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AUTHOR Stammen, Ronald M.

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ABSTRACT

This paper describes North Dakota's distance-education telecommunications infrastructure, and examines the opinions of school administrators about technology needs, usage, and funding. In North Dakota, every school district has access to a computer-mediated telecommunications network, SENDIT, which is bridged to Internet connections through the statewide higher education network. The state government is currently installing a telephone interconnect system with nodes at county seats in order to increase capacity and speed for transferring data at rural locations and solve access problems due to overload. In addition, the 11 colleges and universities and a third of the secondary schools currently provide interactive video with two-way audio and multimedia capabilities. Also, three satellite uplink systems have been approved in the state. A 1993 survey of school district administrators was conducted to address problems about network connectivity and constituency concerns deemed important to members of the state's Educational Telecommunications Council. A 1994 in-depth follow-up study conducted by outside consultants attempted to resolve previously identified issues. Results of the two studies indicate strong statewide support for the university-based interactive video network as a means of expanding curricular offerings of rural and small schools. Included are the consultants' recommendations about telecommunications technological, infrastructural, and institutional alternatives and the underlying structural and organizational make-up of the Educational Telecommunications Council itself. A listing of course offerings over the High School Fully Interactive Television Networks in North Dakota and maps showing network structure and coverage are attached. (RAH)

# Rural Education
# Partnerships Through Technology

by

## National Rural Education Association
## Annual Rural Education Research Forum

October 14 & 15
Paul W. Bryant Convention Center
The University of Alabama, Tuscalosa,

This image of an interactive video classroom was captured from an on-line video camera via a Nextdimension-computer workstation. This workstation was also connected to an Elmo Optical viewer and an Internet connection for presenting retrieved data over the interactive video networks.

**Featured Research at the Symposium - Paper Session**
**Saturday, October 15, 1994 - 3:15 - 4:45 p. m.**
**Chair: Robert Newhouse, Kansas State University**

## Governance Issues: State Educational Telecommunications Council

**Presented by**
**Ronald M. Stammen, Ph. D.**

**Assistant Professor in Educational Administration**
**(Administrative Consultant for the North Dakota Educational Telecommunications Council)**
**College of Human Development and Education**
**FLC 210, Box 5057**
**North Dakota State University/Tri-College University**
**Fargo, ND 58015**

email = stammen@plains.nodak.edu
Telephone = 701-231-7210
Fax = 701-231-7416

**The purpose of this presentation is . . .**

- to define distance education media in terms of broadcast telecommunications, interactive video (television) services, and computer-mediated-telecommunications.
- to explain the financial, technological, and attitudinal dimensions involved while creating a telecommunication infrastructure for rural education.
- to give an account of perspectives school administrators and consultants provided through research designed to explore and explain phenomena affecting high school curriculum offered by new and developing telecommunication technologies.

**North Dakota's Educational Telecommunications Infrastructure**

North Dakota, one of the most rural states in the nation, has every school district accessed to a computer-mediated telecommunications network. This network is called SENDIT and is bridged to Internet connections through the statewide higher education computer network. A full-time coordinator conducts training and handles administrative duties. A systems operator assists the coordinator while maintaining the network which accesses about 200 menu selections and provides a re-posting service throughout the Internet system.

The state government is currently installing a 56 K-byte and T-1 frame-relay telephone interconnect system with nodes at county seats. This will increase the capacity and speed for transferring data at rural locations and solve access problems due to an overload of the 1-800 lines and local access ports at each of the colleges and universities.

The eleven colleges and universities and a third of the secondary schools currently provide interactive video (television) with two-way audio and multimedia capabilities. The video technology varies from voice-activated T-1 compressed video to switch DS-3 digital; however, most high schools utilize two-way analog fiber interactive television networks.

By day these networks are involved with teachers sharing and pairing schedules to enhance their respective curricula. During the evenings and weekends these networks handle a variety of university-to-college or university-to-school district connections to complement degree programs in business, health, and educational administration. In addition, business meetings and continuing education courses are also contributing to a full schedule. Network connections are being requested of the university system by non-connected high school clusters.

