A DELPHI INQUIRY OF THE ROLE OF THE CLASSROOM COORDINATOR/TEACHING PARTNER IN INTERACTIVE SATELLITE INSTRUCTION

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CHAPTER I

THE RESEARCH PROBLEM

In 1971, then United States Commissioner of Education of the Department of Health, Education, and Welfare, Dr. Sidney P. Marland, expressed his belief in the importance of developing and utilizing educational technology.

> Employment of technology in education can no longer be thought of in terms of the future - a vision conjured up at a world's fair and then forgotten for a decade or more. We must think in terms of now. A child cannot wait for the future in order to become educated. His needs are current and pressing. (p. 11)

The combination of educational budget constraints and increasing concern about the educational preparation of American students, especially in rural areas, has spurred the development of a variety of new delivery systems for distance education. These delivery systems can be grouped by their primary presentation form, as follows:

* Print-based systems, such as correspondence courses and self-study packets;
* Audio-based systems, including foreign language tapes, audioconferences, and radio courses;
* Video-based systems, either two-way live classes or one-way live or taped classes, using full-power broadcast, instructional television fixed service (ITFS), cable microwave, fiber optics, satellite, videotapes, videodisc, and slow scan television; and

* Computer-based systems, such as computer-assisted instruction, electronic mail, computer conferencing, and audiographic technologies (Batey & Cowell, 1986).

Until recently, high schools have been reluctant to make extensive use of college courses offered on television or videotape due to the lack of interaction and the prohibitive cost of equipment. However, the availability of inexpensive satellite dishes and live two-way communication provided by the new technology make interactive satellite courses increasingly attractive (Brown, 1985). Four objectives are met by this and other new media:

(1) the need to reach a greater number of students;

(2) the need to provide a wider range of learning materials;

(3) the need to provide opportunities for independent study; and

(4) the need to provide student interaction (MacKenzie, Eraut, & Jones, 1970).

Rural schools in particular view satellite instruction as a means of offsetting the lack of curriculum opportunities resulting from scarce resources.

> Across America's open spaces, rural schools have begun to sprout satellite dishes. Pressed by declining enrollment, lack of funds, and a shortage of teachers, school districts are turning to innovative technology to give students quality courses they would otherwise miss - live and at a fraction of the cost of hiring a full-time instructor. (Secter, 1987, p. 1)

While concern over the inadequate preparation of students in the sciences and mathematics exists nationwide, it is most keenly felt in the rural schools, which are unable to provide advanced courses in these subjects to college-bound students. This puts students who intend to pursue mathematics- and science-related majors at a particular disadvantage once they reach the college or university campus (Holt, 1987).

In response to these concerns, the College of Arts and Sciences of Oklahoma State University, together with the Oklahoma State Department of Education, the Oklahoma Legislature, and rural superintendents across the state, developed the Arts and Sciences Teleconferencing Service (ASTS) in 1984. The first course, German I by Satellite, was broadcast in the fall of 1985. Since then, nine additional courses have been added to the satellite program. These include German II, Russian I, Advanced Placement (AP) Physics, AP Calculus, Precalculus, Chemistry, American History, Applied Economics, Basic Reading and English. Currently in its sixth year, ASTS is serving a total of 365 schools across 27 states during the 1989-90 academic year. While rural schools are the primary users, larger schools have started to enroll students in courses like Russian I and Chemistry (Whittington, 1989).

Need for the Study

Naturally, those investing in any new technology want to be assured that it is effective, and considerable research has been done on the various distance-learning delivery systems and educational media. Robert Heinich (1976) points out that research in the field of alternative educational delivery systems has been largely comparative. The emphasis has been on assessing whether the new medium is as good as conventional instruction, and, generally, the results have indicated that it is. He adds, however, that this kind of research question is naive.

> One of the problems with that kind of research is that it tends to measure the potential of the new technology against the limitations of the old technology. It binds the new down and assumes that it cannot do anything other than what the old technology did and compares it to it. (Heinich, 1976, p. 107)

In the case of rural schools, for example, the choice that exists is not between Physics by Satellite or conventional classroom physics, but between the satellite course or none at all. What may be more useful, then, is an exploration of the factors which may contribute to or impede the academic performance of students participating in satellite courses.

A teacher is considered to have considerable impact on the academic performance of students and to play a primary role in their learning processes (Champagne & Hornig, 1987; Druva & Anderson, 1983). Undoubtedly, therefore, the effectiveness of the satellite instructor is a critical factor linked to the success of the students, and some studies have touched on the skills and characteristics necessary for the on-camera satellite instructor (Platten & Barker, 1987; Barker, 1987a).

There is an additional teacher, however, whose impact on the students must also be considered. Due to accreditation and teacher certification concerns, schools participating in the by-satellite programs must provide a certified teacher who will have direct contact with the students in the classrooms at the receive sites (Whittington, 1989). In the AP Physics by Satellite program, this teacher is called a "classroom coordinator." In the AP Calculus and the Precalculus by Satellite programs, s/he is called a "teaching partner."

The role of the coordinator/teaching partner is unique. Although s/he is responsible for the class in many ways, s/he does not teach the class, serving instead as a collaborator and resource person. According to ASTS, the primary responsibilities of the coordinator/teaching partner are:

(1) to motivate and supervise the students;

(2) to initiate interaction with the ASTS professors by telephone, electronic mail, and campus visits;

(3) to learn the basics of the ASTS computer programs and to assure that all necessary equipment and supplies are "in place and operating;"

(4) to make the final decision in assigning grades;

(5) to prepare students for the courses by reviewing necessary material; and

(6) to adapt the ASTS program to local needs (ASTS, 1988).

In addition, ASTS suggests that coordinators/teaching partners meet certain qualifications. In the AP Physics by Satellite program, the classroom coordinators are asked to have a "secondary math or science background or the occasional assistance of a fellow teacher with such qualifications" (ASTS, 1988, p. 9). In the Calculus by Satellite program, the teaching partner "should be certified in Algebra I, Geometry, Algebra II, and Trigonometry" (ASTS, 1988, p. 9). Precalculus by satellite teaching partners are expected to have a "strong math background" (ASTS, 1988, p. 9). Coordinators/teaching partners are also expected to attend a training session covering their responsibilities and the operation and technical aspects of the course.

Statement of Problem

Concern for providing wider access to educational opportunities has prompted the development of interactive satellite programs. It appears likely that, due to federal support programs, such as the Star Schools project, satellite programs will continue to expand and proliferate. The potential impact of this delivery system may require redefining the traditional roles of students and teachers and the traditional relationships between high schools and universities. Already students are being trained to interact with a medium they have experienced only passively before, and classroom teachers at satellite receive sites are being cast into a role unlike that for which they have been trained in their teacher education programs. It is vital, then, that criteria be developed to define this new teaching role and to determine guidelines for the selection, training and evaluation of its practitioners.

Statement of Purpose

The purpose of this study is to determine the professional and personal characteristics of effective classroom coordinators/teaching partners in science- and mathematics-by-satellite programs and to identify the obstacles and concerns which may impede their effectiveness. To accomplish its purposes, this study will address the following research questions:

(1) What are the most important personal and/or professional characteristics of an effective classroom coordinator/teaching partner for a math- or physics-by-satellite program as suggested

by a consensus of classroom coordinators/teaching partners?

(2) What are the most important personal and/or professional characteristics of an effective classroom coordinator/ teaching partner for a math- or physics-by-satellite program as suggested by a consensus of high school administrators?

(3) What impediments to their effectiveness are of greatest concern to the classroom coordinators/teaching partners in the ASTS math- and physics-by-satellite programs?

(4) What impediments to the effectiveness of the classroom coordinators/teaching partners are of greatest concern to the administrators of high schools participating in the ASTS math- and physics-by-satellite programs?

(5) How does the model suggested by the classroom coordinators/ teaching partners compare to that suggested by the high school administrators?

(6) What does this comparison seem to suggest about an empirical profile of an effective classroom coordinator/teaching partner?

(7) Which suggested changes are seen as most critical to the success of the math- and physics-by-satellite programs?

Significance of the Study

ASTS is a delivery system designed to counteract inequities between small and large and/or urban and rural schools. Therefore, administrators need to know what makes an ASTS program effective. Since classroom coordinators/teaching partners play key roles, policy makers need to identify characteristics of these practitioners which impact on the success of the programs.

The information derived from this study was expected to contribute to a better understanding of the desirable characteristics of classroom coordinators/teaching partners in mathematics- and science-by-satellite programs and the obstacles and concerns which they face. Application of this information was expected to be useful to the classroom coordinators/teaching partners in the daily practice of their role, as well as to the administrators at schools participating in the ASTS interactive satellite programs in the selection and evaluation of faculty to serve in this role. The results obtained from this study were further expected to be useful to those serving as coordinators/ teaching partners in evaluating their own effectiveness.

Assumptions

For the purpose of this study, all administrators and coordinators/teaching partners participating in the AP Physics, AP Calculus, and Precalculus by Satellite programs were considered to be experts based on at least one academic year's experience with the program.

Limitations

The implications derived from this study are applicable to the ASTS AP Physics, AP Calculus, and Precalculus by Satellite programs. While the results may be generalizable to future academic years, they are not generalizable to other interactive satellite program systems or to other subjects offered by the Arts and Sciences Teleconferencing Service.

Scope

This study was limited to classroom coordinators/teaching partners and school administrators participating in the ASTS AP Physics, AP Calculus, and Precalculus by Satellite programs during the 1988-89 academic year.

Definitions

AP

Advanced Placement. This is a College Board program of college-level courses, outlines, and exams for secondary school students. Students performing well on the AP examination may receive college credit or advanced placement (ASTS, 1988).

ASTS program

By-satellite high school and AP courses beamed from Oklahoma State University by the Arts and Sciences Teleconferencing Service.

Interactive satellite instruction

Live, televised courses broadcast via satellite, combined with telephone service and/or electronic mail to provide interaction.

Rural school

A school located in a school district whose total average daily attendance (ADA) is 800 or fewer (Oklahoma State Department of Education).

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of literature was organized into five sections: (1) The Math and Science Education Gap; (2) The Problems of Rural Schools; (3) Distance Education Delivery Systems; (4) Interactive Satellite Instruction; and (5) Effective Teaching Characteristics.

The Math and Science Education Gap

Among the ominous findings presented by the National Commission on Excellence in Education in their 1983 report, A Nation at Risk, was that

> Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world. (p. 5)

Most observers of education agree that there are at least five areas of principal concern regarding math and science education in the United States. The first of these concerns is the indication from standardized test scores that U.S. students are less well trained than their peers in other industrialized countries (Rotberg, 1984). Fewer than 240,000 U.S. high school students take calculus, for example, compared to twenty times that many in the Soviet Union who study the subject for two years. Few American students take more than one year of biology or any physics at all, as compared to students in Japan and East Germany, who begin specialized study of mathematics, as well as biology and physics, in the sixth grade (McGrath, 1982). This inequity is due in large part to a lack of educational opportunities provided by American schools. For instance, only one-third of U.S. secondary schools offers courses in calculus, with fewer than one-third offering courses in physics taught by qualified physics teachers (Despain, 1983). The 1988 AIP Report, on the other hand, indicates that 66% of all high schools offer physics every year, and that another 17% offer the course in alternate years, so that 96% of all high school students attend schools where physics courses are available. The report agrees, however, with the finding that only about a third of all of the physics courses are taught by fully qualified instructors, and also states that small, rural public high schools are among the least likely to offer physics (Neuschatz & Covalt, 1988).

Rotberg (1984) cautions, however, that the use of standardized test scores to compare American students to their peers abroad may be misleading. She points out that, while approximately 80% of the high-school-age group attends high school in the United States, only the highest achieving 20% of European teenagers attends upper-secondary school.

> Consequently, international studies of achievement often compare the average score of more than three-fourths of the age group in the U.S. with the average score of the top 9% in West Germany, the top 13% in the Netherlands, or only the top 45% in Sweden. (p. 670)

Nevertheless, the AIP Report contends that, even taking into account the retention of a higher percentage of U.S. students to the point of graduation, this country compares poorly in terms of the proportion of students exposed to basic physics, as well as the performance of those enrolled in the most advanced courses offered (Neuschatz & Covalt, 1988).

A second concern is that students in the United States today are less well trained than were their predecessors. Indeed, standardized test scores in both verbal and mathematics aptitudes have declined steadily over the past nineteen years. Scores in mathematics alone have declined by thirty points (Gardner, 1983).

Rotberg (1984) points out, on the other hand, that, while declines are more evident in tests that assess the basic knowledge of the general population in the areas of mathematics and science, the achievement test scores have remained high for those students who are likely to major in these subject areas. Gardner (1983) refutes this claim, however, citing federal mandates which have tended to favor the disadvantaged students over those with "the highest potential to contribute to society" (p. 7), with the result that there have been test score gains at the lower end of the scale which are, unfortunately, offset by declines in scores at the upper end.

