
2) selection of concepts,
3) how to individualize instruction,
4) education of the hard to teach,
5) education for scientific literacy,
6) teaching processes and the nature of science,
7) increasing effectiveness of instruction,
8) how to evaluate, and
9) educating the gifted.
The outer circle of the model expresses local, national, and world concerns that influence both professional educators as well as classroom teachers. Examples of these local, national, and world concerns are:

1) use of nuclear energy,
2) interaction with space,
3) survival of planet earth,
4) conservation of natural resources,
5) environmental control,
6) future energy sources,
7) world agricultural needs,
8) minority group concerns,
9) control of pollution, and
10) race for technological survival or supremacy.

b) How does the model of a teacher center that is designed to meet science teachers inservice needs compare with teachers' and professional inservice educators' perceptions of what a teacher center should be?

The science teachers' and professional inservice educators' perceptions of what a teacher center should be compared favorably with the proposed graphic model of a teacher center. One addition to the outer
circle of the model was universal health care suggested by a professional inservice educator and later incorporated into a revised model. The proposed graphic model presented an exciting concept for the interviewed middle and high school science teachers, particularly if the teacher center was conveniently located.

c) In what ways does a selected sample of teacher centers that serve middle and high school science teachers compare with the model proposed in the study?

The teacher centers studied were not of the comprehensive level favored in the model. The clientele of the four teacher centers focused on the placement of student teachers, the supervision of student teachers, and assisting the supervising teacher to supervise more effectively.

Inferences Based on Conclusions of the Study

Science teachers, professional inservice educators, and teacher center directors/personnel responded positively to the possibility of inservice education as proposed in the graphic model of the teacher center. Dissatisfaction with present methods of inservice education may be responsible for the enthusiasm of the three interviewed groups for the proposed model. The delivery
of inservice education in the four teacher centers was unsatisfactory compared to that in the proposed teacher center model.

Recommendation for Future Study

Two major recommendations are indicated:

1) to ascertain teacher centers that have reputations for effectively meeting the needs of middle and high school science teachers, and

2) to identify: a) the extent to which these teacher centers served the needs of all of the middle and high school science teachers; b) ways that the teachers believed they have been served effectively; c) strategies that teacher center directors/personnel believed were effective in helping meet the needs of middle and high school science teachers; d) methods utilized by teacher center personnel to sensitize teachers to problems that are regarded by others as problems but not necessarily by teachers, and e) those things that a teacher center can do most effectively.

In summation, inservice education has been and is considered an important aspect of a teacher's profession. Many types of inservice education have been developed, such as workshops, meetings, lectures, and courses, with no one being satisfactory to meet all teachers' needs.
The teacher center such as the one described in this dissertation is a relative neophyte for inservice education but one that holds much promise. At teacher centers, where teachers' needs are the major focus, inservice education can then become the continuing professionally job-related education of teachers.
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Appendix A

Information Concerning the Model with Science Teachers and Professional Inservice Educators

The three concentric circles represent three different levels of concerns which will have an effect on science teaching for the future. These identified concerns can serve as the basis for a model of a teacher center that serves inservice and preservice science teachers. The teacher center is a place for inservice and preservice teachers to meet, study, discuss, evaluate, and integrate into their teaching, concerns of local, national, and world communities which effect the concerns of professional educators, both of which will have an effect on the teaching related concerns of science teachers.
Appendix A

Model of a Teacher Center that serves Middle and High School Science Teachers
Appendix B

I

QUESTIONNAIRE/INTERVIEW (For Teachers)

NAME:______________________________________________________________

SCHOOL:___________________________________________________________

SEX: M_____ F_____ AGE: 21-30 31-40 41-50 51-60 61-70

YEARS OF TEACHING: 1-5 6-10 11-15 16-20 21-25 26-30 31-35 36-40

Degree(s) Earned: BA BS MA MS MEd EdD PhD Other____

Subject: Major_______Minor_______Minor______________________________

Area(s) of Certification:____________________________________________

Subject(s) Teaching:____________________/____________________/

Grade Level of Students: currently teaching____________________

previously taught____________________

Number of Year(s) Associated with a Teacher Center:______
INTERVIEW (TEACHERS)

1. Through the years, a variety of methods have been utilized to help teachers improve their professional inservice development, such as...professional education courses (which are offered after school hours, in the evening, or during the summer), inservice days, workshops, etc. Would you comment briefly on how effectively you believe these to have been in the past? Were there long lasting effects or were they shortlived? Did you prefer one over the other? For what reason(s)?

2. In the past, it has been suggested that teachers have been little involved in the development of curriculum for the classes that they teach. Has this been your experience? How, in your opinion, has curriculum been determined in the past? Has this been a satisfactory procedure? Why or why not? If teachers were to be involved to a greater extent, what form would their involvement take?

