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ABSTRACT

The paper details development, implementation, and user research/evaluation of TI-IN Network, Inc., the first private, interactive satellite based educational system in the United States developed for public schools and offering a total systems approach by providing both user technology and a wide range of course offerings. An overview of specific technology employed at the 150 receiving sites across 12 states and course offerings (400 hours of in-service teacher/staff training, 18 high school academic courses, student enrichment programming, and tutorials) are outlined. The cooperative partnership between rural public educational institutions and private enterprise is explicated. Research findings based on a year-long evaluation effort focus on variables relative to its use and adoption by students and administrators. Findings indicate primary reasons for adoption are to provide new alternatives and cost-effective ways to increase curricula, increase teacher inservice training, and comply with legislative mandates. Survey results suggest users and administrators perceive TI-IN as "useful," "convenient," "effective," and "good." Students report they like the opportunity for a new experience, the teachers, and courses not otherwise available and 75% indicate they would enjoy taking another TI-IN course even though they were required to work independently more often and to be more self-motivated and attentive during class. (NEC)

REACHING RURAL SCHOOLS USING AN INTERACTIVE SATELLITE BASED EDUCATIONAL NETWORK: EVALUATING TI-IN NETWORK'S FIRST YEAR

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Abstract

The following paper details the development, implementation and the user research/evaluation of the TI-IN Network, Inc.. The Network, is the first private, interactive satellite based educational system in the country developed for public schools. TI-IN Network offers a total systems approach by providing both the user technology and a wide range of course offerings. An overview of the specific technology employed and the course offerings are detailed. The cooperative partnership between rural public educational institutions and private enterprise is explicated. Research findings based on a year-long evaluation effort by the TI-IN Network focus on variables relative to its use and adoption by students and administrators.

The Rural Context

We are all responsible for perpetuating a generalized myth about rural america. For decades, rural areas of the United States have been perceived, usually by urbanites, as victims of cultural isolation and economic deprivation. Others equate the perceived rural isolation with freedom, from a more complex urban lifestyle.

Life in rural regions is idealized as simple, environmentally pure and conservative. These beliefs are responsible in part for creating an inferior image of educational institutions who happen to be located in rural districts. 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.

New technological innovation has been most prevalent in the rural context. However, people continue to believe that rural residents/students are less amenable to change and generally lack the necessary resources for implementing an innovation. These beliefs are not validated by the adoption of TI-IN Network by rural schools.

Rural TI-IN Sites : Adoption Grows

The growth of the TI-IN Network, Inc., an interactive, satellite based educational system, illustrates that school administrators in rural public school districts are the vanguard of its nation-wide adoption. Over half of the 150 receive sites report district sizes by average daily attendance (ADA) to be 1,000 or less. School administrators, who adopt TI-IN, have a high interest in the broad range of course offerings to expand their current curriculum. With the cost of the network being less than hiring one teacher, the service is affordable to even the smallest districts.

The TI-IN Network is a technological alternative to face-to-face classroom instruction. All instruction is live and interactive, using one-way satellite transmitted video with two-way audio talk back. After one year of operation, TI-IN Network is made up of 150 receiving sites (with 175 actual end users/subscribers) across 12 states. Curriculum offerings include, 400 hours of in-service training for teachers/staff, 18 high school academic courses for students, student enrichment programming and tutorials. The courses are broadcast over two-channels, 6 days a week. For rural schools, TI-IN courses offer a creative solution to problems of teacher shortages and new legislative curriculum mandates.

New Technology in the Rural Context

Over the past two decades, rural america has been the testing ground for a wide array of new telecommunications technologies. The government funded research and demonstration projects, that flourished in the early and mid-1970's, used

telecommunications media to expand educational opportunities in geographically remote areas [1].

The change agents who developed the demonstration projects believed that rural residents and institutions, with inherent geographic barriers, needed easier access to information/resources. Elton and Carey (1980) suggest that many assumptions of perceived user needs for technological applications are outweighed by the actual financial costs. For several of the demonstration projects the strong user demand never emerged. Many of the technological choices were too costly after the government funding ended. The high cost of the application was cited as the principal reason for ultimate non-adoption.

While, using video telecommunications media for education in rural areas is not new, the pre-conditions to make it affordable and successful are. Recent state legislative curricula mandates; the decreasing cost of satellite hardware and transmission time; and a cooperative venture between public sector institutions and private enterprise are factors which converge making satellite based education services feasible.