Rotberg (1984) continues by noting that most education observers agree that these problems are the consequences of the general laxity in educational standards in this country and the shortage of qualified science and mathematics teachers. Since many high schools require only two years of math and one year of science, students who do not plan to go to college generally end their studies in these areas at an early age (McGrath, 1982). This may be partly due to a lack of interest, but other factors may be significant as well. Advanced courses are generally the first to be cut in times of tight budgets, and good teachers for these courses are difficult to find (Secter, 1987).

The shortage of qualified teachers in mathematics and science has been termed a "national crisis" (Paul, 1981, p. 177). In 1981, over 80% of the states reported shortages (Despain, 1983), and, according to a 1982 report to the National Convention on Precollege Education in Math and Science, forty-four states indicated a shortage or a critical shortage of math and chemistry teachers, and forty-five indicated a shortage of physics teachers (Gardner, 1983).

Rumberger (1985) cites research which indicates that 50% of the newly hired secondary math and science teachers in 1982 were unqualified in these areas and teaching on an emergency basis. Moreover, the National Science Board predicts that the demand for math and science teachers will more than double from 140,000 in 1987 to 300,000 by 1995. The unlikelihood of meeting this increasing demand is based on the expected retirement of 40% of the current teaching force in math and science (Secter, 1987), and on the marked decline in the number of student teachers in these subject fields (Despain, 1983). Increased high school graduation requirements will further intensify the shortages in the future (Champagne & Hornig, 1987), although they will be offset somewhat by declining secondary school enrollments (Rotberg, 1984).

The fourth major concern which Rotberg (1984) cites is that the United States is not producing sufficient numbers of trained scientists, mathematicians, engineers, and computer scientists to meet economic and military needs. Although, in 1950, 36% of all bachelor's and first professional degrees were in science and engineering, the proportion fell to just 29% by 1980. Likewise, the percentage of master's degrees in science and engineering dropped from a record 30% in 1965 to 18% in 1980 (Gardner, 1983). Senator Edward Kennedy addressed this concern in a 1987 address to the Legislature:

> The costs to this nation of a continued failure to teach math and science to our children will be enormous. The very least we will lose will be billions upon billions of dollars in trade revenue. The true cost of inaction will be the lost talents of an entire generation of our people, and that is ground we will never regain. (Secter, 1987, p. 1)

Despite these concerns, Neuschatz and Covalt (1988) indicate that both total enrollment figures in physics and the proportion of high school students taking a physics course have remained "remarkably stable in the last several decades" (p. 7). Moreover, it is possible that these predicted shortages have been overstated due to limitations in the methodology used to survey projected business and military demands (Rotberg, 1984).

The final concern, according to Rotberg (1984), is that the problems already described will become even more severe over the next decade as technological advances increase the need for a highly trained work force. Already 300 of the largest companies in the United States have been obliged to offer remedial courses in math and English to their entry level workers. At the time they enter the work force, American adults today are less skilled than their parents were (Naisbitt, 1982). In fact, McGrath describes the United States as "rapidly becoming a high-tech society with low-tech education" (1982, p. 67). On the other hand, some economists contend that high technology will tend to reduce rather than increase the skill requirements of jobs and that the supply of technically trained personnel will, in fact, exceed the demand (Rotberg, 1984).

In response to these concerns, the National Science Board's Commission on Precollege Education in Mathematics and Science and Technology has outlined three priorities for our education systems:

(1) To develop a larger pool of well trained and motivated students to pursue careers in science and engineering;

(2) To broaden the range of educational opportunities in mathematics, science, and technology at all grade levels; and

(3) To raise the general science and technology literacy of all citizens (Despain, 1983).

The Problems of Rural Schools

> They are frequently depicted as unsophisticated and slow to change. The reality is, rural schools strive for academic excellence. They are guided by legislative curriculum mandates that require adherence irrespective of size (small/large), geographic location (urban/rural), and regional economic resources. (Pease & Tinsley, 1986, p. 3)

Although the problems of the mathematics and science education gap are national in scope, they are of particular concern to rural school districts. The proposed solutions to these problems also create concerns for rural schools. For example, in virtually every state the agenda for educational improvement has included mandates for increased high school graduation requirements. The subsequent need to offer courses not previously included in their curricula has placed an added burden on small and rural schools. These schools lack the certified personnel and other resources needed to provide more advanced coursework (Barker, 1987a).

The magnitude of this problem becomes clear when the number of rural schools in the United States is considered. According to the

United States Bureau of the Census, in 1984 there were a total of 15,144 public senior high schools. Of that number, 7,329, or 48%, enrolled less than 500 students each (Barker, 1987a). In the state of Oklahoma, 82% of the 457 schools are officially classified as rural, based on district-wide average daily attendance figures of 800 or less (Holt, 1987).

School size and geographic location constitute two of the factors identified as having "the greatest impact on the presence and robustness of physics programs in the high schools" (Neuschatz & Covalt, 1987, p. 51). Another factor is the demographic character of the student body, especially its socio-economic and ethnic composition. The combined effect of these factors in the rural schools is to make the likelihood of providing a vigorous physics program quite small.

There is a final factor, however, which offers some hope for rural schools, and that is "the level of commitment of the school administration to rigorous and sophisticated science instruction, as measured by such variables as years of science required for graduation, level of funding provided, and level of support perceived by teachers" (Neuschatz & Covalt, 1987, p. 51). This is the kind of commitment which has led many rural school administrators to seek alternate educational delivery systems when conventional classroom instruction is not a viable means of providing instruction in science, mathematics, or foreign language fields. These distance learning delivery systems, particularly interactive satellite instruction, meet the objectives identified by researchers at the Northwest Regional Educational Laboratory as being particularly beneficial to rural schools. These objectives are:

(1) To provide equity and to increase the quality of educational opportunity;

(2) To provide access to subject matter experts or career models not available in the local community;

(3) To provide interaction and joint activities with students in other schools;

(4) To provide increased access to information and instructional resources;

(5) To provide opportunities for staff development and inservice training; and

(6) To promote increased school/community linkages (Barker, 1987b).

As Sandy Garrett, former Oklahoma State Department of Education's Director of Rural Education, has explained,

> Smaller schools have to look at alternate methods for providing higher-level courses, such as circuit-riding teachers or transporting kids. Telecommunications technology has made it less expensive to transport information than to transport people. (Wesslund, 1986, p. 15)

Without the aid of such technology, some rural schools face the loss of state aid monies when their students transfer to other schools to take advantage of programs unavailable at their home schools. Thus, the problems of these small, rural schools are exacerbated (Wesslund, 1986).

Distance Learning Delivery Systems

In 1976, while addressing the Third National Conference on Open Learning and Nontraditional Study, Daniel Ferber stated,

> On May 17, 1954, the Supreme Court voted to desegregate the nation's "schooling." Just over twenty years later it is time to desegregate "learning" by eliminating barriers not only to race, but also of place, time, age, and resources. (p. 1)

Elimination of such barriers is one of the primary objectives of the various distance learning technologies. There are three basic elements to distance education as defined by Batey and Cowell (1986). First, the communication between teacher and students is not face-to-face. Second, there is an organization which plans, coordinates, and supervises the program. And, third, a technology-based delivery system is often used, although this is not required. The usefulness of distance education is not limited to any specific curriculum; all standard subjects can be taught effectively and efficiently through distance methods. The amount and the nature of the "distance" in distance education may vary. It is not limited to geographic separation and can be the result of social, political, or economic conditions.

Actually, distance education may have had its beginning as long ago as 1850 in Cambridge, England, when it was decided to have a lecturer go out into the community to bring the benefits of learning to the general public. By the 1900s, correspondence study had come into being, and its popularity was augmented by William Rainey Harper, who introduced it to the University of Chicago where it flourished. The creation of the Division of Extension at the University of Iowa in 1915 demonstrated for the first time the usefulness of extension education in areas other than agriculture. This developing attitude toward distance learning led Van Hise, the president of the University of Wisconsin, to contend, even before 1920, that the modern university should give equal importance to bringing knowledge to the people as well as to on-campus teaching and research (Ray, 1976).

By the 1920s, educational radio was established. Many of the early radio stations were located at and operated by universities. In the 1930s, schools "of the air" were established and run by several universities, and commercial networks produced comparable programs, such as the CBS American School of the Air, which ran from 1930 to 1940 (Purdy, 1983).

As early as the 1930s, attempts were made to use video for educational purposes, and, by the 1940s, elementary and secondary schools were experimenting with programs offered by commercial stations. In fact, by 1948, there were at least eight colleges and universities producing or airing educational television materials. An interesting, and expensive, use of television instruction was developed by the Midwest Program on Airborne Television Instruction (MPATI). This program called for a DC-6 aircraft to broadcast two channels while circling a four-mile area. Instruction was thus received in a one-hundred-fifty to two-hundred-mile radius, reaching parts of six states. The MPATI program was discontinued in 1966 (Purdy, 1983).

The history of the development of distance education reflects an evolution toward increasingly efficient and cost-effective delivery systems. Print-based systems, such as correspondence and other home study courses, while still widely used, tend to have poor completion rates when compared to other distance learning programs (Norwood, 1976). Lipson (1977) describes procrastination as "one of the most serious dangers to the distant student" (p. 131), and he points out that

> Students need broadcast television and other mass media for some important instructional purposes, but more especially for motivation, affect, and pacing. The isolated student needs the emotional and psychological support of television and other mass media. (p. 131)

Television has had a major impact on distance learning, although some educators believe that we have been slow in taking full advantage of the potential of this medium. Grossman (1976) points out that "the perception of educational television as simply an electronic classroom is really no different from the automobile first having been thought of as a horseless carriage" (p. 2). Television or televised courses have now evolved, however, into what are termed "telecourses," which use an "integrated system of instruction, employing both video and print media" (Zigerell, 1983, p. 18), with the key being the integration of those elements. One of the advantages of televised instruction is that:

> Television can provide an expert model to emulate. We can show a scientist dealing with, talking about, explaining a difficult idea. We can show a skilled craftsman or a surgeon performing a precise task in living color, slow motion, and stop action. (Lipson, 1977, p. 131)

Moreover, the use of videotape and videocassettes has made televised instruction relatively inexpensive, flexible, and easy to handle.

In a study done on the use of telecourses at a junior college, Sutterfield (1981) found that students, whether completers or non-completers, had a positive attitude toward their experiences in the telecourses, as did both the on-campus instructors, who coordinated the programs, and the college administrators. Although a higher percentage of the on-campus students tended to complete the course and to receive higher grades than the telecourse students, the latter group were especially pleased with the convenience and the independent study aspect of the telecourses.

Despite all of the benefits described, it is argued that the passive television format is not an adequate alternative for face-to-face classroom instruction. Interaction is increasingly seen as a crucial element of education. Fortunately, alternatives have been developed to provide effective communication and support in distance education programs. In some cases, attempts have been made to provide support directly by persons other than the primary teachers. In others, interaction has been achieved through distance methods. All agree that when distance methods are used, it is crucial that both frequent contact and short turnaround time be provided (Batey & Cowell, 1986).

Among the computer-based systems providing interaction are electronic mail and audiographic teleconferencing. The electronic mail system, which has been used effectively in a course on writing fiction, can be used to send lessons and assignments from the master teacher to students in another location. The students can then write their assignments offline and send them back to the teacher for corrections and comments. Audiographic teleconferencing allows the instructor and students to use graphics tablets just as they would a blackboard and to have their writing displayed on computer monitors at each site. Additionally, writing can be superimposed on existing diagrams and video images. The special modem used allows both voice and data transmission (Batey & Cowell, 1986).

Interaction is also a key element in using television effectively. A study was done by Mitra in 1988 to test the difference in students' attitudes toward learning methods involving face-to-face interaction, TV with interaction, and TV without interaction. The findings indicated that TV with interaction was perceived as preferable to TV without interaction and almost as good as the face-to-face situation.

One type of television delivery system is the Instructional Television Fixed Service (ITFS) established by the Federal Communications Commission in 1963. ITFS is described as a "point-to-points" system for transmitting up to four channels to predetermined receive sites which are equipped with special receiving antennas (Norwood, 1976). When the system is used to link schools, interaction may be provided by telephone and mail services or by campus visits by the television teacher. Expansion of this system to a greater number of receive sites over a larger geographic area has been accomplished through the use of interactive satellite instruction.

Interest in distance education in general has grown rapidly in recent years, and studies at the postsecondary level and within industry have shown that distance education works. That is, students can learn at least as well by distance methods as they can by conventional methods (Batey & Cowell, 1986). While the cost for distance delivery systems is at times higher than employing a regular teacher (Ellertson, 1987), cost comparisons to conventional instruction depend on the technology used, the number of students served, and the locations of the students (Batey & Cowell, 1986). The design requirements for instructional materials used in distance education are not much different from those used in conventional classrooms. It is hoped, however, that innovative instructional materials will outdistance conventional ones, making the question of equivalent quality academic (Markle, 1976). Finally, distance education programs can have some unexpected side effects. Among these are increased cooperation between schools and districts, increased parental involvement, and mastery of technologies that can be applied by both students and teachers to other areas (Batey & Cowell, 1986).