(Introduce model with explanation)

3. In recent years, Americans have adopted the British Teacher Centre idea, an environment for teachers' professional development which takes into consideration teachers' individual needs and the educational conditions of the area in which they are located. As a science teacher, can you elaborate on any feasible goals or educational needs that could be met by a teacher center that serves middle and high school science teachers? (ex. sharing of ideas, development of curriculum, increased content knowledge)
4. A number of ways have been proposed that a teacher center could be helpful to teachers. For example, it has been suggested that at a teacher center, teachers could get help in improving their teaching skills. What kinds of teaching skills would you suggest teachers need help in improving? Would teachers be interested in learning how to use guided inquiry in their classroom, a strategy designed through the use of structured questions to lead students to an answer? Would teachers seek help for ways to teach concepts such as the concepts of equilibrium in chemistry, genes in life science and biology, electricity in physical science, and magnetism in earth science? Do teachers need assistance in implementing games, role playing, and simulations in teaching? Would teachers seek help in implementing higher level questions in their teaching? How would a teacher center be helpful to you?

5. It has also been suggested that at a teacher center, teachers would have the opportunity to share with each other teaching experiences that they have had in their own classrooms. Some have suggested that specific techniques that they utilize in their classrooms might be shared. Do any specific techniques come to your mind? Would sharing units of study that they have developed be worthwhile? What would you suggest that other teachers might do that you would be interested in having them share with you? What kinds of things do you do that would be of interest to other teachers?

6. As a teacher interested in your own personal and professional growth, do you think that it would make a difference if a university credited course was offered at the university or on-site at a teacher center? When considering that the Tyler Independent School District requires teachers to take additional credits every five years, what factors become important in making your selection of a course or courses? Does time make a difference in your course choice? If you elected to
take your course at a teacher center, what times would be convenient for you — during school hours, after school, evening, or weekends? Do you want science content courses or would you prefer to have specific education courses. What science courses or what specific education courses would you consider? Would you suggest some science content courses or specific education courses that might be geared to meeting teachers' specific needs? Would courses such as the following generally fit the needs of a sizeable number of teachers -- "New Developments in Science Curricula", "New Equipment for Use in a School Laboratory", "Computers in Science Education", "Career Education in Science", and "Analysis of Instructional Strategies"?

7. It has been suggested that teacher centers can provide help and direction to teachers as they investigate and seek answers to problems and issues that confront them. At a teacher center, teachers would have access to various resources such as literature related to the problem(s) to be investigated, access to teachers who have investigated similar problems, or university professors knowledgeable in areas of problems to be investigated. What are some problems and issues that you and other teachers recognize that you believe the resources available at the teacher center could be helpful in finding better answers? Some problems that might be investigated are: How can individualized instruction be implemented in my classes? What are some evaluative methods for judging achievement of higher level objectives, i.e., after reading information on the earth's solstice and equinox, the learner will be able to compare the earth's solstice and equinox; or the learner will be able to elaborate on the pros and cons of nuclear energy after thoroughly researching the issue? What can I as a teacher do to integrate "special needs" children into my classroom, i.e., physically or mentally handicapped, slow learners, or students who cannot read? In what ways can science teachers instruct their students in the art of writing?
8. It is thought by some educators that the teacher center can offer assistance to teachers in carrying out small research projects in their own classrooms. Do you believe that it is feasible for teachers to do research related to the effectiveness of instruction? Some suggested examples of such research projects are: concrete evidence of a teacher's effectiveness, strategies to implement different methods of teaching and indicators of the effectiveness of each method, and comparison of two different curricula at the same level. Do you think these are feasible topics to research? What kinds of assistance would you need? What are some other research projects that the personnel at a teacher center might assist a teacher in carrying out?

9. A suggestion has been made that a teacher center should be a place where a teacher could consult with informed personnel on educational issues, where curriculum units from other schools would be available for inspection and study, where live materials such as plants or animals and apparatus that your lab lacks would be available on loan or at very low cost, some of which would have to be reserved, picked up and returned. How useful do you believe each of these services would be to you and your fellow teachers? What kinds of equipment would you suggest that a teacher center might stock that would be useful to you, i.e.,:

- **Physics:** oscilloscope, car motor, Van de Graaf generator, cathode ray tube
- **Biology:** dissecting microscope, specimen models
- **Chemistry:** atomic models, centrifuge
- **Earth Science:** rock collections, geiger counters
- **Life Science:** live or preserved specimens
- **Physical Science:** telescope, barometer, thermometers
10. What factors might interfere with your use of a teacher center? Would the location of the teacher center have an effect on your use of such a center? If you had a part-time job or coaching job, would this also affect your decision about using a teacher center? If the school district did or did not provide released time for using the teacher center, would this also have an effect on your decision about using a teacher center?