TI-IN Network Responds to Rural Needs

The TI-IN Network was conceived to equalize academic resources available to high school students and teachers. The TI-IN Network's roots are in Texas. At the time of its inception, Texas, not unlike other states, increased the curriculum requirements for high schools through legislative mandates.

A general teacher shortage, especially acute in specific subject areas (ie., foreign languages, computer math), coupled with increased budgetary demands of local districts, made compliance nearly impossible. TI-IN provides a solution to the plight of high schools by offering the mandated courses.

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1 Examples of the variety of educational applications include: training vocational rehabilitation counselors via audio teleconferencing (Pease, 1983); continuing medical education for health providers via terrestrial based microwave video with audio talk back (Niemiac, 1983); continuing education for extension agents using audio teleconferencing and other narrow band video applications (ie., slow scan, electro writers) for enhancement (Parker, 1979); multiple uses of cable television with a telephone dial-in for student homework tutorials and course offerings (Pease, 1982; Boyle, 1982).

TI-IN evaluated both the user needs and their geographic locations to match their needs with the attributes of the satellite receive technology. Using Ku-Band satellite transmission permits any school located in the continental United States to receive these resources. As a private company, TI-IN is able to engineer, maintain and market the state-of-the art technology. The services are affordable, the initial subscriber cost, including approximately $8,400 in one-time equipment cost, is less than hiring one teacher.

Private Enterprise and Public Education Merge

The successful development of TI-IN stems from the cooperative venture between private enterprise and public education agencies. The partnership began between TI-IN and the Texas Region 20 Educational Service Center located in San Antonio. Region 20 is the critical link for the Network by providing the broadcast (up-link) facility for program origination. The Region 20 staff select the best qualified, certified high school teachers and submit the lesson plans for each course to the state education agency. By approving the lesson plans, state or local education agencies award academic credit for the courses taught via TI-IN.

Table 1. High School Courses 1985-86

Channel A	Channel B
Honors Calculus	U.S. Government
Latin I	Spanish I
Computer Science	Computer Math
Personal Business	French I
Business Law	Trigonometry
Psychology	German I
Sociology	Elem. Analysis
	Pre-Calculus

Region 20 provides the necessary staff to manage the operation of its multiple studio facility. A curriculum expert works with each instructor to maximize their use of the multi-media features available on the TI-IN system. All of the 10 teachers reported a low use of media in their face-to-face classroom instruction. The results of a end of the year survey suggests that TI-IN teachers report their teaching style has changed to incorporate multiple media (ie., slides, videotapes, pictures, graphics). Instructors are taught skills in how to maximize the two-way audio interaction with students.

Serving other time zones and sharing resources. TI-IN continues to cultivate relationships with other public education agencies interested in providing broadcast facilities. For the school year 1987-1986, TI-IN will offer courses originating from a university located on the west coast and one on the east. Each university will act as a TI-IN affiliate. These broadcast sites will add to the present resources available to subscribers.

State education departments across the county are evaluating TI-IN's total educational approach. They are considering its economic advantages for potential national resource sharing.

A "Total Systems" Approach to Implementation

TI-IN differs from other applications of satellite based technology, it brings the entire programming and hardware package to the user. TI-IN leases the satellite transmission time, registers students, coordinates and contracts with nationally know inservice trainers and works alongside Region 20 on program development. Dissemination of information about the TI-IN Network to potential subscribers is an on-going activity.

The user equipment is engineered by TI-IN specifically for the primary user population (students). They install, maintain and monitor the nationwide operation of the Network. Technological obsolescence of equipment is prevented by system-wide modification and replacement of component parts.

Characteristics of the receive equipment. A TI-IN site is equipped with a receive-only satellite antenna and the TI-IN audio-video (AV) cart. The AV cart is a self contained unit on wheels, making it transportable for easy installation in any room. Each cart has a television monitor for video reception of the instructor, a videocassette recorder for storing missed class lessons, four cordless telephone handsets with automatic dial to facilitate student and teacher interaction, a satellite receiver, and the signal descrambling device.

For security reasons a dot matrix printer is kept in a locked compartment in the bottom of the AV cart. Tests and other written information are sent from the broadcast facilities via the satellite to each receive site, this information is printed out on the dot matrix printer. The talkback and copy distribution capabilities of TI-IN are made possible by use of a proprietary Multi Function Interface Unit (MFIU). The MFIU is stored in the AV cart.