Interactive Satellite Instruction

Televised courses broadcast via satellite have been described by one rural sociologist as a "restructuring kind of technology" (Brown, 1985, p. 31). Although televised courses are not new, much of the technology which makes them affordable and attractive is. Equipment which was once prohibitively expensive has been replaced by inexpensive satellite dishes and low-cost subscription rates. Additionally, live two-way communication is now possible, allowing for student interaction that was formerly impossible (Brown, 1985).

Predictions have been made about the possible educational applications of satellite technology almost since the time of its conception. Still, the realization of these dreamed of applications has been slow. Major interest in using satellites for education followed the 1965 launch of the first International Telecommunications Satellite Consortium (INTELSAT) satellite, and this interest was encouraged by the Johnson administration (Polcyn, 1979). It would be another twenty years, however, before the interactive satellite instructional programs began in earnest in the United States.

Although costs and lagging technology were important factors in the reluctance of schools to make widespread use of televised courses, teacher resistance may have also played a role.

> According to the literature of instructional technology and the experience of both the users and producers of the things of learning, teachers in the classroom tend to resist technology, especially and primarily television, for several reasons: (1) most important, the basic conservatism of the educational establishment; (2) fear of the effects of instructional technology on their role and responsibilities; (3) the ineptitude and insensitivity of the hardware people; and (4) the minimal or nonexistent involvement of teachers at every stage of the process. (Armsey & Dahl, 1973, pp. 10-11)

Gradually, however, it has become clear that two alternatives exist for improving education in this country. The first alternative is to increase the resources going into our schools by massive amounts. The second, and more likely, alternative is to increase the efficiency and effectiveness of the schools through an investment in technology (Armsey & Dahl, 1973).

A number of interactive instructional television satellite systems are now in use. In addition to the Arts and Science Teleconferencing Service (ASTS) beamed out of Oklahoma State University, there are, for example, the TI-IN Network in Texas, the Accelerated Learning of Spanish Program in Utah, and Eastern Washington University's Telecommunications Project (Barker, 1987b). These systems use a combination of technologies, including "a limited range TV transmission known as Instructional Television Fixed Service; satellite for a visual component; telephone for audio; computer and electronics blackboard for graphics and data; cable and microwave . . ." (Levinson, 1985, p. 14). The ASTS programming is provided at a low cost to subscribers. In 1988 the fee for Oklahoma schools was $1750, while out-of-state schools paid

$2000. The individual school districts also pay for their own equipment, including the down-link satellite dish and the upgrading of computer facilities. On the average, these costs are approximately $7000 to $10,000 per district (ASTS, 1988). Added to this figure is the cost of hiring a teacher to be in the classroom at the receive sites (Whittington, 1989).

Among the advantages of satellite over other technologies are that this delivery system is "distance insensitive" and "terrain insensitive" (Carlisle, 1977, p. 53). This means that it costs no more to broadcast over satellite within a single state than it does to broadcast nationally or even internationally, and broadcasts can reach up into the mountains and down into the valleys with equal ease. Additionally, as Arms (1980) points out, satellite instruction can result in "the drastic curtailing of the time space between the occurence of an event of historical significance and its contemplation within an orderly and educational context, i.e., in the classroom" (p. 48).

While the interactive telecourses are seen as a more viable means of expanding the curriculum than other methods that have been tried, including correspondence, videotaped instruction, independent learning, and one-way television courses (Barker, 1987a), this delivery system is not without its problems. The first of these is the difficulty of creating a "classroom atmosphere" (Platten & Barker, 1987, p. 13). The lack of face-to-face contact between student and teacher is a problem which is further compounded by large class sizes (Brown, 1985). The equipment may be difficult for the instructors to operate, and problems may arise due to inclement weather interfering with the broadcasts (Platten & Barker, 1987).

In a 1986 study of 330 students participating in the TI-IN Network, Pease and Tinsley report three aspects of the program which students liked: (1) the opportunity for a new experience; (2) the teachers; and (3) the chance to take a course not otherwise available. Although these students indicated that they would recommend a satellite course to a friend, they also felt that these courses were more demanding than face-to-face courses, requiring more attentiveness, more self-motivation, and more independent study. In a similar study, Barker (1987a) reported the major strengths of satellite teaching cited by students in descending order of frequency as:

> (1) the variety of classes available which otherwise would not have been offered in the school; (2) personality of the TV teacher; and (3) the instruction was varied and interesting. (p. 8)

Barker (1987a) also reported the least liked aspects of satellite teaching according to this study:

> (1) too much homework was required, and it was too difficult; (2) communication over the telephone made hearing difficult; (3) it was often hard to get hold of the TV teacher by telephone during the lesson broadcast; (4) the contact between the TV teacher and classmates in other receive site locations seemed too impersonal; and (5) some TV teachers were poorly prepared or lacked ability to portray themselves well over the TV. (p. 8)

The students surveyed in this study also recommended that improvements to the system include better audio quality and efficiency of the telephone interaction, bigger television screens at the receive sites, better maintenance of the receive site equipment, and better teachers on the television (Barker, 1987a). In a similar study of the ASTS German I by Satellite program, 11% of the students surveyed perceived the class as easier than a regular class in the same subject, 66% perceived it as harder than a regular class, and 22% perceived it to be at the same difficulty level. The perceived difficulty of the class did not seem to be dependent on the amount of homework given, however, as only 20% of the students felt that they had more homework than in a regular class, 37% felt that they had less homework, and 42% felt that the amount of homework was about the same as for a regular class (Hobbs & Osburn, 1988).

Surveys of administrators at schools using interactive satellite programs have revealed a consistent satisfaction. In the study of the ASTS German by Satellite program, Hobbs and Osburn (1988) found that the reasons most often cited by administrators for initiating the program were that it was the only alternative for offering a foreign language class and also that the technology was appealing. The by-satellite course advantages which these administrators considered most significant were: (1) the curriculum expansion opportunity for small schools; (2) the equipment cost; and (3) that the courses are not class-size dependent. The disadvantages considered most significant were: (1) the equipment cost; (2) course subscription fees; and (3) the overall flexibility of the courses. Among the uses of satellite technology possible in their districts, the administrators indicated overwhelmingly that providing high school credit courses was the top priority. Other priorities included student enrichment programming and teacher in-service. Barker (1987a) also surveyed principals at receive sites using the TI-IN Network and found that the majority felt that the satellite courses were a benefit to their programs and well worth the cost.

Platten and Barker (1987) provide some suggestions to maintain quality in satellite courses. For example, instruction must be well organized around clearly defined goals that are communicated to the students, and homework and tests should be related to these goals. Each lesson should be well prepared to avoid "dead air" time, and visual information should be neatly prepared to insure legibility for transmission over TV. Graphics should be professionally prepared if possible. In addition, the instructor must be sensitive to students s/he cannot see, and should regularly direct questions to the students at the receive sites to promote interaction. Finally, the instructor must always be aware that s/he is teaching to a camera, so maintaining a well-paced, clearly articulated delivery, making eye contact, and avoiding nervous gestures become critically important.

There are a number of issues surrounding the use of interactive satellite instruction, as well as other distance education delivery systems, which must be considered. There is, for example, the problem of conflicting state policies. As Levinson (1985) points out, "Because technology-delivered courses can cross state lines . . . state-established teacher certification, course accreditation, and student-teacher ratio regulations are jeopardized" (p. 14). Since state governments historically control education, and since the federal government has a role in the regulation of communications across state boundaries, distance education also has the potential for putting these two authorities in conflict with each other. Additionally, there is the concern over which district gets credit for students participating in a televised course delivered to several districts (Batey & Cowell, 1988).

Batey and Cowell (1988) offer some suggestions for dealing with the concern over teacher certification requirements. They suggest that the distance teacher may be viewed "not as a person, but rather as instructional material" (p. 24). Likewise, they say, the content of the distance course "can be construed as a 'textbook' or as some other more standard educational input" (p. 24). Another solution they suggest is the use of a "teacher of record," such as the classroom coordinators or teaching partners used in the ASTS programs. Since this requires an extra salary and, therefore, increased costs, they suggest that provisional certification of the distance teacher should also be considered. It is stressed, however, that the state departments of education be involved in determining the "limits of acceptability" of these solutions (p. 24). The Oklahoma State Department of Education, for example, allowed an exception to the rule that there must be a teacher in the room accredited in the subject being taught, which made it possible for an English or science teacher to run a German by Satellite program (Wesslund, 1986).

Batey and Cowell are, thus, in agreement with a group of Missouri and North Dakota school administrators who, when asked to rank order their preference for the agency which should have the authority to set standards and/or accredit instruction by satellite courses, ranked individual state departments of education as their first choice. There was a tie for second among the remaining three choices, which were (1) "a national or regional entity, such as the North Central Accreditation Agency;" (2) "a national or regional joint accreditation committee formed by members of various state departments of education/ instruction;" and (3) "individual school districts" (Hobbs & Osburn, 1988, p. 12).

There are some public school administrators who have expressed concern that this new technology will erode their control, since they have little leverage over teachers hundreds of miles away who may teach in several districts (Tifft, 1989). Some rural educators are also expressing concern over the undue influence which may be exerted by satellite programs broadcast from metropolitan areas on the "integration and identity of rural communities" (Conboy & D'Cruz, 1988, p. 101). In such situations, there is clearly a choice that must be made among the advantages and disadvantages of large-scale and small-scale development of distance courses. While the large-scale programs may be more complete, up-to-date, sophisticated, and skillfully presented, their disadvantages include a lack of familiarity on the part of the people choosing content and methodology with the conditions of the local schools and students (Batey & Cowell, 1986).

The inflexible nature of course broadcasts is another concern to schools. As Batey and Cowell (1986) explain:

> . . . scheduling may become a special problem when a distance education program is introduced into a school. If the program originates from the outside, it may be broadcast only at specific times, and the whole school schedule will have to accommodate this rigidity. Most audio and video transmissions can be recorded and saved for later use without great increase in costs. However, when this is done, the live quality of the transmission will be lost and most interactive features present cannot be utilized. (p. 27)

The study done by Hobbs and Osburn (1988) on the ASTS German I by Satellite program indicated that, in fact, all but one of the participating schools did tape the live broadcasts. The schools indicated that this taping was done for a variety of purpose, including: (1) "students who are absent from class (77%);" (2) "student review (71%);" (3) "students whose class schedule will not permit regular attendance (59%);" (4) "use by other students, faculty, and community members not enrolled in the class (24%);" and (5) "other, e.g. public relations (6%)" (p. 23).

Despite these concerns, it would appear likely that the use of interactive satellite instruction will expand in the future. A survey of school administrators indicated that they unanimously perceived the future role of such distance learning technologies as positive. The factors which they saw as most significantly limiting their schools in making greater use of distance learning technologies, such as interactive satellite instruction, in the future, however, were: (1) the lack of outside funds; (2) the school district budget; and (3) the State Department of Education policies and regulations (Hobbs & Osburn, 1988, pp. 13-14).

Some hope for these schools may be found in Senator Edward Kennedy's "Star Schools" concept which has authorized $100 million to be spent between 1988 and 1993 to purchase telecommunications hardware for state and regional networks providing instruction in mathematics, science and foreign language (Secter, 1987). Other future possibilities include the option for schools to switch channels to take advantage of the course offerings of a variety of networks. As Marshall Allen, director of Educational Television Services at Oklahoma State University, predicts, "For a simple expenditure of $2000 to $3000 [schools] can get access to 100 different choices. They might want to take a computer class out of California and Japanese out of somewhere else and physics out of here" (Secter, 1987, p. 1).

Effective Teaching Characteristics

These by-satellite educational technologies are not intended, however, to replace the classroom teacher. Rather, as the Carnegie Task Force on Teaching as a Profession (1986) states, "these technologies should make it possible to relieve teachers of much of the burden of imparting information to students, thereby freeing them for coaching, diagnosing learning difficulties, developing students' creative and problem-solving capacities and participating in school management" (p. 94). To understand the qualities needed by the teachers who will work most effectively with these technologies, it is important to understand what is meant by teacher quality in general.

In their 1986 report _Tomorrow's Teachers_, the Holmes Group made the following observation:

> If teaching is conceived as a highly simple work, then any modestly educated person with average abilities can do it. But if teaching is conceived as a responsible and complex activity that is clearly related to both group learning and individual learner success . . . then teaching requires special selection and preparation. (p. 27)

The traditional reliance on certification by teacher training institutions and years of experience as indexes of teacher competence is no longer seen as adequate (Searles & Kudeki, 1987). Defining and evaluating teacher quality, however, has not been a simple matter. The definitions which have been advanced are typically based on three models:

(1) the preparation model, which uses input measures such as the number and type of courses taken by the teacher or the completion of a recognized and accredited degree program;

(2) the professional practice model, which is based on the teacher's instructional practices, ability to assess and to meet the needs of the students, participation in extra-classroom activities, and acceptance of the responsibility for continuing professional education; and

(3) the production model, which is based on student outcomes (Champagne & Hornig, 1987).