11. What characteristics do you believe that teacher centers should have that serve teachers interested in the teaching of science? Examples: a place for teachers to meet socially, a center governed by teachers, a place where resources are available, a center aimed at the professional growth and development of teachers, a place where curriculum units are available or can be developed, and a place where teachers can carry on research.

12. Teachers should be one of the primary benefactors of a teacher center. What do you believe would be some of the outstanding benefits to teachers of a teacher center that serves science teachers? (i.e., improved teaching skills, opportunity for investigating problems in a classroom, specific courses that meet teachers' needs.)

13. Students should benefit if their teachers take advantage of the resources available at a teacher center. What would be some of the major benefits to the students taking advantage of such a teacher center? (i.e., increased understanding of what is taught,
classes that are more interesting, being more highly motivated, scoring higher on tests, courses that are more relevant.)

14. If given the opportunity to meet the required inservice days in any professional manner that you chose, what ways would you choose? (Depending on answer, might mention: workshops, professional meetings, lectures, courses, and teacher centers.)

15. Looking again at the graphic model, would you change the model in any way, and if so, what would be the changes?
Appendix B

FOLLOW-UP QUESTIONNAIRE (TEACHERS) 2 weeks later

1. To what extent has the professional inservice development of teachers been affected by attendance:

   ...at inservice days?
   a) very much  b) some  c) little  d) very little  e) none
   ...at workshops?
   a) very much  b) some  c) little  d) very little  e) none
   ...at professional education courses?
   a) very much  b) some  c) little  d) very little  e) none

2. To what extent should teachers be involved in the development of the curriculum for the classes that they teach?
   a) very much  b) some  c) little  d) very little  e) none

3. To what extent, in your opinion, would a teacher center that serves middle and high school science teachers, meet the following goals and educational needs:

   ...sharing of ideas?
   a) very much  b) some  c) little  d) very little  e) none
   ...development of curriculum?
   a) very much  b) some  c) little  d) very little  e) none
   ...increased content knowledge?
   a) very much  b) some  c) little  d) very little  e) none
4. To what extent would a teacher center be helpful to teachers in improving their teaching skills?
   a) very much   b) some  c) little  d) very little  e) none

5. To what extent would teachers utilize a teacher center as an opportunity:
   
   ...to share teaching experiences that they have had in their own classroom?
   a) very much   b) some  c) little  d) very little  e) none

   ...to share specific techniques that they utilize in their own classrooms?
   a) very much   b) some  c) little  d) very little  e) none

   ...to share units of study that they have developed?
   a) very much   b) some  c) little  d) very little  e) none

6. Would offering a course at a teacher center rather than on-site at a university influence teachers to choose the teacher center rather than the university?
   a) very much   b) some  c) little  d) very little  e) none

7. With resources such as literature related to the problems, university professors, and other teachers available at a teacher center, to what extent would science teachers utilize these resources in investigating problems and issues related to the teaching of science?
   a) very much   b) some  c) little  d) very little  e) none

8. To what extent would teachers utilize a teacher center that offered assistance to teachers in carrying out, in their own classrooms, research such as that related to the effectiveness of instruction?
   a) very much   b) some  c) little  d) very little  e) none
9. To what extent would a teacher utilize a teacher center that made available:

...informed personnel on educational issues for consultation?

a) very much  b) some  c) little  d) very little  e) none

...curriculum units from other schools for inspection and study?

a) very much  b) some  c) little  d) very little  e) none

...live materials such as plants and animals?

a) very much  b) some  c) little  d) very little  e) none

...equipment or apparatus, some of which would have to be reserved, picked up, and returned?

a) very much  b) some  c) little  d) very little  e) none

10. To what extent would factors such as the following discourage teacher use of a teacher center?

...a teacher center located 20 miles away?

a) very much  b) some  c) little  d) very little  e) none

...a teacher center located 50 miles away?

a) very much  b) some  c) little  d) very little  e) none

...a coaching or part time job?

a) very much  b) some  c) little  d) very little  e) none

...failure of the district to provide released time?

a) very much  b) some  c) little  d) very little  e) none

11. To what extent do you believe that a teacher center should have the following characteristics:

...a place for teachers to meet socially?

a) very much  b) some  c) little  d) very little  e) none
...a center governed by teachers?
a) very much b) some c) little d) very little e) none

...a place where resources are available?
a) very much b) some c) little d) very little e) none

...a center aimed at the professional growth and development of teachers?
a) very much b) some c) little d) very little e) none

...a place where curriculum units are available or can be developed?
a) very much b) some c) little d) very little e) none

...a place where teachers can research?
a) very much b) some c) little d) very little e) none

12. To what extent, in terms of your understanding of a teacher center, do you feel that a teacher center would be helpful to teachers in:

...improving their teaching skills?
a) very much b) some c) little d) very little e) none

...opportunity for investigating specific classroom problems?
a) very much b) some c) little d) very little e) none

...offering specific courses that meet teachers' needs?
a) very much b) some c) little d) very little e) none

13. When teachers take advantage of the opportunities offered by teacher centers, their students could be expected to benefit:

...by increased understanding of what is taught?
a) very much b) some c) little d) very little e) none
...from classes that are more interesting?
a) very much  b) some  c) little  d) very little  e) none

...by being more highly motivated?
a) very much  b) some  c) little  d) very little  e) none

...by scoring higher on tests?
a) very much  b) some  c) little  d) very little  e) none

...by courses that are more relevant?
a) very much  b) some  c) little  d) very little  e) none

14. If teachers had the opportunity to meet required inservice days in any professional manner that they chose, to what extent would teachers choose:

...workshops?
 a) very much  b) some  c) little  d) very little  e) none

...lectures?
 a) very much  b) some  c) little  d) very little  e) none

...professional meetings?
 a) very much  b) some  c) little  d) very little  e) none

...teacher centers?
 a) very much  b) some  c) little  d) very little  e) none

...courses?
 a) very much  b) some  c) little  d) very little  e) none
Appendix C

Criteria for Professionals' Critique of Science Teachers' and Professional Inservice Educators' Questionnaires

DIRECTIONS

The enclosed questionnaires are to be given to professionals who are familiar with teacher centers and to science teachers in middle and high schools, two weeks following a corresponding interview with each person. The interview probes the feasibility of a teacher center that serves middle and high school science teachers.

Along with the questionnaires are criteria for your evaluation of both questionnaires. There are three criteria for each question to be judged by choosing the most appropriate rating under each criteria. Please put a check in either "very much", "some", or "little or none" for each criteria.
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# Professionals

The question addresses an issue related to the professional life and work of teachers. The meaning of the question is clear and unambiguous. The question addresses an issue related to the present or possible future use of teacher centers.

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Appendix D

I

QUESTIONNAIRE/INTERVIEW (for Professionals)

NAME:__________________________________________

SCHOOL:________________________________________

SEX: M____ F____ AGE: 21-30 31-40 41-50 51-60 61-70

YEARS OF TEACHING: 1-5 6-10 11-15 16-20 21-25
26-30 31-35 36-40

Degree(s) Earned: BA BS MA MS MEd EdD PhD Other____

Subject Concentration(s):________________________________________

Current Position:________________________________________

If Teaching, Level of Students Being Taught:____________________

Administrative or Supervisory Experience:____________________

________________________________________________________________

Number of Year(s) Associated with a Teacher Center:______
INTERVIEW (PROFESSIONALS)

1. Through the years, a variety of methods have been utilized to help teachers improve their professional inservice development, such as...professional education courses (which are offered after school hours, in the evening, or during the summer), inservice days, workshops, etc. Would you comment briefly on how effective you believe these to have been in the past? Have you seen any long lasting effects or were they shortlived? Would you have a preference for one over the other? For what reason(s)?

2. In the past, it has been suggested that teachers have been little involved in the development of curriculum for the classes that they teach. Has this been your experience? How, in your opinion, has curriculum been determined in the past? Has this been a satisfactory procedure? Why or why not? If teachers were to be involved to a greater extent, what form would their involvement take?

3. As a professional educator associated with or having been associated with a teacher center, you are familiar with the teacher center concept, an environment for teachers' professional development, which takes into consideration their individual needs and the educational conditions of the area in which they are located. Can you elaborate on any feasible goals or educational needs that could be met by a teacher center that serves middle and high school science teachers? (ex. sharing of ideas, development of curriculum, increased content knowledge)

(Introduce model with explanation)
4. A number of ways have been proposed that a teacher center could be helpful to teachers. For example, it has been suggested that at a teacher center, teachers could get help in improving their teaching skills. What kinds of teaching skills would you suggest teachers need help in improving? Would teachers be interested in learning how to use guided inquiry in their classrooms, a strategy designed through the use of structured questions to lead students to an answer? Would teachers seek help for ways to teach concepts such as the concepts of equilibrium in chemistry, genes in life science and biology, electricity in physical science, and magnetism in earth science? Do teachers need assistance in implementing games, role playing, and simulations in teaching? Would teachers seek help in implementing higher level questions in their teaching? In what other ways might a teacher center be helpful to teachers?

5. It has also been suggested that at a teacher center, teachers would have the opportunity to share with each other teaching experiences that they have had in their own classrooms. Some have suggested that specific techniques that teachers utilize in their classrooms might be shared. Do any specific techniques come to your mind? Would sharing units of study that teachers have developed be worthwhile? What would you suggest that teachers might do that they would be interested in sharing with other teachers?