The installation of the TI-IN hardware enables each site to receive two video channels with a total of over 20 hours of programming to select from. All interaction is live and made possible through toll-free telephone WATS lines. For user convenience, the toll-free WATS number is transmitted within the

satellite signal and processed by the MFIU so that, with a flick of the button, located on the handset, the number to an instructional studio is automatically dialed.

Using the technology as a communications network. As the subscriber base increases and the programming resources grow, the TI-IN Network plans to expand to eight channels. Use of the Network for statewide or national meetings is expected to grow as adoption becomes widespread. Education administrators view the Network as a communications tool as well as an instructional medium. Currently, the Texas State Education Agency administrators hold regular weekly meetings over the Network.

User Evaluation of TI-IN

From its inception, the TI-IN Network, Inc., has been committed to the development of a long-term research plan. The application of this innovation within the context of public high schools is new. A comprehensive research and evaluation of the effectiveness of the media, course satisfaction by the users and the perceived ease-of-use of the hardware are critical to understanding the factors which contribute to a successful/unsuccessful adoption.

Research Overview

The TI-IN staff worked in conjunction with the Texas Education Agency (TEA) and the Region 20 Educational Center to evaluate the first year of operation. The TEA decided to collect data at the mid-year point, only. Comparisons in their study are drawn between the completion of a mid-term final by TI-IN students and students instructed in the same subject but in a face-to-face classroom. TEA's results are expected to be released in September, 1986.

TI-IN's approach was to collect a baseline of all the research populations. The baseline serves as a measuring stick whereby long term growth and development may be assessed. Too often this step in data collection is lost when a new technology is being implemented (Carey and Moss, 1985). The actual baseline was collected prior to system-wide use in September, 1985. Subsequent data collection points include, mid-semester course evaluations, a mid-year (end of first semester) and year-end evaluation.

Self-administered survey instruments were developed and administered to five research populations: TI-IN teachers, public high school administrators (the decision makers), TI-IN's classroom facilitators (monitors), TI-IN students (users) and their parents. The results of the administrator (decision maker) and student (user) data collection are the focus of the following discussion.

Rationale

The theoretical underpinnings of this evaluation are built on Rogers (1982) diffusion of innovation theory. In his landmark book, Rogers suggests that the rate of diffusion of an innovation is a process influenced by four interrelated constructs: (1) the relevant social system, (2) the timing of the adoption, (3) the communication channels and information used to learn of the innovation and (4) the attributes of the innovation. Rogers defines an innovation as, "an idea, practice, or object perceived as new by an individual or unit of adoption."

TI-IN offers a new technological innovation which is being melded into a traditional educational context, where face-to-face instruction is the long standing model. Public secondary educational institutions are the relevant social system for its adoption. High school teachers, students, administrators and support staff compose the adoption unit.

The criteria of "time and rate of adoption" are used to classify the degree of innovativeness of public school administrators. The five categories include: innovators, early adopters, early majority, late majority and laggard. Those administrators who implemented TI-IN during the school year 1985-86 would be classified as "innovators." Most of the "innovators" are administrators in rural school districts. They took the greatest risk by first adopting an enterprise, then unproven. [2]

Purpose of the study. The purpose of this study is to understand the reasons for use and the trends of adoption. The research examines the motivations that underlie student use and administrator adoption. Expectations regarding the benefits and the utility of using the technology are examined through general attitudes, beliefs and specific attitudes toward change and innovation. Students evaluate the content of each course for overall course satisfaction. Demographic characteristics (ie., sex, age, media experience) of the users and decision makers are examined.

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[2] For more information regarding the employment of the diffusion theory in the research design, refer to the article written by Pease and Tinsley, "TI-IN Network: evaluating the diffusion and adoption of an interactive-instructional satellite system." In, Lorne Parker and Chris Olgren Teleconferencing and Electronic Communication V. University of Wisconsin Extension, Madison, Wisconsin, 1986.

Research Questions

Four questions are framed around insights from Rogers diffusion of innovation theory. Questions include: How do new users and decision makers learn of TI-IN? What are the factors that motivate users and administrators to adopt TI-IN? Are initial user expectations, attitudes and beliefs about using TI-IN sustained over the period of actual use? Are factors such as, the degree of perceived teacher/student interaction and an instructors teaching style, correlated to ratings of course satisfaction?