Of these three models, the preparation model and the production model are the most controversial. The preparation model uses measures which can only assess effectiveness indirectly. Moreover, completion of a course does not necessarily indicate mastery of a subject, and all programs are not equally rigorous. The production model is especially problematic because it is so difficult to factor out the portion of a student's achievement that is due to the teacher and that which is due to other factors, such as the student's values, available resources, and home environment (Champagne & Hornig, 1987).

Increasingly, educators are emphasizing a balance of abilities which effective teachers need to possess. As Champagne and Hornig (1987) state,

> Few people would disagree that, all other things being equal, an intelligent teacher is preferable to a stupid one. However, such other qualities as an ability to relate well to children or an aptitude for simultaneous problem-solving may be equally important. The problem is defining a desirable balance of qualities. Does an intelligent person who is not altogether comfortable around children make a better teacher than a less intelligent one who is adept at motivating kids? (p. 62)

This need for a balance of qualities is echoed by Wiggins and Chapman (1987) who stress the need for "consistent attention to both affective and cognitive considerations" if educational excellence is to be ensured. While the affective area includes the emotive aspects of teaching, such as conviviality, anxiety, and enthusiasm, the cognitive area includes content-related traits, such as use of examples, variety in presentations, and correctness of lessons (Balka, 1986). A 1986 national survey of high school seniors also supports the importance of this balance between the affective and cognitive. When asked what characteristics they felt were important in their teachers, the students responded that teachers needed to be "understanding, knowledgeable and fair," and they ranked their own teachers highest in knowledgeability and lower on fairness and understanding (Clark, p. 504). According to Maddux, Samples-Lachmann, and Cummings (1985), however, "the upshot of opinion . . . seems to be that while both intellectual and personal-social characteristics are considered important, the latter are probably most important" (p. 160).

A third category, which Balka (1986) calls managerial, has been added to the affective and cognitive categories for classifying teacher behaviors. The managerial area includes the behaviors related to maintaining effective classroom control. Although he uses different labels for them, Bergen (1987) describes the same three categories or dimensions of the professional act of teaching as "the conceptual knowledge dimension (A), the general knowledge dimension (B), and the personal dimension (C)" (p. 28). He states that the teaching act may occur in accordance with any one of these dimensions or with a combination of any two of the dimensions or with all three. Although not every act can include all three dimensions, he emphasizes the importance of trying to achieve this integration, and he points out that "it is insufficient to know teaching theory (A) and have a genuine concern for students (C) without having gained a level of proficiency in classroom routines (B)" (p. 28).

The results of a study done on American students in gifted programs indicates that, while these students valued teacher characteristics from all three of these domains, they valued the personal-social characteristics of their teachers more than the cognitive or classroom-management variables. It is interesting to note, however, that the gifted students in the higher IQ group valued the cognitive variables more than did the lower IQ group (Maddux et al, 1985).

The characteristics necessary for effective teaching in the areas of science and mathematics are not appreciably different from those needed in other areas. Balka (1986), in a study of the characteristics cited in letters of support of candidates for the Presidential Awards Program for Excellence in Mathematics Teaching, found that the three most frequently cited categories of characteristics were "concern for students," "availability," and "knowledge of mathematics" (pp. 322-3). The top ranked characteristic, "concern," included such affective behaviors as "politeness, acceptance, friendliness, encouragement, and receptiveness to students' comments" (p. 325).

In a meta-analysis of research on science teacher behaviors and their relation to student outcomes, Druva and Anderson (1983) found that student outcomes are positively associated with teacher preparation, particularly science training, but also with educational and academic training in general. This may have to do with the finding that the teachers with a more positive attitude toward their curriculum tend to be those with a higher grade point average, more experience teaching, and a higher degree of intellectuality. In the affective domain, the acquisition of values by students is positively related to a values orientation on the part of the teacher (p. 473-8).

Searles and Kudeki offer this profile of an outstanding science teacher:

> . . . a person who is able to maintain a classroom with a pleasant atmosphere where learning can occur, one who is sure of the subject matter being taught, and presents the material in a clear and effective manner. This person is concerned about the students and ensures that they understand the concepts of science they are being taught by relating new knowledge to that which they already know. This instructor's teaching shows evidence of creativity and resourcefulness by utilizing various materials and methods of teaching as deemed necessary. The teaching is definitely "pupil-centered," for an outstanding science teacher is able to perceive then make provisions for the needs and abilities of the individual student. The teacher is a person who is available after school for those students who need extra help . . . Such an individual is consistently fair and emotionally calm when enforcing the rules of the school, has a good sense of humor, and is respected by the students. (pp. 10-11)

The behaviors identified as desirable among distance-learning teachers reflect somewhat different needs on the part of the students. Students in the Women's External Degree program at St. Mary-of-the-Woods College were asked what qualities and teaching behaviors they desired from their teachers. The three most frequent responses were "providing feedback," "being helpful and supportive," and "being prompt" (Stoffel, 1987, pp. 26-7). In comparing the results of her survey with those of the survey done by Clark (1987) on high school students, Stoffel (1987) describes some interesting differences in the responses of the two groups, the most striking of which concerns the characteristic of knowledgeability. While this characteristic rated very highly among the teenagers, it comprised only 3% of the distance learners' responses. This, Stoffel states, points out two significant aspects of distance learning:

> First, the quality of the learning materials is probably more crucial to the success of the course than the knowledge, education or skill of the instructor. The texts, assignments and activities carry the load for making the educational experience "happen" for the distance student. Since expertise may not be crucial, distance programs might surmise that instructors with well-developed distance skills could handle a variety of courses, some of which might be tangential to their educational background. (p. 26)

In the case of interactive satellite instruction, however, the classroom teacher must interact with another instructor, rather than just with materials written by another instructor. This delivery system requires a unique form of collaboration between the high school teacher and, in the case of the ASTS program, the college professor. This kind of collaboration has been urged by both the Holmes Group (1986) and the Carnegie Report (1986), who "emphasize that a strong association between the various areas of the educational process is essential for the future strength and professionalism of education" (Fuchs & Moore, 1988, p. 412).

A similar type of collaboration was tried by Fuchs and Moore (1988), a college professor and a fourth grade teacher. The results of their experiment with an elementary school class point out some of the concerns created by such a pairing. For example, the approach of the professor was more theory-based, while that of the teacher was based on practical teaching experience. The professor had to meet the challenges of following established classroom procedures and understanding the skill level and attitudes of the students. The teacher was concerned with clarifying concepts and answering students' questions without undermining the authority of the professor. For both, the adjustment to having another teacher in the room and sharing authority was a new and difficult challenge.

Identifying the teacher who can effectively meet these new challenges is generally the responsibility of the school principal. Although the classroom is perceived as a fairly autonomous unit, principals can influence classroom activities and educational outcomes though observation, evaluation, and providing direct support and guidance to classroom teachers (Deal & Celotti, 1980). In a study done by Searles and Kudeki (1987) to determine the level of agreement or disagreement between principals and teachers regarding the criteria used to measure the effectiveness of science teachers, the results indicated that high school principals and science teachers agree on most of the evaluative criteria. This seems to indicate that principals have a clear understanding of what goes on in science classrooms and what characteristics are needed by the teachers to make effective science learning possible. This same kind of understanding of the role of the classroom coordinator/teaching partner in an interactive satellite program is critical to principals who must select and evaluate the faculty who will serve effectively in that capacity.

Summary

Educators, economists, politicians, and other citizens have expressed concern over the inadequate preparation of American students in the sciences and mathematics. This inadequacy may reduce the rigor of the college and university programs and leave the American work force unable to compete in an increasingly high-tech world. The problem is most acute in the rural schools, where scarce resources limit curricular choices for students. A variety of distance learning delivery systems has been developed to meet the needs of students isolated by geographic, as well as social and economic barriers. One of the more recent developments in distance learning is interactive satellite instructional television networks, such as the Arts and Sciences Teleconferencing Service. Although there are problems inherent in the use of interactive telecourses, they are seen as a viable alternative to other means of expanding educational opportunities. Since the use of these new technologies may cast teachers in new roles in the classroom, it is important to understand what characteristics make for effective teaching in traditional programs and which of these characteristics are most important for a nontraditional delivery system such as interactive satellite instruction.

CHAPTER III

METHODOLOGY

Introduction

This study was designed to identify the characteristics of an effective classroom coordinator/teaching partner for the Arts and Sciences Teleconferencing Service's AP Physics, AP Calculus, and Precalculus by Satellite programs. It was also designed to identify the obstacles inherent in the programs or present at the high schools which impede the effectiveness of the classroom coordinator/teaching partner and to suggest strategies for improvement of the programs. The method utilized in this study for gathering the data was the Delphi technique developed by Olaf Helmer and his associates at the Rand Corporation in the 1950s (Travers, 1978). This chapter describes the Delphi study procedure, the sample, and the survey instrument.

Design and Procedure

The Delphi technique was selected as the method to be utilized in this study (McNamara, 1988; Weber, 1988). According to Dalkey (1969) the Delphi technique is a method used for eliciting and refining group judgments when the issue is one for which exact knowledge is not available. This method is intended to reduce the biasing effects created by dominant individuals, irrelevant communications, and group pressure toward conformity (Dalkey, 1978). This is accomplished, according to Cyphert and Gant (1971), by not bringing the experts together in one place and by not reporting individual opinions. They describe the method as "a carefully designed program of sequential interrogations (with questionnaires) interspersed with information and opinion feedback" (p. 272). In the Delphi method, expert opinions are collected and tabulated, usually in a manner protecting their anonymity. The information obtained in the first round is then fed back to those answering the questions. The individuals can then see how their associates answered the questions and may reconsider their positions and change their previous answers if they wish. The tabulation of expert opinions is, thus, taken a step further in this technique by the attempt to achieve some degree of consensus through iteration of the questionnaire (Travers, 1978).

On June 9, 1989, the initial questionnaire was mailed with a cover letter to each of the twenty-five classroom coordinators/teaching partners and twenty-five high school administrators identified in the sample (Appendix A). Telephone calls were made and/or written follow-up notes were mailed in late June and early July to those who had not responded. Forty of the fifty experts, twenty-two classroom coordinators/teaching partners and eighteen high school administrators, or 80% of the total sample responded to the first questionnaire (Appendix D). Tuckman (1978) indicates that it is necessary to obtain data from nonrespondents only when responses are received from less than 80% of those receiving the questionnaire.

The second mailing was sent out on July 17, 1989, consisting of a cover letter and the compiled responses received from the participants in the first round (Appendix B). For each question, the participants were asked to indicate the respective level or order of priority of the responses (Cyphert & Gant, 1971; Weaver, 1971). The purpose of the prioritizing was to create a hierarchical structure on which to base a profile of an effective classroom coordinator/teaching partner (Pfeiffer, 1968). Again, phone calls were made and/or letters were mailed to nonrespondents in August. Thirty-three of the forty first round participants, or approximately 83% of the first round respondents, responded in the second round. Of the thirty-three second round respondents, seventeen were classroom coordinators/teaching partners, and sixteen were high school administrators. Of the seven non-respondents, two had left their school sites for positions on other campuses. Telephone conversations with three of the remaining five revealed that they were away on vacation during July and August, but that they were in general agreement with the priority listings of the second round participants.

A third mailing was sent out on September 16, 1989 (Appendix C). The Delphi group's rankings for each question were combined on one form and returned with instructions to examine the lists and to respond with dissenting opinions, comments or suggestions for revision (Cyphert & Gant, 1971). Nine of the second round participants, six classroom coordinators/teaching partners and three high school administrators, responded in the third round. Since the third round cover letter requested that they respond only if they had suggestions for revision or correction, it is assumed that the non-respondents were in general agreement with the consensus rankings.

After the rounds were completed, the consensus from the group of classroom coordinators/teaching partners was compared to that of the high school administrators.

The Sample

The population from which the sample used in this study was selected consisted of the ninety-two classroom coordinators/teaching partners and eighty-nine high school administrators from fifteen states who participated in the Arts and Sciences Teleconferencing Service (ASTS) AP Physics, AP Calculus, and/or Precalculus by Satellite programs during the 1988-89 academic year. From this population, twenty-five classroom coordinators/teaching partners and twenty-five high school administrators were selected for a total of fifty participants. According to Cyphert and Gant (1971), the Delphi technique is usually used with fifty or fewer respondents. Since each of the study participants was considered to be an "expert" based on at least one year's experience with the ASTS interactive satellite program, random selection was used to approximate a representative sample of the population (Jaccard, 1983).