Three satellite uplink systems have been approved in the state by various funding agencies or legislative acts. University-based transportation and aeronautical programs have a regional support base in the nation. The third uplink, Prairie Satellite Network, has provided satellite dishes to 70 of the 190 secondary school districts. Two satellite studios will be able to broadcast

programs to be developed by educators and/or entrepreneurs. In addition, the public telecommunication group offers school television services, Spanish I & II, and piloted (1994-1995) Spanish III nationwide with SERC STAR School funding.

## Research Design and Demographics

A survey was conducted to addressed problems about network connectivity and constituency concerns deemed important to members of the state's Educational Telecommunication Council. The questions were developed during a modified affinity process whereby Council and Advisory Committee members submitted descriptions of their concerns and interests. In most cases, the questions were constructed in the language frequently described or discussed by school administrators providing the majority of feedback at state meetings. Twenty-nine questions were used to solicit degrees of agreement according to a 4-point Likert scale. Question 30 asked the respondents to write any comment which reflects their concern, interest, or perspective missed in the previous questions. It was also suggested that they could write about some aspect they thought should be given special emphasis.

## Results of the 1993 Survey

The survey was sent to 230 school administrators or directors who represented high school districts, graded-elementary districts, or similar institutions. The response return rate was 54 percent. Demographic data indicated that 85 percent of the respondents were secondary school administrators with a keen interest in telecommunications. This majority constituted 66 percent of the high school districts. Statistical tests were taken for internal reliability. Respondents willingly wrote their opinions in response to Question 30. There were 123 written comments which substantiated the issues and conflicts of most concern to the Council, in addition to the following summary of the areas of agreement to the structured questions:

### Inquiries about the University's Statewide Interactive Video Network

Two-thirds of the respondents felt that North Dakota University System's Interactive Video Network is an adequate system serving the purpose for which it was intended. However, 90 percent agreed that connecting this university network with high school interactive television clusters is important to meet their schools' educational needs. Ninety-eight percent agreed that an effort should be made to have all rural high schools belong to a two-way interactive television cluster so students will have access to college and university services like their counterparts do in cities where these institutions are located. Likewise, 97 percent agreed that an effort should be made to have all rural, remote high schools belong to such a cluster so teachers and administrators will have local access to college and university graduate courses. This same majority felt that if high school to college/university connections are made in one area of their

state, they should be made throughout the state. About 80 percent did not agree that scheduling factors and technical logistics are too time-consuming or demanding to expect the university system to be connected to all high schools.

Only six statements were written regarding the university system. The following represents a consensus regarding networks for secondary schools:

*Response #47: "We desire higher education link-ups, not duplication of other services."*

**Prairie Public Television (PPTV)**

Indications from the written comments made by the respondents showed that Prairie Public Television services were the least understood and the most criticized. Ninety-one percent of the respondents disagreed that interactive television classroom construction should halt until schools have taken full advantage of Prairie Public Television's services which will utilize their federal grant to place 70 satellite receiving dishes in schools statewide. There was widespread disagreement (98%) that schools should utilize Prairie School Television's interactive satellite high school Spanish courses rather than local area ITV Spanish courses.

Only 53 percent agreed that the Prairie Public Television interactive SERC satellite high school courses are important for their schools. Only 38 percent felt it is cost-effective for the North Dakota Educational Telecommunication Council to pay state SERC dues because few high schools use these satellite high school courses and teacher in-service workshops. A larger majority, 65 percent of the respondents, agreed that schools should utilize the Prairie School Television teacher in-service training program for using television and videos. Fifty-seven percent agreed that Prairie Public Television adult education programs involving the University of Mid-America and other lifelong learning programs are important services for their schools. Only 44 percent agreed that the PPTV broadcast interactive Spanish language program is an important program for their schools.

Although it is difficult to provide a representative sample of the many written responses pertaining to Prairie Public Television, the following comes close:

*Response #17: "Prairie Public TV is a for-profit business. I think it's time the ND ETC stop funding this organization. We also feel there is a real conflict of interest with Prairie Public sitting on the council and the council issuing them funding. They, in turn, charge the schools. Let's fund higher education and elementary/ secondary education. Your council could use a real alignment. Connecting communities with the Higher Ed system is great. We're all in this together."*

**High School Two-way Interactive Television Networks (ITV)**

Eighty percent of the respondents perceive that the Council has a primary purpose to fund two-way ITV clusters. Most respondents agreed (70%) that such networks which share teachers to offer more elective courses should be in all high schools.