Methods

Research populations. The user population is composed of all high school students (N=330) who enrolled in TI-IN academic courses over the 1985-86, school year. The student population, last fall, consisted of 220 students across 55 Texas sites; by January, the population grew to 330 students across 70 sites in Texas and nationwide.

The other population is school administrators (N=65), ie., principals, superintendents. They represent the population who made a decision to adopt TI-IN.

Data collection instruments. No single method of gathering data are adequate for evaluating the complex interaction of variables related to users/decision makers and the technological innovation. Three methods of qualitative and quantitative data collection were employed in this study. The multiple data sources include: self-administered survey instruments, interviewing and unobtrusive classroom observation.

Quantitative methods. Self-administered survey questionnaires are used to establish a baseline (N=220) of all users and administrators. Each questionnaire includes questions regarding general attitudes about TI-IN; feelings about change; motivating factors for use; previous media use and experience; and sources of information used to learn of TI-IN. The questionnaire items were measured by open-ended responses, multiple choices or semantic differential and Likert (7-point) scales.

A majority of the baseline items on the student (user) questionnaire were replicated. These questionnaires were administered at mid-year (at the end of the first semester) and the end of the year (N=330). In addition, students completed a single-page course evaluation questionnaire at the mid-semester point (each semester). The self-administered questionnaire includes 9 course satisfaction items. Each item is measured using a 7-point scale.

Data gathered from the administrators baseline questionnaire were used to develop the end of the year survey. Items on the end of the year questionnaire measure the overall evaluation and satisfaction with the TI-IN programs and hardware. Open-ended responses to questionnaire items are required by respondents. Four items on the questionnaire ask for responses based on a 7-point Likert scale.

Qualitative methods. On-site interviews were conducted at a small sample of the receive sites. Students, administrators and classroom monitors were interviewed at each site. The TI-IN staff observed the student participation in TI-IN programming and their use of the equipment. All sites interviews were completed in schools remotely located in Texas.

Data analyses. Methods of data analysis for all the research variables range from simple descriptive statistics to multivariate analysis. The statistics employed for the discussion below are simple descriptive statistics. The multivariate analysis is available in the evaluation report for TI-IN's first year.

Discussion of the Results

Administrators: The Decision Makers

The diffusion and implementation of the TI-IN Network has been the result of the direct support of school administrators. Results from the baseline survey completed in August, 1985, by subscribing districts, indicate that superintendents are responsible TI-IN advocacy in 75 % of the districts. Demographic characteristics of the district administrators suggest that as a group, they are on the average 44 years old, have job tenure of 7 years and have completed more master's degrees than doctoral degrees.

Ways of learning about TI-IN. Formal channels of communication are how these administrators learned of TI-IN. The primary sources include, direct mailings received from TI-IN or from a conference demonstration and presentation. Administrators report that the average length of time is six months from first learning of the innovation to the time of actual implementation.

Factors motivating the decision to adopt. The baseline survey identifies three primary reasons (see Table 2.) for adoption.

Table 2. Primary Reasons for Adoption by School Administrators (N=35)	
53 %	NEW ALTERNATIVE AND COST-EFFECTIVE WAY TO INCREASE CURRICULA
30 %	INCREASE TEACHER INSERVICE TRAINING
10 %	TO COMPLY WITH LEGISLATIVE MANDATE

Once TI-IN implementation was certain, each school established a policy for selecting students. Three criteria are identified by administrators, these include: 1) a student must be a junior or senior, 2) with a better than average grade point average and 3) must meet the approval of a principal or guidance counselor.

Did TI-IN meet expectations. Responses on the end of the year questionnaire suggest that overall, administrators are pleased with their decision to adopt TI-IN. Table 3. illustrates their evaluation of TI-IN by meeting their initial expectations.

Table 3. Rating Initial Expectations of TI-IN by Administrators (N=50)	
60 %	"EXACTLY WHAT I EXPECTED"
30 %	"EVEN BETTER THAN I EXPECTED"
10 %	"LESS THAN I EXPECTED"

Of the administrators, 90 percent report that TI-IN met or exceed their expectations. Ten percent report that TI-IN fell below their expectations. As TI-IN was not operational when the administrators decided to adopt, it is possible that some

administrators had unrealistic expectations. They may have subsequently been disappointed when their preconceived image of the technology was not confirmed. Nevertheless, 49 of the 50 administrators report plans to re-subscribe to TI-IN.