Of the ninety-two classroom coordinators/teaching partners, sixty-two, or approximately two-thirds, participated in the AP Physics by Satellite program, and thirty participated in one of the two math-by-satellite programs. In the sample, seventeen subjects were classroom coordinators for the physics program, and eight were teaching partners for the math programs. The sample also consisted of representatives from eleven of the fifteen states which participated in the ASTS physics- and math-by-satellite programs during the 1988-89 academic year.

The Survey Instrument

The initial instrument consisted of three open-ended, short answer questions (Appendix A). Prior to its administration, the instrument was submitted for review and approval to a panel consisting of the Dean of the College of Arts and Sciences, the Manager of the Arts and Sciences Teleconferencing Service, the satellite instructors for the ASTS AP Physics, AP Calculus, and Precalculus by Satellite programs, and the dissertation adviser for this study.

The question referring to characteristics of an effective classroom coordinator/teaching partner was intended to elicit practical criteria for prioritizing, analyzing and comparing the perceptions of coordinators/teaching partners and school site administrators. The question referring to obstacles to effectiveness was designed to identify and prioritize the existing concerns. The question referring to changes which could be made in the satellite programs was intended to focus on practical solutions to the concerns expressed.

Data Analysis

The data gathered were analyzed following the return of each of the three mailings. The following research questions were utilized in the analysis of the data results of the questionnaire:

(1) What are the most important personal and/or professional characteristics of an effective classroom coordinator/teaching

partner for a math- or physics-by-satellite program as suggested by a consensus of classroom coordinators/teaching partners?

(2) What are the most important personal and/or professional characteristics of an effective classroom coordinator/teaching partner for a math- or physics-by-satellite program as suggested by a consensus of high school administrators?

(3) What impediments to their effectiveness are of greatest concern to the classroom coordinators/teaching partners in the ASTS math-and physics-by-satellite programs?

(4) What impediments to the effectiveness of the classroom coordinators/teaching partners are of greatest concern to the administrators of high schools participating in the ASTS math- and physics-by-satellite programs?

(5) How does the model suggested by the classroom coordinators/teaching partners compare to that suggested by the high school administrators?

(6) What does this comparison seem to suggest about an empirical profile of an effective classroom coordinator/teaching partner?

(7) Which suggested changes are seen as most critical to the success of the math- and physics-by-satellite programs?

The responses to the questionnaire and their subsequent rankings were analyzed to provide answers to the seven research questions, which form the framework for chapter four. The responses to each of these questions form the substance of the analysis.

CHAPTER IV

PRESENTATION OF FINDINGS

The purpose of this study was to identify the characteristics of effective classroom coordinators/teaching partners for physics and math-by-satellite programs and the impediments to their effectiveness. A review of the literature concerning interactive satellite instruction and characteristics of effective teachers provided insights into desirable traits for traditional classroom teachers and for satellite instructors but failed to provide insights into this new role for teachers. The Delphi research study technique was utilized to generate lists of desirable characteristics, obstacles and strategies for improvement. The experts surveyed then judged the value of each characteristic, obstacle, and strategy relative to the others to create a priority listing for each.

This chapter presents the findings of the research and analysis of the data. The first section identifies the characteristics, obstacles, and strategies suggested by the participants in the first round of the Delphi study. The second section presents the priority rankings done by the participants in the second round. The third section describes the evaluation of the rankings done by the particpant experts and their suggestions for revisions done in the third round. The fourth section presents an analysis of the findings.

First Round Responses

A three-question survey instrument was sent to fifty Delphi subject matter experts, twenty-five classroom coordinators/teaching partners and twenty-five high school administrators in June, 1989 (Appendix A). Forty of the fifty experts responded to the first round questionnaire (Appendix D). Where the contributions of the experts were similar, like responses were combined (Weber, 1988). This analysis of the Delphi group suggestions condensed all of the responses into 22 characteristics for the first question (Table I), 16 obstacles for the second question (Table II), and 17 strategies for the third question (Table III). The responses from both groups, classroom coordinators/teaching partners and high school administrators were included in the condensed list, due to the similarities in the responses from both groups. It was believed, however, that differences existed between the two groups in the priority values attributed to the responses, as will be discussed later in the rankings from each group.

Research Survey Question Number One

The first question concerned the personal and/or professional characteristics of an effective classroom coordinator/teaching partner for a math- or physics-by-satellite program. This question was reformatted from the research questions, "What are the most important characteristics of an effective classroom coordinator/teaching partner for a math- or physics-by-satellite program as suggested by a consensus of classroom coordinators/teaching partners?" and "What are the most important characteristics of an effective classroom coordinator/

teaching partner as suggested by a consensus of high school administrators?"

All 40 of the participants in the study responded to the first question. The characteristics suggested by the experts were condensed to a list of 22 using similarity of responses. A synopsis of the Delphi group's responses is presented in Table I. The characteristics are listed in no specific order of priority. Of the characteristics listed, all were cited by the classroom coordinators/teaching partners, and all but two, "availability during the broadcasts," and "patience," were also cited by the high school administrators.

Research Survey Question Number Two

The second question concerned the conditions at the high schools or in the satellite program which were seen as obstacles to the effectiveness of the classroom coordinators/teaching partners. This question was reformatted from the research questions, "What impediments to their effectiveness are of greatest concern to the classroom coordinators/teaching partners in the ASTS math- and physics-by-satellite programs?" and, "What impediments to the effectiveness of the classroom coordinators/teaching partners are of greatest concern to the administrators of high schools participating in the ASTS math- and physics-by-satellite programs?"

All 40 of the study participants responded to question number two The obstacles suggested by the experts were condensed to a list of 16 using similarity of responses. A synopsis of the Delphi group's responses is presented in Table II. The obstacles are not listed in any specific order of priority. Thirteen of the obstacles listed were

TABLE I

CHARACTERISTICS OF AN EFFECTIVE CLASSROOM COORDINATOR/TEACHING PARTNER

A Synopsis of Delphi Responses
Background/knowledge/aptitude in mathematics and/or science
Organizational skills
Motivation skills
Desire to learn new ideas and/or methods
Student-centeredness
Flexibility
Ability to work in cooperation with the satellite instructor
Dedication to and/or interest in the satellite program
Positive attitude/enthusiasm
Active participation in support of the course
Disciplinary/classroom management skills
Willingness to give extra time/do extra work
Familiarity with the equipment
Time management skills
Teacher certification
Communication skills
Availability during the broadcasts
Patience
Understanding of/empathy toward students
Dependability
Creativity
Willingness to accept one's limitations

TABLE II

MAJOR OBSTACLES TO CLASSROOM COORDINATOR/TEACHING PARTNER EFFECTIVENESS

A Synopsis of Delphi Responses
Time and schedule conflicts
Difficulty communicating with the satellite instructor
Negative attitude of the students
Selection of the classroom coordinator/teaching partner
Need to release the classroom coordinator/teaching partner from other duties
Equipment/maintenance problems
Lack of adequate classroom and/or laboratory facilities
Poorly prepared students
Lack of staff, administrative and/or community support
Lack of computer and/or software support
Problems with grading homework and/or tests
Funding/cost of program
Lack of pay for the classroom coordinator/teaching partner
Poor organization of lab materials
Inadequate math/science background of the classroom coordinator/teaching partner
Lack of guidelines from the State Department of Education

cited by both groups. Two of the obstacles, "inadequate math/science background of the classroom coordinator/teaching partner," and "poor organization of lab materials," were cited only by the classroom coordinators/teaching partners. One of the obstacles, "lack of guidelines from the State Department of Education," was cited only by the high school administrators.

Research Survey Question Number Three

The third question concerned the changes which could be made in the ASTS program in order to make greater effectiveness of the classroom coordinators/teaching partners possible. This question was reformatted from the research question, "Which suggested changes are seen as most critical to the success of the math- and physics-by-satellite programs?"

Thirty-three of the forty experts responded to question number three. Four of the nonrespondents indicated that there were no changes needed. The responses suggested by the experts were condensed into a list of 17 strategies. A synopsis of the Delphi group's responses is presented in Table III. The strategies are not listed in any specific order of priority.

Of the strategies listed, seven were suggested by both groups. The six strategies suggested only by the classroom coordinators/ teaching partners were: "provide better review and preparation for standardized tests;" "build time into the schedule for students to catch up;" "place more emphasis on labs, application of knowledge, and problem-solving;" "cover less material more thoroughly;" "provide pay for the classroom coordinators/teaching partners;" and "provide a drop

TABLE III

STRATEGIES FOR PROGRAM IMPROVEMENT

A Synopsis of Delphi Responses
Make scheduling more responsive to the needs of the high schools
Provide both pre-service and in-service workshops for classroom coordinators/teaching partners via satellite
Build time into the schedule for students to catch up
Make grading less burdensome
Improve communication (e.g., through electronic mail)
Place more emphasis on labs, application of knowledge, and problem-solving
Provide more computer time and/or software
Clarify the duties of the classroom coordinator/teaching partner
Reduce the cost of the programs
Cover less material more thoroughly
Develop a better understanding of student needs through evaluation and feedback from the classroom coordinators/teaching partners
Provide a drop period for students at no cost to the school
Reduce the number and length of the labs
Provide pay for the classroom coordinators/teaching partners
Provide better review and preparation for standardized tests
Provide access to broadcast tapes when the equipment fails
Provide more advanced notice of channel changes

period for students at no cost to the school." The four strategies suggested only by the high school administrators were "provide more advanced notice of channel changes;" "clarify the duties of the classroom coordinator/teaching partner;" "improve communication;" and "provide access to broadcast tapes when the equipment fails."

Second Round Rankings

In the second round of the Delphi study, a questionnaire designed from the responses to the first survey was sent out (Appendix C). The purpose of the second questionnaire was to prioritize the responses to the three questions in the first questionnaire. The cover letter which accompanied the second questionnaire asked the experts to rank the responses to the questions in order of priority by numbering them from most to least important, with the number one being the most important for that particular question.

Thirty-three of the 40 participants in the study responded to the second round questionnaire. The second round respondents included seventeen classroom coordinators/teaching partners and sixteen high school administrators. Not all of the respondents ranked each of the responses for each question. The wording of the first question on the original questionnaire may have been confusing, since fourteen of the respondents rank ordered only six responses. Some of the experts also noted on questions two and three that they ranked ordered only those responses that they perceived as applicable to their high school campuses.

Combined rankings are presented for the responses to each of the original three questions (Tables IV, VII, and X). That is, the rankings from the classroom coordinators/teaching partners are combined with those from the high school administrators. This was done to provide an overview of the perceptions of the high school personnel participating in the ASTS programs. The rankings of the responses from the two subgroups are then presented separately (Tables V, VI, VIII, IX, XI, and XII). This was done to facilitate analysis and comparison between the two groups.

Research Survey Question Number One

In the second round questionnaire the experts ranked the 22 different responses to the first question on a scale of 1 to 22. A consecutive point system was used in which rankings of "1" received 22 points, rankings of "2" received 21 points, rankings of "3" received 20 points, and so on, ending with rankings of "21" receiving 1 point. In the case of an expert not ranking a particular response, that response was given no points. In the case of an expert ranking two or more responses equally, for the purpose of this analysis, each of his rankings received the corresponding point value for the rank indicated.