There was a split response (50-50) as to whether the cost of installation of an interactive television classroom is within each school district's financial means. The scenario given in the inquiry focused on the typical analog, fiber optic two-way system that ranged from $70,000 to $80,000 with $50,000 reimbursed from the Council. Sixty-four percent indicated their school district could afford the typical yearly cost that ranges from $8,000-to-$15,000, including line charges, to share teachers for elective courses 5 to 7 periods a day.

Although the word "never" was questioned by one respondent, 63 percent disagreed that basic education courses or high school-required courses should never be allowed to be offered over ITV networks. A majority of respondents (70%) agreed that an effort should be made so all high schools can have an ITV classroom and to provide equal access to all schools.

The respondents provided more statements regarding high school ITV than in any other area. The following response brings out the conflicts apparent throughout the state regarding opinions about the type of technologies with reference to supervision capabilities:

*Response #76: "Also I hear of statements like all new systems should be digital instead of analog. Those people must be non-educators because supervision analog is the system of choice for high schools now or until the technology is there for direct full-time supervision."*

**SENDIT Computer-mediated Telecommunications**

Sixty-eight percent agreed that SENDIT should be fully funded by a legislative line-item budget rather than the way it is this current year with local educational agencies supporting approximately 15 percent of the cost. A substantial majority of the respondents (72%) agreed that SENDIT is used often in their schools. Ninety-four percent of the respondents indicated that they intend to utilize the technological services provided by local ITV classroom clusters, PPTV, and SENDIT. A typical response is reflected by this quote specifically called in by an ITV cooperative board discussing this survey:

*"SENDIT is really great. However, it is not worth the yearly cost if you cannot get on-line during the day to use it. ETC should not continue to fund operations like SENDIT if it takes funds away from funding ITV classrooms and networks."*

**Inquiries Related to Technology Education in General**

Seventy-five percent agreed that an effort should be made so all schools are equally equipped with telecommunication technologies. Eighty-three percent agreed that schools should utilize the

Center for Instructional Innovation at Valley City State University's statewide mission to train educators how to adequately use educational technologies. Forty-eight percent agreed that teachers have a fear that such long-distance delivery systems will eventually be used to reduce the teaching force. Finally, 58 percent agreed that these long-distance delivery systems will never be as good as traditional classroom instruction regardless of how innovative and proactive the distance education teacher.

In regard to the latter point, one respondent provided the following statement:

*Response #33: "This is the only question that addresses quality of 'total' instruction received by students using ITV. ITV has been all too often called the savior of the small rural schools. I need to be convinced that ITV has qualities that I want to promote (for the average/general high school student and class).* (It is) *Exceptional for the specialty low-count elective or new technical-type subject."*

**Summary of Survey Findings**

In essence, this survey found a strong agreement for high schools to be connected to the statewide university video network regardless of scheduling factors, technical logistics, and a clearly defined reason for such connections. The findings bear out a substantial disregard for the public television's initiatives and capabilities to provide ubiquitous broadcast services. School administrators indicated that the Council's primary funding should be for two-way interactive video services to provide elective courses within cooperating clusters. They also agreed these clusters should eventually utilize the technological services provided by Public Television and the statewide computer-mediated telecommunication network, SENDIT.

There was agreement that all schools should be equally equipped with telecommunication technologies and that a statewide mission is essential to train educators how to adequately use educational technologies. However, the written statements provided by the respondents clearly indicated that the Council was held suspect because providers and vendors involved in these services are among the membership. Subsequent discussions about these concerns brought forth a desire by the Council to delve further into these aspects by soliciting a second opinion from out-of-state experts prior to the next legislative session which starts January, 1995.