Overall ratings of the experience. Fifty-five percent of the administrators describe TI-IN as "cost effective." They explain that "it is less expensive than hiring a teacher and offers program variety at a reasonable cost." Some describe TI-IN as, "saving money." A smaller group report that "cost is not as important, this is the only way we could have met legislative mandates and expand our curriculum."

Table 4. below details the four items that administrators describe as liking most about the Network.

Table 4. What Administrators Liked Most	
80 %	"THE PROFESSIONALISM OF TI-IN AND REGION 20 STAFF"
46 %	"HIGH QUALITY OF INSTRUCTION"
29 %	"EXPANDED CURRICULA/INSERVICE"
26 %	"THE INTERACTIVITY"

Their likes about the Network are similar to the reasons for adoption reported in the baseline. On the baseline survey, administrators identified two concerns -- the quality of instruction using this medium (whether students can learn) and the ability for students/teachers to interact. Table 4. suggests that by the end of the year, the initial concerns had been eliminated.

The overall appraisal of the TI-IN experience is detailed below.

Table 5. Overall Rating of the TI-IN Experience by Administrator (N=45)

	GOOD	NEUTRAL	POOR
THE OVERALL MAINTENANCE AND REPAIR OF HARDWARE*	26	13	2
ACADEMIC ACHIEVEMENT BY STUDENT**	28	5	-
	EASY	NEUTRAL	DIFFICULT
THE WORKING RELATIONSHIP WITH REGION 20	35	7	3

*missing = 4
**missing = 12

Adoption patterns of urban vs. rural. Each district administrator proposes TI-IN adoption to the local school board. Qualitative observation of the length of time a district takes in making a decision to adopt TI-IN suggests that both the size of the district and the perceived degree of need for the service are important factors in adoption. Small districts, usually in rural settings, who have a strong need for the TI-IN offerings adopt more quickly than larger districts with slightly less need.

A district's size appears to influence the length of the decision making process. The administrative organizational structure of larger districts requires processing information through more formal channels. Routing information through these channels often involve more people and more processing time. In addition, large districts, usually urban ones with in-house studio facilities, evaluate whether or not they would be able to provide the same service (using technology) as TI-IN. Always the evaluation effort indicates that a district or region could not afford to produce an in-house service comparable to TI-IN. But the evaluation increases the time of the decision making process.

The length of time it took to adopt TI-IN by the first subscribers was about 6 months. The length of time between learning about TI-IN and adopting it has decreased over the last year. It must be remembered that the first subscribers adopted a

system sight unseen; they were the risk takers and "innovators." Today, a decision to adopt may be based on a concrete service that is operational. The decision makers may observe a live demonstration of the hardware and programming prior to adoption.

Students: The TI-IN Network Users

Over 300 high school students have had an opportunity to participate in TI-IN courses. Motivation for enrolling in the courses are for extrinsic reasons such as, needing the course to "gain acceptance into college" or "to graduate from high school." Intrinsic reasons for enrolling include, "interested in taking a course via television" or "it will a new experience that will help in the future."

Characteristics of users. Overall, the students represent the upper division classes within the high schools. The majority are female (N=190) and 10 per cent take two or more TI-IN classes. Those students enrolled in more than one class are primarily from rural schools with small ADA, where curriculum offerings are reportedly limited. The table below provides basic user characteristics.

Table 5. Characteristics of Users [3]

	% of Respondents
HIGH SCHOOL STUDENTS	330
SEX: FEMALE	190
MALE	140
GRADE IN SCHOOL:	
JUNIORS/SENIORS	270
SOPHOMORES	60

Differences between female and male users. The major difference between male and female students are their course selections. One-half of the female students, in contrast to 10 percent of the males, select foreign language courses. Males choose math related topics proportionately more often. Another sex related difference is personal media habits. Seventy percent

[3] The basic demographic data that is reported are preliminary. The distribution of age and sex may change slightly as additional questionnaires are merged and analyzed.

of the females report reading a book or writing letters, only 44 % of the males report engaging in these activities. Males are 60 % more likely to watch television or listen to a record.

Ways students learned of TI-IN. A majority, 200 students out of the 220 who completed the baseline, report learning about TI-IN through interpersonal communication channels. These channels include contact with a curriculum advisor/counselor, the school principal, a teacher, a parent or friend.