The combined rankings of the two groups surveyed of the 22 characteristics of effective classroom coordinators/teaching partners are shown in Table IV. The rankings of the 22 characteristics suggested by the classroom coordinators/teaching partners alone are presented in Table V. Table VI presents the rankings of the characteristics suggested by the high school administrators. In each of these tables, the characteristics are listed in order of their importance with the number of votes and points received by each. In

TABLE IV

COMBINED RANKINGS OF THE CHARACTERISTICS OF EFFECTIVE CLASSROOM COORDINATORS/TEACHING PARTNERS

Rank	Votes	Points	Characteristics N = 33
1	31	577	Background/knowledge/aptitude in math and/or science
2	30	519	Positive attitude/enthusiasm
3	26	359	Active participation in support of the course
4	23	349	Motivation skills
5	24	345	Dedication to and/or interest in the satellite program
6	24	344	Ability to work in cooperation with the satellite instructor
7	24	320	Familiarity with the equipment
8	22	316	Organizational skills
9	23	315	Time management skills
10	24	300	Communication skills
11	24	295	Disciplinary/classroom management skills
12	21	293	Availability during the broadcasts
13	23	285	Flexibility
14	23	276	Willingness to give extra time/do extra work
15	22	265	Dependability
16	23	251	Student-centeredness
17	23	249	Patience
18	22	243	Desire to learn new ideas and/or methods
19	20	233	Understanding of/empathy toward students

TABLE IV (Continued)

Rank	Votes	Points	Characteristics
20	21	169	Willingness to accept one's limitations
21	21	164	Teacher certification
22	19	134	Creativity

TABLE V

CLASSROOM COORDINATORS/TEACHING PARTNERS' RANKINGS OF THE CHARACTERISTICS OF EFFECTIVE CLASSROOM COORDINATORS/TEACHING PARTNERS

Rank	Votes	Points	Characteristics N = 17
1	17	344	Background/knowledge/aptitude in math and/or science
2	15	253	Positive attitude/enthusiasm
3	12	188	Ability to work in cooperation with the satellite instructor
4	13	186	Willingness to give extra time/do extra work
5	13	183	Organizational skills
6	13	182	Time management skills
7	12	175	Dedication to and/or interest in the satellite program
8	12	172	Disciplinary/classroom management skills
9	12	164	Availability during the broadcasts
10	13	162	Active participation in support of the course
11	13	161	Flexibility
11	11	161	Motivation skills
13	13	157	Communication skills
13	13	157	Patience
15	11	136	Familiarity with the equipment
16	11	126	Dependability
17	11	121	Understanding of/empathy toward students
18	12	120	Desire to learn new ideas and/or methods
19	13	115	Student-centeredness

TABLE V (Continued)

Rank	Votes	Points	Characteristics
20	11	104	Teacher certification
21	11	97	Willingness to accept one's limitations
22	10	71	Creativity

TABLE VI

HIGH SCHOOL ADMINISTRATORS' RANKINGS OF THE CHARACTERISTICS OF EFFECTIVE CLASSROOM COORDINATORS/TEACHING PARTNERS

Rank	Votes	Points	Characteristics N = 16
1	15	266	Positive attitude/enthusiasm
2	14	233	Background/knowledge/aptitude in math and/or science
3	13	197	Active participation in support of the course
4	12	188	Motivation skills
5	13	184	Familiarity with the equipment
6	12	170	Dedication to and/or interest in the satellite program
7	12	156	Ability to work in cooperation with the satellite instructor
8	11	143	Communication skills
9	11	139	Dependability
10	10	136	Student-centeredness
11	10	133	Time management skills
11	9	133	Organizational skills
13	9	129	Availability during the broadcasts
14	10	124	Flexibility
15	12	123	Disciplinary/classroom management skills
15	10	123	Desire to learn new ideas and/or methods
17	9	112	Understanding of/empathy towards students
18	10	92	Patience
19	10	90	Willingness to give extra time/do extra work

TABLE VI (Continued)

Rank	Votes	Points	Characteristics
20	10	72	Willingness to accept one's limitations
21	9	63	Creativity
22	10	60	Teacher certification

some cases there were two responses receiving the same number of points. These were given tied rankings.

Research Survey Question Number Two

In the second round questionnaire the experts ranked the sixteen different responses on a scale of 1 to 16. A consecutive point system was used in which rankings of "1" received 16 points, rankings of "2" received 15 points, rankings of "3" received 14 points, and so on, ending with rankings of "16" receiving 1 point. In the case of an expert not ranking a particular response, that response was given no points. In the case of an expert ranking two or more responses equally, each of his rankings received the corresponding point value for the rank indicated.

The combined rankings of the 16 obstacles to effectiveness are shown in Table VII. The rankings of the 16 obstacles to effectiveness suggested by the classroom coordinators/teaching partners are presented separately in Table VIII. Table IX presents the rankings of the 16 obstacles suggested by the high school administrators. As before, in each of these tables, the obstacles are presented in order of their importance with the number of votes and points received by each. Obstacles receiving the same number of points were given tied rankings.

Research Survey Question Number Three

In the second round questionnaire the experts ranked the 17 different responses to the third question on a scale of 1 to 17. A consecutive point system was used in which rankings of "1" received 17 points, rankings of "2" received 16 points, rankings of "3" received 15

TABLE VII

COMBINED RANKINGS OF OBSTACLES TO CLASSROOM COORDINATOR/TEACHING PARTNER EFFECTIVENESS

Rank	Votes	Points	Major Obstacles
1	31	420	Time and schedule conflicts
2	26	275	Funding/cost of program
3	25	274	Problems with grading homework and/or tests
4	27	259	Poorly prepared students
5	26	258	Negative attitude of the students
6	25	252	Inadequate math/science background of the classroom coordinator/teaching partner
7	24	248	Lack of adequate classroom and/or laboratory facilities
8	24	238	Selection of the classroom coordinator/teaching partner
9	25	229	Need to release the classroom coordinator/ teaching partner from other duties
10	23	225	Difficulty communicating with the satellite instructor
11	24	216	Lack of pay for the classroom coordinator/ teaching partner
12	21	186	Lack of computer and/or software support
13	25	168	Lack of staff, administrative, and/or community support
14	22	162	Equipment maintenance problems
15	23	150	Poor organization of lab materials
16	22	92	Lack of guidelines from the State Department of Education

TABLE VIII

CLASSROOM COORDINATORS/TEACHING PARTNERS' RANKINGS
OF OBSTACLES TO EFFECTIVENESS

Rank	Votes	Points	Major Obstacles N = 17
1	17	243	Time and schedule conflicts
2	14	173	Inadequate math/science background of classroom coordinator/teaching partner
3	13	145	Negative attitude of the students
4	13	144	Problems with grading homework and/or tests
5	14	140	Poorly prepared students
6	13	128	Funding/cost of program
7	12	126	Lack of adequate classroom and/or laboratory facility
8	13	123	Need to release the classroom coordinator/ teaching partner from other duties
9	12	114	Difficulty communicating with the satellite instructor
10	13	107	Lack of staff, administrative, and/or community support
11	12	102	Lack of pay for the classroom coordinator/ teaching partner
12	11	100	Selection of the classroom coordinator/ teaching partner
13	11	78	Equipment maintenance problems
14	11	77	Poor organization of lab materials
14	10	77	Lack of computer and/or software support
16	11	52	Lack of guidelines from the State Department of Education

TABLE IX

HIGH SCHOOL ADMINISTRATORS' RANKINGS OF OBSTACLES TO EFFECTIVENESS

Rank	Votes	Points	Major Obstacles N = 16
1	14	177	Time and schedule conflicts
2	13	147	Funding/cost of program
3	13	138	Selection of the classroom coordinator/ teaching partner
4	12	130	Problems with grading homework and/or tests
5	12	122	Lack of adequate classroom and/or laboratory facilities
6	13	119	Poorly prepared students
7	12	114	Lack of pay for the classroom coordinators/ teaching partners
8	13	113	Negative attitude of the students
9	11	111	Difficulty communicating with the satellite instructor
10	11	109	Lack of computer and/or software support
11	12	106	Need to release the classroom coordinator/ teaching partner from other duties
12	11	84	Equipment maintenance problems
13	11	79	Inadequate math/science background of the classroom coordinator/teaching partner
14	12	73	Poor organization of lab materials
15	12	61	Lack of staff, administrative, and/or community support
16	11	40	Lack of guidelines from the State Department of Education

points, and so on, ending with rankings of "17" receiving 1 point. In the case of an expert not ranking a particular response, that response was given no points. In the case of an expert ranking two or more responses equally, each of his rankings received the corresponding point value for the rank indicated.

The combined rankings of the strategies for program improvement are shown in Table X. Table XI presents separately the rankings of the strategies suggested by the classroom coordinators/teaching partners. The rankings of the strategies suggested by the high school administrators are listed separately in Table XII. Again, in each of these tables, the strategies are listed in order of importance with the votes and points received by each. Tied rankings are given to responses receiving a like number of points.

Third Round Evaluations

In the third round of the study, the tabulated rankings of the responses (Appendix C) were sent out to the experts. A cover letter instructed them to to review the results critically. If they disagreed with the results or wished to suggest changes or additions, they were asked to respond with their recommendation.

Nine of the participants, six classroom coordinators/teaching partners and three high school administrators, responded to the third round. The cover letter which accompanied the third round mailing indicated that, if the participants were satisfied with the results, their participation in the study was ended. Therefore, the nonresponse of the remaining experts is assumed to indicate satisfaction with the results. Follow-up phone calls to five of the nonrespondents supported

TABLE X

COMBINED RANKINGS OF STRATEGIES FOR PROGRAM IMPROVEMENT

Rank	Votes	Points	Strategies N = 33
1	28	337	Provide better review and preparation for standardized tests
2	28	328	Build time into the schedule for students to catch up
3	28	323	Make scheduling more responsive to the needs of the high schools
4	28	312	Reduce the cost of the programs
5	25	284	Cover less material more thoroughly
6	26	274	Provide a drop period for students at no cost to the school
7	27	268	Develop a better understanding of student needs through evaluation and feedback from the classroom coordinators/teaching partners
7	26	268	Provide access to broadcast tapes when the equipment fails
9	24	258	Make grading less burdensome
10	24	250	Reduce the number and length of labs
11	28	230	Improve communication (e.g., through electronic mail)
12	27	218	Clarify the duties of the classroom coordinator/teaching partner
13	24	217	Provide more computer time and/or software
14	26	211	Provide more advanced notice of channel changes
15	27	195	Provide both pre-service and in-service workshops for classroom coordinators/teaching partners via satellite

TABLE X (Continued)

Rank	Votes	Points	Strategies
16	26	190	Provide pay for the classroom coordinators/ teaching partners
17	24	183	Place more emphasis on labs, application of knowledge, and problem-solving

TABLE XI

CLASSROOM COORDINATORS/TEACHING PARTNERS' RANKINGS OF STRATEGIES FOR PROGRAM IMPROVEMENT

Rank	Votes	Points	Strategies N = 17
1	17	241	Provide better review and preparation for standardized tests
2	17	210	Build time into the schedule for students to catch up
3	14	177	Cover less material more thoroughly
4	16	175	Make scheduling more responsive to the needs of the high schools
5	15	163	Provide access to broadcast tapes when the equipment fails
6	15	149	Reduce the cost of the programs
7	13	144	Make grading less burdensome
8	14	140	Develop better understanding of student needs through evaluation and feedback from the classroom coordinators/teaching partners
9	15	135	Provide more advanced notice of channel changes
10	14	127	Provide a drop period for students at no cost to the school
11	13	125	Reduce the number and length of labs
12	13	115	Provide both pre-service and in-service workshops for classroom coordinators/teaching partners via satellite
13	13	108	Provide more computer time and/or software
14	14	105	Provide pay for the classroom coordinators/ teaching partners
15	16	103	Improve communication (e.g., through electronic mail)

TABLE XI (Continued)

Rank	Votes	Points	Strategies
16	12	98	Place more emphasis on labs, application of knowledge, and problem-solving
17	13	89	Clarify the duties of the classroom coordinator/teaching partner

TABLE XII

ADMINISTRATORS' RANKINGS OF STRATEGIES FOR PROGRAM IMPROVEMENT

Rank	Votes	Points	Strategies N = 16
1	13	163	Reduce the cost of the programs
2	12	148	Make scheduling more responsive to the needs of the high schools
3	12	147	Provide a drop period for students at no cost to the school
4	14	143	Provide both pre-service and in-service workshops for classroom coordinators/teaching partners via satellite
5	14	129	Clarify the duties of the classroom coordinator/teaching partner
6	13	128	Develop better understanding of student needs through evaluation and feedback from the classroom coordinators/teaching partners
7	12	127	Improve communication (e.g., through electronic mail)
8	11	118	Build time into the schedule for students to catch up
9	11	109	Provide more computer time and/or software
10	11	107	Cover less material more thoroughly
11	11	105	Provide access to broadcast tapes when the equipment fails
12	11	98	Provide better review and preparation for standardized tests
13	12	85	Provide pay for the classroom coordinators/ teaching partners
13	12	85	Place more emphasis on labs, application of knowledge, and problem-solving

TABLE XII (Continued)

Rank	Votes	Points	Strategies
15	11	79	Make grading less burdensome
16	11	76	Provide more advanced notice of channel changes
17	11	70	Reduce the number and length of labs

this assumption. Those who responded in the third round did not suggest changes in the rank orders or deletions of any of the characteristics, obstacles, or strategies, so it is assumed that they, too, were generally satisfied with the results.

There were, however, some additions suggested. One expert wished to add "ineffective satellite instructor" as an obstacle to effectiveness. Another had several additional strategies for program improvement to propose, including having the satellite instructor give the assignments to the classroom coordinator/teaching partner at least one month in advance so that he could give the students their assignments. This expert also advised that mail to the classroom coordinator/teaching partner from the satellite instructor be addressed by name to avoid mail delivery delays at the receive sites.

A few of the respondents suggested clarification of some responses. For the characteristics of effective classroom coordinators/teaching partners, one expert suggested "Presence, not just availability during the broadcasts." Another wanted "Teacher certification" qualified by "in physics or math." This expert also wanted to specify "IBM" computer software under obstacles and strategies. Under strategies for improvement, one expert wished to change "Reduce the cost of the programs" by specifying the "initial cost." To the suggested strategy, "Cover less material more thoroughly," one expert added, "Work more problems of the type assigned instead of deriving formulas." To the strategy, "Make scheduling more responsive to the needs of the high schools," this same expert added, "Continue teaching beyond the end of April -- self-study of advanced principles is difficult." Finally, one expert expressed dissatisfaction with being assigned two satellite classes without time or money compensation and added, "Time is more important."