6. As a professional educator interested in the professional development of teachers, would you think that it makes a difference if a university credited course was offered at the university or on-site at a teacher center? Would you be willing to teach a university credited course at a teacher center if teachers showed a preference for the teacher center? Would a time
choice by teachers -- during school hours, after school, evenings, or weekends -- be a factor in your decision to teach a course at a teacher center? What other factors might influence your choice -- e.g., hours credited towards your teaching load by the university, possibility of extra pay, association with a formally recognized teacher center?

7. It has been suggested that teacher centers can provide help and direction to teachers as they investigate and seek answers to problems and issues that confront them. At a teacher center, teachers would have access to various resources such as literature related to the problem(s) to be investigated, access to teachers who have investigated similar problems, or university professors knowledgeable in areas or problems to be investigated. What are some problems and issues that you and other professionals recognize that you believe the resources available at a teacher center could be helpful to teachers in finding better answers. Some problems that might be investigated are: How can individual instruction be implemented in classes. What are some evaluative methods for judging achievement of higher level objectives, i.e., after reading information of the earth's solstice and equinox, the learner will be able to compare the earth's solstice and equinox; or the learner will be able to elaborate on the pros and cons of nuclear energy after thoroughly researching the issue? What can teachers do to integrate "special needs" children in the classroom, i.e., physically or mentally handicapped, slow learners, students who cannot read? In what ways can science teachers instruct their students in the art of writing?

8. It is thought by some educators that the teacher center can offer assistance to teachers in carrying out small research projects for their own classrooms. Do you believe that it is feasible for teachers to do research related to the effectiveness of instruction? Some
suggested examples of such research projects are: concrete evidence of a teacher's effectiveness, strategies to implement different methods of teaching and indicators of the effectiveness of each method, and comparison of two different curricula at the same level. What are some other research projects that the personnel at a teacher center might assist a teacher in carrying out?

9. A suggestion has been made that a teacher center should be a place where a teacher could consult with informed personnel on education issues, where curriculum units from other schools would be available for inspection and study, where live materials such as plants or animals and apparatus that a school lab lacks would be available on loan or at very low cost, some of which would have to be reserved, picked up, and returned. How useful do you believe each of these services would be to teachers? What other items might the teacher center have available? Would you, as a professional, be willing to act as a consultant to teachers through a teacher center?

10. What factors might interfere with teachers use of a teacher center? Would the location of the teacher center have an effect on their use of such a center? If they had a part-time job or coaching job, would this also have an effect on their decision about using a teacher center. If the school district provided or did not provide released time for using the teacher center, would this also have an effect on their decision about using a teacher center?

11. What characteristics do you believe that teacher centers should have that serve teachers interested in the
teaching of science? Examples: a place for teachers to meet socially, a center governed by teachers, a place where resources are available, a center aimed at the professional growth and development of teachers, a place where curriculum units are available or can be developed, and a place where teachers can carry on research.

12. Teachers should be one of the primary benefactors of a teacher center. What do you believe would be some of the outstanding benefits to teachers of a teacher center that serves science teachers? (i.e., improved teaching skills, opportunity for investigating problems in the classroom, specific courses that meet teachers' needs.)

13. Students should benefit if their teachers take advantage of the resources available at a teacher center. What would be some of the major benefits to the students of teachers taking advantage of such a teacher center? (i.e., increased understanding of what is taught, classes that are more interesting, being more highly motivated, scoring higher on tests, courses that are more relevant.)

14. If teachers were given an opportunity to meet the required inservice days in any professional manner that they chose, what do you think they are most likely to choose? (Depending on answer, might mention: workshops, professional meetings, lectures, courses, and teacher centers.)
15. Looking again at the graphic model, would you change the model in any way, and if so, what would be the changes?
Appendix D

II

FOLLOW-UP QUESTIONNAIRE (PROFESSIONALS) 2 weeks later

1. To what extent has the professional inservice development of teachers been affected by attendance:
   ...at inservice days?
   a) very much  b) some  c) little  d) very little  e) none
   ...at workshops?
   a) very much  b) some  c) little  d) very little  e) none
   ...at professional education courses?
   a) very much  b) some  c) little  d) very little  e) none

2. To what extent should teachers be involved in the development of the curriculum for the classes that they teach?
   a) very much  b) some  c) little  d) very little  e) none

3. To what extent, in your opinion, would a teacher center in your area that serves middle and high school science teachers, meet the following goals and educational needs:
   ...sharing of ideas?
   a) very much  b) some  c) little  d) very little  e) none
   ...development of curriculum?
   a) very much  b) some  c) little  d) very little  e) none
   ...increased content knowledge?
   a) very much  b) some  c) little  d) very little  e) none