Overall evaluation of TI-IN. Sixty percent of the students report that their final class grade is the same or better than a grade they would expect in a face-to-face classroom. A survey of mid-year grades suggest that students earn a "B" or better across most classes.

There are three aspects of TI-IN that students like. See Table 6. for a listing of what students like by the end of the year.

Table 6. What Students Like About TI-IN

LIKE OPPORTUNITY FOR A NEW EXPERIENCE
LIKE TEACHERS
LIKE COURSES NOT OTHERWISE AVAILABLE

Seventy-five percent of the students indicate that they would enjoy taking another class from the TI-IN teacher. What they like best about the teacher is indicated in Table 7..

Table 7. What Students Like Best About TI-IN Teachers

SHE/HE IS NICE AND PATIENT.
SHE/HE WAS THOROUGH, SMART AND UNDERSTANDING. -EXPLAINED THE COURSE MATERIAL WELL
SHE/HE HAD AN ENTHUSIASTIC STYLE THAT KEPT THE CLASS ALIVE (INTERESTING) AND HUMANIZED IT BY HAVING A SENSE OF HUMOR.

TI-IN users report that they would recommend a TI-IN course to a friend. However, users did suggest that TI-IN classes are more demanding than other face-to-face classes. They report that they were required to work independently more often, to be more self-motivated and more attentive during class time.

Users also report that 57 % of their parents are interested in their TI-IN progress. Forty percent indicated that their parents like TI-IN as an instructional medium. Another forty percent report that they "do not know" how their parents feel about TI-IN.

Overall satisfaction with courses. The mid-semester evaluation of the user satisfaction with the TI-IN teachers, the course, the technology and the degree of interactivity reveal a correlation with overall student satisfaction and the degree of interactivity. Where students rated a class as overall "very good," they were more likely to rate the teacher's style as "very clear" and the level of interactivity as "a great deal." The course content for highly rated classes was more often rated "interesting." Teachers were perceived more "easily" assessable for after class help.

Users who rate a course "average or below" are more likely to identify the interactivity as "a little" and the course content "sometimes interesting/sometimes boring." The perceived ability to talk with the teacher outside the classroom as "sometimes easy."

No specific topic type seems to be rated more positively than another. Rather, it appears that other variables including, the style of the teacher or the general difficulty (and popularity) of a particular subject contribute to the overall ratings. For example, psychology is better liked than calculus or latin. The latter to courses are rated more often as "difficult" or "sometimes boring."

Both the baseline and the end of the year surveys suggest that users and administrators general attitudes about TI-IN are positive. TI-IN is perceived to be "useful," "convenient," "effective" and "good."

Conclusions

Today, high school students located in rural districts such as, Dime Box, Texas, are successfully participating in credit bearing courses not before available. These students have classmates who are located in rural sites throughout Texas, California, Arkansas, Nebraska, Nevada, Oklahoma, Kansas, Iowa, South Dakota, Minnesota and Michigan. For these districts, TI-IN offers an alternative for overcoming geographic and curriculum limitations.

By offering a "total systems approach," TI-IN is able to meet the conditions for success. First, TI-IN offers a service that is important to school districts. The overall evaluation of administrators (innovators) indicate that TI-IN met their curriculum and budgetary requirements.

Second, TI-IN makes the technology and the programming compatible with user skills and norms. The technology is simple to operate. Installation requires no room modification for subscribers. The instructional techniques TI-IN teachers use are analogous to a face-to-face class, this minimizes the users time needed for making an adjustment. All instruction is live and interactive, students are expected to be attentive, participate and complete their homework.

Third, the cost of TI-IN subscription is competitive with the traditional face-to-face classroom. Administrators, who were subscribers last year, evaluated this system as overall "cost effective and less expensive than hiring a teacher."

The factors of compatibility, ease of use and cost effectiveness may explain why more administrators across the nation are adopting TI-IN. In September, 1986, the student population tripled to over 1000 registrants.

Future research. Having established a baseline, the research effort for the second will enable us to draw comparisons based on similar students in similar courses. The evaluation effort for 1986-87, includes a greater concentration on understanding the degree to which classroom interaction plays in actual course performance. On-going evaluation allows both the user and TI-IN staff to monitor the quality of its programming and hardware offerings.

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