Analysis of Findings

Research Survey Question Number One

From the experts' combined rankings, the top ten characteristics of an effective classroom coordinator/teaching partner were identified:

1. Background/knowledge/aptitude in math and/or science
2. Positive attitude/enthusiasm
3. Active participation in support of the course
4. Motivation skills
5. Dedication to and/or interest in the satellite program
6. Ability to work in cooperation with the satellite instructor
7. Familiarity with the equipment
8. Organizational skills
9. Time management skills
10. Communication skills

These characteristics identified as most significant confirm what is revealed in the literature about effective teaching characteristics in general in that they tend to fall into three categories: cognitive, affective, and managerial. The strongest agreement was indicated for "background/knowledge/aptitude in math and/or science," which received 31 votes from the total of 33 second round respondents. The suggestion made by Stoffel (1987) that with distance learning systems the instructors may be able to handle courses tangential to their educational backgrounds is not supported here. The number two characteristic, "positive attitude/enthusiasm" also evidenced strong agreement, receiving 30 votes from the 33 second round respondents. Therefore, the importance of both cognitive and affective characteristics in math and science education mentioned in the literature is supported by these findings. Nevertheless, although a cognitive characteristic is ranked first, and an affective characteristic is ranked second, the emphasis is on managerial skills, as six of the top ten characteristics might be considered as belonging to this category. These managerial characteristics would include "active participation in support of the course," "motivation skills," "familiarity with the equipment," "organizational skills," "time management skills," and "communication skills."

The classroom coordinators/teaching partners and the high school administrators were very close in their rankings of the top two characteristics. In fact, for these two characteristics the rankings of the two groups displayed a converse relationship. Five characteristics were ranked in the top ten by the classroom coordinators/teaching partners but not by the high school administrators. Two of these characteristics, "organizational skills" and "time management skills" were tied at eleventh by the administrators. Three other characteristics indicated a wider difference in rankings. The classroom coordinators/teaching partners ranked "willingness to give extra time/do extra work" as fourth in importance, while the administrators ranked this characteristic nineteenth. The classroom coordinators also ranked "disciplinary/ classroom management skills" and "availability during broadcasts" considerably higher than did the administrators. The differences in the rankings of these characteristics by the two groups would seem to indicate a disparity in the perceptions of the time and energy demands of the role of classroom coordinator/teaching partner.

Similarly, the administrators ranked five characteristics in the top ten which the classroom coordinators/teaching partners did not. These characteristics were "motivation skills," "familiarity with the equipment," "communication skills," "dependability," and "student-centeredness." These choices would tend to present a profile of the classroom coordinator/teaching partner as more strictly a support person who keeps the students on task and comfortable and the program running smoothly. This profile is further supported by the administrators` ranking of "positive attitude/enthusiasm" above "background/knowledge/aptitude in math and/or science."

Research Survey Question Number Two

From the combined rankings done by the experts on the second round questionnaire, the eight obstacles of greatest concern were also identified:

1. Time and schedule conflicts
2. Funding/cost of program
3. Problems with grading homework and/or tests
4. Poorly prepared students
5. Negative attitude of the students
6. Inadequate math/science background of the classroom coordinator/teaching partner

7. Lack of adequate classroom and/or laboratory facilities

8. Selection of the classroom coordinator/teaching partner

Very strong agreement was indicated for the first-ranked obstacle, "time and schedule conflicts," with 31 votes from the 33 second round respondents. This concern was not limited to receive sites outside the state of Oklahoma where the broadcasts originate. Studies cited in the review of literature support the finding that this is an obstacle of significant concern in interactive satellite instructional programs. The differences in the point assessment totals for the remaining seven obstacles are not as dramatic. Both the students and the classroom coordinators/teaching partners themselves are indicated twice as potential sources of concern, as are the physical resources of space and money.

There is considerable agreement between the classroom coordinators/teaching partners and the high school administrators in their top eight rankings. Both groups agreed on the first-ranked obstacle. The classroom coordinators/teaching partners perceived their own lack of preparation in math and/or science as a much more significant concern, however, than did the administrators. This suggests that the classroom coordinators/teaching partners perceive their role as more involved in actual instruction than do the administrators. That the administrators conversely ranked "selection of the classroom coordinator/teaching partner" considerably higher is likely due to the critical role they play in that selection process. There is a converse relation between the rankings of the two groups on the obstacles, "need to release the classroom coordinator/teaching partner from other duties," and "lack of pay for the classroom coordinator/teaching partner," with the classroom coordinators/teaching partners ranking the former higher, and the administrators the latter. This would tend to support the claim made by one classroom coordinator on the third round that "time is more important [than money]," as well as to underscore the perception of the classroom coordinators/teaching partners that their role is more demanding of their time than might be expected by the administrators.

Research Survey Question Number Three

From the combined rankings of the participant experts on the second round questionnaire, the eight most important strategies for improving the by-satellite program were identified:

1. Provide better review and preparation for standardized tests
2. Build time into the schedule for students to catch up
3. Make scheduling more responsive to the needs of the high schools
4. Reduce the cost of the programs
5. Cover less material more thoroughly
6. Provide a drop period for students at no cost to the school
7. Develop a better understanding of student needs through evaluation and feedback from the classroom coordinators/ teaching partners.
7. Provide access to broadcast tapes when the equipment fails

The strategies suggested by the participants reflect the concerns expressed regarding scheduling and cost problems. In addition, five of the strategies are more directly related to the needs of the students.

When the rankings of the two groups are viewed separately, differences become apparent which are not altogether surprising, considering the role each group plays in the satellite programs. Of the top eight strategies indicated by the high school administrators, the top five are related to administrative concerns, with the remaining three more related to student needs. On the other hand, four of the top eight strategies indicated by the classroom coordinators/teaching partners, including those ranked first, second and third, relate directly to better meeting the needs of the students. There is some indication here that the satellite instructors, all of whom are university professors, are not perceived as being as attuned to the particular needs of high school students as traditional classroom teachers might be, especially since they are unable to observe the students in the classrooms during the lecture broadcasts.

Summary

This study was conducted to identify the professional and personal attributes of effective classroom coordinators/teaching partners for math-and physics-by-satellite programs, the impediments to their effectiveness, and the strategies for overcoming those impediments. The forty participants, 22 classroom coordinators/teaching partners and 18 high school administrators, were asked to suggest these characteristics, obstacles and strategies, to rank their responses, and to evaluate the final results.

The experts identified 22 characteristics of effective classroom coordinators/teaching partners, 16 obstacles to their effectiveness, and 17 strategies for program improvement. The suggestions were then returned to the experts for rank ordering. These rankings were used to develop a model of an effective classroom coordinator/teaching partner, using the characteristics selected as most significant.

The similarities and differences in the perceptions of the two groups surveyed, classroom coordinators/teaching partners and high school administrators, were then considered. The same characteristics were listed by both groups as most significant, and they were in agreement on the obstacle of greatest concern. Some of the differences in the rankings suggested may be the result of the different perceptions of the two groups of the role that the classroom coordinators/teaching partners play in the satellite program.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to identify the characteristics of effective classroom coordinators/teaching partners for math- and science-by-satellite programs, the impediments to their effectiveness, and the strategies for program improvement. This study compared the perceptions of classroom coordinators/teaching partners in the ASTS program with those of high school administrators at the satellite receive sites. This chapter presents a summary of the research, conclusions, and recommendations based on the data collected.

Summary

A Delphi study of forty participant experts generated three separate lists of characteristics of effective classroom coordinators/ teaching partners, obstacles to their effectiveness which exist in the ASTS program or on their high school campuses, and strategies for improvement of the by-satellite program. This was accomplished by a survey consisting of three questions: (1) Please list a minimum of six personal and/or professional characteristics of an effective classroom coordinator/teaching partner for a math- or science-by-satellite program. (2) What conditions at your high school or in the satellite program itself do you see as major obstacles to effective service as a classroom coordinator/teaching partner? (3) Are there any changes in the ASTS program that could be made in order to make greater effectiveness of classroom coordinators/teaching partners possible?

Many of the responses from the participant experts were identical or similar. These responses were combined to produce 22 characteristics, 16 obstacles, and 17 strategies. The condensed responses were compiled on a second questionnaire and returned to the experts with instructions to rank each of the responses in the order of most significant or important to least significant or important. The rankings from the two groups surveyed were combined to provide an overview of the perceptions of the participants in the ASTS satellite programs. The combined rankings were then sent to the experts for evaluation and suggestions for revision. When the three rounds were completed, the rankings of the characteristics, obstacles and strategies suggested by each of the two groups surveyed were analyzed separately to facilitate comparison.

Conclusions

The conclusions reached on the basis of the findings were as follows:

In general, there is considerable agreement between the classroom coordinators/teaching partners and the high school administrators as to the desirable characteristics of classroom coordinators/teaching partners, the obstacles to their effectiveness, and the strategies for dealing with these obstacles.

Both groups indicate that the desirable characteristics of classroom coordinators/teaching partners are similar to those of traditional classroom teachers in science and mathematics. These characteristics would include a strong knowledge base in science and/or mathematics and a positive attitude about the subject matter.

Strong managerial skills are critical to a classroom coordinator/ teaching partner, in particular, the ability to manage time and to keep students on task.

High school administrators tend to view the role of the classroom coordinator/teaching partner as a supporting player to the instructional role played by the satellite teacher. This perception is due in part to the description of the role of this practitioner provided by the ASTS program, as well as to the orientation of the administrators who act more as support persons themselves than as instructors.

The classroom coordinators/teaching partners tend to view their role as a more active, collaborative one. This may be due to their accustomed role as instructional leader in the classroom, but may also be due to a perception that they are better geared to meeting the needs of secondary level students than are the on-camera satellite instructors.

The scheduling of the broadcasts is the greatest impediment to classroom coordinator/teaching partner effectiveness. Conflicts exist not only in the time of day of the broadcasts, but also in the scheduling of the beginning and end of the semester and of the holiday breaks.

The effectiveness of the classroom coordinator/teaching partner is also limited by the cognitive and affective preparation of the by-satellite students. The inability of the classroom coordinators/

teaching partners to affect the pace or presentation of the course material precludes their providing the level of assistance to the students that they might in a traditional classroom situation.

Classroom coordinators/teaching partners need release time from other duties to be physically present in the classroom during the broadcasts and to provide the attention and support needed by the by-satellite students. In terms of the workload involved, the by-satellite course should be considered as equivalent to a traditional class and not as an auxiliary activity which might be added to a full courseload.

Recommendations

The following recommendations can be made on the basis of the findings and conclusions noted earlier.

Future Research

Classroom Coordinators. Demographic information is needed to provide a profile of the educators who are currently performing the role of classroom coordinator/teaching partner. Information such as subject field certification, degrees earned, years of professional experience, regular assignment at the receive site, and reason for accepting this role would be useful.

In addition, research should be done to identify the characteristics of effective classroom coordinators/teaching partners indicated by the by-satellite students as being of greatest significance. Follow-up research should then be done to test the impact of the characteristics identified by both practitioners and students on student academic outcomes.

Satellite Instructors. Additional research needs to be done to identify the characteristics of satellite instructors which have the greatest positive impact on by-satellite students. Whether there is need for prior secondary teaching experience is one question raised by this study which could be addressed in such research.

By-satellite Students. Since concerns were expressed about the cognitive and affective preparedness of the by-satellite students, student characteristics in both domains which are predictive of success in this type of program need to be identified, as well as strategies to assist students in developing those characteristics.

In addition, surveys should be done to determine the general satisfaction level of by-satellite students, as well as any concerns they may have with the satellite programs.

Follow-up studies should also be done of former by-satellite students to determine the impact of the by-satellite courses on their college retention rates and their academic performance in college level courses in the same or similar subjects.

Program Impact. Evaluation of the effectiveness of the satellite programs must be ongoing. In terms of academic outcomes, this might involve comparing the scores of by-satellite students on standardized tests to national norms or to the scores of a sample of similar students in traditional mathematics and physics courses.

Since the by-satellite programs are designed, in part, to improve the access to mathematics and science education in rural and other underserved areas, research will need to be conducted in the future to determine if these programs have indeed provided better prepared students, as reflected in SAT, ACT, and AP test scores, for example, and greater interest in mathematics and science related fields, as reflected in college enrollment by majors and degrees completed.

Implications for Practice

Information obtained from studies done to determine the characteristics of effective classroom coordinators/teaching partners should be used to provide a model of selection criteria on which high school administrators can base their staffing decisions. This information would also be helpful in developing evaluation instruments for these practitioners.