4. To what extent would a teacher center be helpful in improving their teaching skills?
   a) very much  b) some  c) little  d) very little  e) none
5. To what extent would teachers utilize a teacher center as an opportunity:

... to share teaching experiences that they have had in their own classrooms?

a) very much  b) some  c) little  d) very little  e) none

... to share specific techniques that they utilize in their own classrooms?

a) very much  b) some  c) little  d) very little  e) none

... to share units of study that they have developed?

a) very much  b) some  c) little  d) very little  e) none

6. Would offering a course at a teacher center rather than on-site at a university influence teachers to choose the teacher center rather than the university?

a) very much  b) some  c) little  d) very little  e) none

7. With resources such as literature related to the problems, university professors, and other teachers available at a teacher center, to what extent would science teachers utilize these resources in investigating problems and issues related to the teaching of science?

a) very much  b) some  c) little  d) very little  e) none

8. To what extent would teachers utilize a teacher center that offered assistance to teachers in carrying out, in their own classrooms, research such as that related to the effectiveness of instruction?

a) very much  b) some  c) little  d) very little  e) none

9. To what extent would a teacher utilize a teacher center that made available:

... informed personnel on educational issues for consultation?

a) very much  b) some  c) little  d) very little  e) none
...curriculum units from other schools for inspection and study?

a) very much  b) some  c) little  d) very little  e) none

...live materials such as plants and animals?

a) very much  b) some  c) little  d) very little  e) none

...equipment or apparatus, some of which would have to be reserved, picked up, and returned?

a) very much  b) some  c) little  d) very little  e) none

10. To what extent would each of the following factors discourage teacher use of a teacher center:

...a teacher center located 20 miles away?

a) very much  b) some  c) little  d) very little  e) none

...a teacher center located 50 miles away?

a) very much  b) some  c) little  d) very little  e) none

...a coaching or part time job?

a) very much  b) some  c) little  d) very little  e) none

...failure of the district to provide released time?

a) very much  b) some  c) little  d) very little  e) none

11. To what extent do you believe that a teacher center should have the following characteristics:

...a place for teachers to meet socially?

a) very much  b) some  c) little  d) very little  e) none

...a center governed by teachers?

a) very much  b) some  c) little  d) very little  e) none
...a place where resources are available?

a) very much  b) some  c) little  d) very little  e) none

...a center aimed at the professional growth and development of teachers?

a) very much  b) some  c) little  d) very little  e) none

...a place where curriculum units are available or can be developed?

a) very much  b) some  c) little  d) very little  e) none

...a place where teachers can research?

a) very much  b) some  c) little  d) very little  e) none

12. To what extent, in terms of your understanding of a teacher center, do you feel that a teacher center would be helpful to teachers in:

...improving their skills?

a) very much  b) some  c) little  d) very little  e) none

...opportunity for investigating specific classroom problems?

a) very much  b) some  c) little  d) very little  e) none

...offering specific courses that meet teachers' needs?

a) very much  b) some  c) little  d) very little  e) none

13. When teachers take advantage of the opportunities offered by teacher centers, their students could be expected to benefit:

...by increased understanding of what is taught?

a) very much  b) some  c) little  d) very little  e) none

...from classes that are more interesting?

a) very much  b) some  c) little  d) very little  e) none
...by being more highly motivated?
   a) very much   b) some   c) little   d) very little   e) none
...by scoring higher on tests?
   a) very much   b) some   c) little   d) very little   e) none
...by courses that are more relevant?
   a) very much   b) some   c) little   d) very little   e) none

14. If teachers had the opportunity to meet required inservice
days in any professional manner that they chose, to what
extent would teachers choose:
   ...workshops?
   a) very much   b) some   c) little   d) very little   e) none
   ...lectures?
   a) very much   b) some   c) little   d) very little   e) none
   ...professional meetings?
   a) very much   b) some   c) little   d) very little   e) none
   ...teacher centers?
   a) very much   b) some   c) little   d) very little   e) none
   ...courses?
   a) very much   b) some   c) little   d) very little   e) none
Appendix E

INTERVIEW (Teacher Center Directors)

NAME: ____________________________________________________________

SCHOOL: __________________________________________________________

SEX:  M  F  AGE:  21-30  31-40  41-50  51-60  61-70

YEARS OF TEACHING:  1-5  6-10  11-15  16-20  21-25  26-30  31-35  36-40

Degree(s) Earned:  BA BS MA MS MEd EdD PhD Other________

Subject Concentration(s): ________________________________________

Current Position: ________________________________________________

If Teaching, Level of Students Being Taught: _______________________

Administrative or Supervisory Experience: __________________________

Number of Year(s) Associated with a Teacher Center: ______          
1. Through the years, a variety of methods have been utilized to help teachers improve their professional inservice development, such as...professional education courses (which are offered after school hours, in the evening, or during the summer), inservice days, workshops, etc. Would you comment briefly on how effective you believe these to have been in the past? Have you seen any long lasting effects or were they shortlived? Would you have a preference for one over the other? For what reason(s)?

2. In the past, it has been suggested that teachers have been little involved in the development of curriculum for the classes that they teach. Has this been your experience? How, in your opinion, has curriculum been determined in the past? Has this been a satisfactory procedure? Why or why not? If teachers were to be involved to a greater extent, what form would their involvement take?

3. As a professional educator associated with a teacher center, you are familiar with the teacher center concept, an environment for teachers' professional development which takes into consideration their individual needs and the educational conditions of the area in which they are located. Can you elaborate on any feasible goals or educational needs that could be met by a teacher center that serves middle and high school science teachers? (ex. sharing of ideas, development of curriculum, increased content knowledge)

(Introduce model with explanation)
4. A number of ways have been proposed that a teacher center could be helpful to teachers. For example, it has been suggested that at a teacher center, teachers could get help in improving their teaching skills. What kinds of teaching skills would you suggest teachers need help in improving? Would teachers be interested in learning how to use guided inquiry in their classrooms, a strategy designed through the use of structured questions to lead students to an answer? Would teachers seek help for ways to teach concepts such as the concepts of equilibrium in chemistry, genes in life science and biology, electricity in physical science, and magnetism in earth science? Do teachers need assistance in implementing games, role playing, and simulations in teaching? Would teachers seek help in implementing higher level questions in their teaching? In what other ways might a teacher center be helpful to teachers?

5. It has also been suggested that at a teacher center, teachers would have the opportunity to share with each other teaching experiences that they have had in their own classrooms. Some have suggested that specific techniques that teachers utilize in their classrooms might be shared. Do any specific techniques come to your mind? Would sharing units of study that teachers have developed be worthwhile? What would you suggest that teachers might do that they would be interested in sharing with other teachers?

6. As a professional educator interested in the professional development of teachers, would you think that it makes a difference if a university credited course was offered at the university or on-site at a teacher center? Have you found time, to be a factor in the willingness of teachers to use the teacher center -- during school hours, after school, evenings, or weekends? In your experience, what have been the most popular hours for teachers' use of a teacher center?
7. It has been suggested that teacher centers can provide help and direction to teachers as they investigate and seek answers to problems and issues that confront them. At the teacher center, have middle and high school teachers had access to various resources such as literature related to the problem(s) to be investigated, access to teachers who have investigated similar problems, or university professors knowledgeable in areas of problems to be investigated? What are some problems and issues that you recognize, that you believe the resources available at a teacher center could be helpful to science teachers in finding better answers? Some problems that might be investigated are: How can individual instruction be implemented in classes? What are some evaluative methods for judging achievement of higher level objectives, i.e., after reading information on the earth's solstice and equinox, the learners will be able to compare the earth's solstice and equinox; or the learner will be able to elaborate on the pros and cons of nuclear energy after thoroughly researching the issue? What can teachers do to integrate "special needs" children in the classroom, i.e., physically or mentally handicapped, slow learners, students who cannot read? In what ways can science teachers instruct their students in the art of writing?

8. It is thought by some educators that the teacher center can offer assistance to teachers in carrying out small research projects in their own classrooms. Do you believe that it is feasible for teachers to do research related to the effectiveness of instruction? Some suggested examples of such research projects are: concrete evidence of a teacher's effectiveness, strategies to implement different methods of teaching and indicators of the effectiveness of each method, and comparison of two different curricula at the same level. What are some other research projects that the personnel at a teacher center might assist a teacher in carrying out?
9. A suggestion has been made that a teacher center should be a place where a teacher could consult with informed personnel on education issues, where curriculum units from other schools would be available for inspection and study, where live materials such as plants or animals and apparatus that a school lab lacks would be available on loan or at very low cost, some of which would have to be reserved, picked up, and returned. Have these services been available to middle and high school science teachers? How useful do you believe each of these services would be to teachers? What other items does the teacher center have available?

10. What factors have you found that interfere with teachers use of a teacher center? Has the location of the teacher center had an effect on their use of such a center? If they have a part-time job or coaching job, has this also had an effect on their decision about using a teacher center? If the school district provided or did not provide released time for using the teacher center, has this also had an effect on their decision about using a teacher center?

11. What characteristics do you believe that teacher centers should have that serve teachers interested in the teaching of science? Examples: a place for teachers to meet socially, a center governed by teachers, a place where resources are available, a center aimed at the professional growth and development of teachers, a place where curriculum units are available or can be developed, and a place where teachers can carry on research.

12. Teachers should be one of the primary benefactors of a teacher center. What do you believe would be some
of the outstanding benefits to teachers of a teacher center that serves science teachers? (i.e., improved teaching skills, opportunity for investigating problems in the classroom, specific courses that meet teachers' needs.)