Given that satellite instruction will have a major impact on education in the future, teacher training institutions, particularly in states which are largely rural, should gear part of their programs toward preparing teachers to fulfill the role of both on-camera satellite instructor and classroom coordinator/teaching partner. Such training would necessarily include emphases on the skills and qualities identified by studies such as this one, including understanding and utilizing the technology and developing skills in collaboration and team teaching.

Most satellite programs include a pre-service workshop for the classroom coordinators/teaching partners. The results of this study strongly indicate that the on-camera satellite instructors need the same kind of pre-service orientation to familiarize themselves with the ability level of the students whom they will instruct. Opportunities must also exist for the classroom coordinators/teaching partners to update the satellite instructors on the progress of the students so that catch up time or review may be provided as needed.

The exposure of students to the television as an interactive medium of education should be begun early in areas where satellite instruction is prevalent. This exposure should emphasize the development of skills in areas such as self-motivation, independent study, and peer teaching which may be identified in the research as necessary to the successful by-satellite student.

Reconsideration of the scheduling of the broadcasts is strongly indicated by this study. Although some scheduling problems are due to the time changes across states, scheduling of vacations, holidays, and catch up time should be planned with more input from the receive sites and proposed schedules announced early enough for the receive sites to adjust their schedules as needed.

Concluding Thoughts

The role of the classroom coordinator/teaching partner is a new one, and one that is not precisely like any other teaching situation. The results of this study tend to indicate that this role is not an entirely comfortable one for the practitioners. It may be that, accustomed to their classroom autonomy, they do not slip easily into the role of support person. It may also be that they are frustrated by their inability to adjust the course to the needs of their students.

Their responses to this study indicate a belief that their relationship to the satellite instructor should not be ancillary but collegial and collaborative. Educators who seek to provide wide access to quality education must continue to search for ways to improve existing technologies as well as to develop new ones. To improve on interactive satellite instruction may require taking a new look at the role of the classroom coordinator/teaching partner, developing training programs that will prepare teachers for the future impact of this new role, and finding ways in which this practitioner's special skills can have greater positive effects.

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APPENDIXES

APPENDIX A

DELPHI GROUP QUESTIONNAIRE

June 9, 1989

Dear

The evaluation of the ASTS Subjects by Satellite program is an ongoing process. As part of that process, I am writing to request your participation in a Delphi study I am conducting. The results of this study will form the basis for my doctoral dissertation in Higher Education Administration at Oklahoma State University.

The purpose of this study is to determine what personal and/or professional characteristics are most important to effective classroom coordinators/teaching partners for by-satellite programs in math and science, what obstacles to effective service in this capacity exist, and what changes might be made in the by-satellite programs to promote greater effectiveness among classroom coordinators/teaching partners. This study is supported by the professors who instruct the ASTS physics, calculus, and precalculus courses, and the information gleaned from it will be of help to them.

You are one of a group of twenty-five classroom coordinators/teaching partners and twenty-five high school principals selected to participate in this study. As a participant in the study, you will be asked to:

(1) Respond to the attached questionnaire.
(2) Evaluate on two separate occasions the information gathered as part of the questionnaire response from all fifty participants.

All information will be treated anonymously. You will receive the results of the study as soon as they are completed. Your consideration and participation are very much appreciated.

Cordially,

Maggie Payne
Senior Academic Counselor

Enclosures

cc: Dr. John Gardiner
Education Administration and Higher Education
Oklahoma State University

QUESTIONNAIRE

1. Please list a minimum of six personal and/or professional characteristics of an effective classroom coordinator/teaching partner for a math-or science-by-satellite program.

   A.

   B.

   C.

   D.

   E.

   F.

2. What conditions at your high school or in the satellite program itself do you see as major obstacles to effective service as a classroom coordinator/teaching partner?

   A.

   B.

   C.

   D.

   E.

   F.

3. Are there any changes in the ASTS program that could be made in order to make greater effectiveness of classroom coordinators/teaching partners possible?

   A.

   B.

   C.

   D.

   E.

   F.

APPENDIX B

SECOND ROUND MAILING

July 17, 1989

Dear Participant:

First, let me thank you for your response to round one of the Delphi study regarding effective service as a classroom coordinator/teaching partner for the ASTS math- and physics-by-satellite programs. Your input was vital to this study, and I hope that you will continue to help us to refine the data by completing the second round questionnaire.

I have listed for your review all of the responses I received to the three questions in round one. All like responses have been combined. I am now asking you to rank order the criteria selected by you and the other participants. By this method, I hope to determine a consensus of opinion among classroom coordinators/teaching partners and school administrators.

Please complete the attached form, indicating your name and school at the bottom, and return it to me in the enclosed self-addressed, stamped envelope as soon as possible. Your responses are greatly appreciated and are vital to the completion of this study.

Sincerely,

Maggie Payne
Senior Academic Counselor

Enclosure

cc: Dr. John J. Gardiner
Education Administration and Higher Education
Oklahoma State University

Listed below are the responses to the original three questions in round one of Delphi study concerning effective classroom coordinators/teaching partners for the ASTS math- and science-by-satellite programs. Like responses have been combined.

Question one: Please list a minimum of six personal and/or professional characteristics of an effective classroom coordinator/teaching partner for a math- or science-by-satellite program.

Please indicate the order of importance of the classroom coordinator/teaching partner characteristics listed below by numbering them from most important to least important, with 1 indicating the most important. The responses are not listed below in any specific order of priority.

____ 1. Ability to work in cooperation with the satellite instructor.

____ 2. Familiarity with the equipment.

____ 3. Availability during the broadcasts.

____ 4. Background/knowledge/aptitude in math and/or science.

____ 5. Willingness to give extra time/do extra work.

____ 6. Positive attitude/enthusiasm.

____ 7. Organizational skills.

____ 8. Active participation in support of the course.

____ 9. Motivation skills.

____ 10. Student-centeredness.

____ 11. Desire to learn new ideas and/or methods.

____ 12. Time management skills.

____ 13. Dedication to and/or interest in the satellite program.

____ 14. Teacher certification.

____ 15. Communication skills.

____ 16. Flexibility.

____ 17. Disciplinary/classroom management skills.

____ 18. Patience.

(responses continue on next page)

____ 19. Understanding of/empathy toward students.

____ 20. Creativity.

____ 21. Dependability.

____ 22. Willingness to accept one's limitations.

Question two: What conditions at your high school or in the satellite program itself do you see as major obstacles to effective service as a classroom coordinator/teaching partner?

Please indicate the order of concern of each of the obstacles to effectiveness listed below by numbering them from of greatest concern to of least concern, with 1 being of greatest concern. The responses are not listed below in any order of priority.

____ 1. Lack of adequate classroom and/or laboratory facilities.

____ 2. Negative attitude of the students.

____ 3. Problems with grading homework and/or tests.

____ 4. Time and schedule conflicts.

____ 5. Selection of the classroom coordinator/teaching partner.

____ 6. Poorly prepared students.

____ 7. Lack of computer and/or software support.

____ 8. Difficulty communicating with the satellite instructor.

____ 9. Equipment maintenance problems.

____ 10. Lack of staff, administrative, and/or community support.

____ 11. Funding/cost of program.

____ 12. Lack of pay for the classroom coordinator/teaching partner.

____ 13. Poor organization of lab materials.

____ 14. Need to release the classroom coordinator/teaching partner from other duties.

____ 15. Inadequate math/science background of classroom coordinator/teaching partner.

____ 16. Lack of guidelines from the State Department of Education.

Question three: Are there any changes in the ASTS program that could be made in order to make greater effectiveness of classroom coordinators/teaching partners possible?

Please indicate the order of importance of each of the suggested changes below by numbering them from most important to least important, with 1 being most important. The responses are not listed below in any order of priority.

____ 1. Provide more computer time and/or software.

____ 2. Reduce the number and length of labs.

____ 3. Provide both pre-service and in-service workshops for classroom coordinators/teaching partners via satellite.

____ 4. Make grading less burdensome.

____ 5. Cover less material more thoroughly.

____ 6. Provide better review and preparation for standardized tests.

____ 7. Provide pay for the coordinators.

____ 8. Make scheduling more responsive to the needs of the high schools.

____ 9. Reduce the cost of the programs.

____ 10. Improve communication (eg. through electronic mail).

____ 11. Build time into the schedule for students to catch up.

____ 12. Place more emphasis on labs, application of knowledge, and problem-solving.

____ 13. Clarify the duties of the classroom coordinator/teaching partner.

____ 14. Provide more advanced notice of channel changes.

____ 15. Provide access to broadcast tapes when the equipment fails.

____ 16. Develop better understanding of student needs through evaluation and feedback from the classroom coordinators/ teaching partners.

____ 17. Provide a drop period for students at no cost to the school.

Name:
School:

APPENDIX C

THIRD ROUND MAILING

September 16, 1989

Dear Participant:

The Delphi study on the ASTS physics- and math-by-satellite programs is nearly completed, and your help has made it all possible. For that you have my profuse thanks. Knowing how very busy you all are makes me all the more appreciative of the time you've given for this study.

Enclosed are three tables on which are listed the responses to each of the original three questions. The responses are listed in order of importance according to the rankings you gave in round two of the study. Please peruse the tables, and, if you disagree with the results or wish to suggest changes or additions, please send your remarks to me in the enclosed self-addressed, stamped envelope. If you are satisfied with the rankings as they are presented in the tables, then your participation in the study is finished. By the way, several of you included additional comments in previous responses. These comments have been noted, and I thank you for taking the extra time.

Again, my thanks for your efforts, and my best wishes for a satisfying school year.

Sincerely,

Maggie Payne
Senior Academic Counselor

Enclosure

cc: John J. Gardiner
Educational Administration and Higher Education
Oklahoma State University

CHARACTERISTICS OF EFFECTIVE CLASSROOM COORDINATORS/TEACHING PARTNERS BY RANK IMPORTANCE

Rank	Votes	Points	Characteristics
1	31	577	Background/knowledge/aptitude in math and/or science
2	30	519	Positive attitude/enthusiasm
3	26	359	Active participation in support of the course
4	23	349	Motivation skills
5	24	345	Dedication to and/or interest in the satellite program
6	24	344	Ability to work in cooperation with the satellite instructor
7	24	320	Familiarity with the equipment
8	22	316	Organizational skills
9	23	315	Time management skills
10	24	300	Communication skills
11	24	295	Disciplinary/classroom management skills
12	21	293	Availability during the broadcasts
13	23	285	Flexibility
14	23	276	Willingness to give extra time/do extra work
15	22	265	Dependability
16	23	251	Student-centeredness
17	23	249	Patience
18	22	243	Desire to learn new ideas and/or methods
19	20	233	Understanding of/empathy toward students
20	21	169	Willingness to accept one's limitations
21	21	164	Teacher certification
22	19	134	Creativity

MAJOR OBSTACLES TO CLASSROOM COORDINATOR/TEACHING PARTNER EFFECTIVENESS BY RANK IMPORTANCE

Rank	Votes	Points	Major Obstacles
1	31	420	Time and schedule conflicts
2	26	275	Funding/cost of program
3	25	274	Problems with grading homework and/or tests
4	27	259	Poorly prepared students
5	26	258	Negative attitude of the students
6	25	252	Inadequate math/science background of the classroom coordinator/teaching partner
7	24	248	Lack of adequate classroom and/or laboratory facilities
8	24	238	Selection of the classroom coordinator/teaching partner
9	25	229	Need to release the classroom coordinator/teaching partner from other duties
10	23	225	Difficulty communicating with the satellite instructor
11	24	216	Lack of pay for the classroom coordinator/teaching partner
12	21	186	Lack of computer and/or software support
13	25	168	Lack of staff, administrative, and/or community support
14	22	162	Equipment maintenance problems
15	23	150	Poor organization of lab materials
16	22	92	Lack of guidelines from the State Department of Education

STRATEGIES FOR PROGRAM IMPROVEMENT
BY RANK IMPORTANCE

Rank	Votes	Points	Strategies
1	28	337	Provide better review and preparation for standardized tests
2	28	328	Build time into the schedule for students to catch up
3	28	323	Make scheduling more responsive to the needs of the high schools
4	28	312	Reduce the cost of the programs
5	25	284	Cover less material more thoroughly
6	26	274	Provide a drop period for students at no cost to the school
7	27	268	Develop a better understanding of student needs through evaluation and feedback from the classroom coordinators/teaching partners
7	26	268	Provide access to broadcast tapes when the equipment fails
9	24	258	Make grading less burdensome
10	24	250	Reduce the number and length of labs
11	28	230	Improve communication (e.g., through electronic mail)
12	27	218	Clarify the duties of the classroom coordinator/ teaching partner
13	24	217	Provide more computer time and/or software
14	26	211	Provide more advanced notice of channel changes
15	27	195	Provide both pre-service and in-service workshops for classroom coordinators/teaching partners via satellite
16	26	190	Provide pay for the coordinators

APPENDIX D

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