13. Students should benefit if their teachers take advantage of the resources available at a teacher center. What would be some of the major benefits to the students of teachers taking advantage of such a teacher center? (i.e., increased understanding of what is taught, classes that are more interesting, being more highly motivated, scoring higher on tests, courses that are more relevant.)

14. If teachers were given an opportunity to meet the required inservice days in any professional manner that they chose, what do you think they are most likely to choose? (Depending on answer, might mention: workshops, professional meetings, lectures, courses, and teacher centers.)

15. Looking again at the graphic model, would you say that the teacher center with which you are associated parallels the graphic model in any way? Would you change the graphic model in any way, and if so, what would be the changes?
16. How receptive have middle and high school science teachers been to the teacher center idea compared to other teachers such as elementary school teachers or middle and high school teachers in the disciplines of history, social studies, English, physical education, languages, or business? What percentage of middle and high school science teachers within the teacher center boundaries have utilized the teacher center facilities? What percentage of these science teachers that have utilized the teacher center, have reported an impact on the curriculum and instruction of their students? What percentage of these same science teachers have returned to use the teacher center and continue to use the existing resources that are available at the teacher center?
## Appendix F

### Description of Middle and High School Science Teachers Interviewed

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<td>BS</td>
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<td>MS</td>
</tr>
<tr>
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<tr>
<td>T-12</td>
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## Appendix F

### Description of Professional Inservice Educators Interviewed

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<td>Ed.D.</td>
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<td>16 plus</td>
<td>10</td>
<td>Ed.D.</td>
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<td>P-3 Asst. Prof.</td>
<td>6-10</td>
<td>4</td>
<td>Ph.D.</td>
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<td>P-4 Chair, Dept. of Educ.</td>
<td>16 plus</td>
<td>6</td>
<td>Ed.D.</td>
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<td>P-5 Dean, Sch. of Educ.</td>
<td>16 plus</td>
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<td>Ed.D.</td>
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<td>P-6 Prof. Educ.</td>
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## Description of Teacher Center
### Directors/Personnel Interviewed

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<td>TC-1b Specialist with T.C.</td>
<td>16 plus</td>
<td>4</td>
<td>MA</td>
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<tr>
<td>TC-2 Dean, Center for Teaching and Learning</td>
<td>16 plus</td>
<td>13</td>
<td>Ed.D.</td>
</tr>
<tr>
<td>TC-3 Director of Staff Dev.</td>
<td>16 plus</td>
<td>1</td>
<td>MA</td>
</tr>
<tr>
<td>TC-4 Chm., Dept. of Prof. Field Exp.</td>
<td>16 plus</td>
<td>10</td>
<td>Ed.D.</td>
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</table>
Appendix G

Written Consent Form
"A Model Teacher Center and the Inservice Education of Middle and High School Science Teachers:
A Study of Four Teacher Centers"

I. I, Mary C. Nash, am a doctoral candidate in Science Education at the University of Massachusetts in Amherst, Massachusetts. In my dissertation research, I will be looking at issues related to a proposed model of a teacher center that serves middle and high school science teachers.

II. As a participant in this study, you will be interviewed for approximately an hour at a mutually agreeable time and place. The interview will center around a proposed graphic model of a teacher center that serves middle and high school science teachers. Questions asked during the interview will explore the issues of inservice education, curriculum development, professional growth and development, and research. Participants who are middle and high school science teachers and participants who are now or have been associated with the Northeast Texas Teacher Center will be asked to answer a questionnaire that parallels the interview, two weeks following the interview. Teacher center directors/personnel will be interviewed.

III. The interviews will be audio-taped and later transcribed. My goal is to analyze and then compose materials from these transcripts and questionnaires for my doctoral dissertation, possible journal articles, and for instructional purposes. In all written materials and oral presentations that utilize material from the interviews or questionnaires, the interviewee will be identified by a pseudonym to insure confidentiality, while the school district, local teacher center, and four established teacher centers will be identified.

IV. While having consented to participate in the interview and questionnaire processes, and having so done, you may withdraw your consent to have specific excerpts from the interviews or questionnaires used in any printed materials or oral presentations if I am notified in writing within the next two weeks.

V. In signing this form, you are agreeing to the use of the materials as stated in III. If the material from the interview or questionnaire were to be used in another way not described, I will contact you for your additional written consent.

VI. In signing this form, you are also assuring me that you will make no financial claims on me for the use of the material in the interview or questionnaire.

I, ____________________________, have read the above form and agree to participate in the research under the conditions stated above.

Signature of Participant

Date

Interviewer

Mary C. Nash
Appendix H

Model of a Teacher Center that serves Middle and High School Science Teachers