**In-depth Follow-up Study, 1994**

In order to attempt to resolve such issues and consider advances in technology, the Council contracted an expanded study to ascertain future needs, changing priorities, and acquire a fresh, unbiased appraisal of the progress to date. The consultant study was awarded to Network Resources, Inc., of Madison, Wisconsin, and Hezel Associates of Syracuse, New York. The activities they undertook during this process were as follows:

1. The consultants initiated the study with intense discussions with the administrative consultant who prepared the 1993 study. They relied on this expertise during the onset to become oriented to the telecommunication infrastructure, socio-political background, funding aspects, and people involved in the statewide enterprise.
2. Six days were spent during the initial visit gathering literature (see references) and holding personal interviews with state leaders, council members, school administrators, university administrators, and government officials.
3. Two roundtable sessions were held in April and May. The format during each of these two-day sessions consisted of self-assessment exercises and in-depth discussions whereby the Consultants facilitated the process and gathered information through nominal-group techniques. From 20 to 25 state leaders, Council members, and Advisory committee members participated. Many participants provided written feedback to the Consultants after each session.
4. Personal interviews were held with coordinators and teachers during site visits at secondary and higher institutions' interactive video classrooms.
5. A statewide telephone survey was conducted to specifically query the priorities for educational telecommunications among K-12 schools.

The issues and concerns brought out by the statewide survey in 1993 were amplified in the Consultants' final reports. Their detailed findings filled substantial gaps about policy and organizational issues. The telephone survey included 12 cluster schools and 9 non-cluster schools. The non-clustered schools not having interactive television networks held SENDIT and Prairie Public Television Services in a much higher regard than did the cluster schools. SENDIT was top priority among the non-clustered schools.

The debates about types of technology for interactive television were identified as those who were "analog advocates" and "digital defenders." Funding new clusters was the highest priority for the cluster schools, whereas this priority came in third among the non-clustered schools surveyed. Both groups chose funding Prairie Public Television programs as their lowest priority and felt vendors and providers should not have membership on the Council.

**Benefits and Cost of High School Interactive Television Networks**

This 1994 study explained how the North Dakota schools were quick to see the possibilities of interactive television as a means of expanding the offerings of rural schools. While a number of neighboring states had developed cable and microwave television systems to link schools into regional clusters, these technologies were seen as too expensive for most widely-dispersed North Dakota districts. Clusters of schools moved rapidly to apply for funding from the Council to

support construction of their networks, a technology fostered by:

1. the rapid deployment of fiber optic cabling by the state's telephone companies,
2. the strong advocacy of such systems by the state's Vocational Education Technology Consultant, and
3. the willingness of many rural telephone cooperatives to negotiate moderately-priced video service contracts.

The Consultants' report also emphasizes that the Council in turn recognized:

1. the potential of such systems to strengthen small schools,
2. the necessity to promote cooperation and possible consortium-building among smaller districts,
3. the need to help link smaller schools to stronger partners, and
4. that they should encourage applicants to consider video cluster planning as part of a state-funded "rural school restructuring initiative."

The principal objective of these clusters has been to give rural high school students curricular choices that would not otherwise be available due to limited faculty, gaps in expertise, or insufficient student enrollment. These objectives are met by offering three to six courses in every academic or vocational area. The Consultants also explained that the cluster networks delivered postsecondary and advanced classes from participating higher education institutions. A variety of non-instructional but highly-valued uses includes interschool meetings and co-curricular activities, from crop judging to college admission counseling. The cluster networks helped further the process of interschool cooperation and have surpassed expectations in meeting the academic objectives. Cluster administrators reported that they are pleased with their network and see them as providing new opportunities for their students, staff, and communities at a reasonable price.

One school administrator provided the following scenario to depict a yearly operational cost effective comparison for a typical rural high school (grades 9-12; 200 pupils):

1. *Regular High School with 35 courses at $875,000 equals $25,000 per course.*
2. *I-TV cooperating cluster adding 6 courses at $15,000 equals $2,500 per course.*

**Recommendations based on Consultants' Findings**

The Consultants provided a detailed review of the findings with overviews of the demographic, technological, and educational environment in which the accomplishments to date have occurred along with the socio-political and organizational challenges encountered during the first four years of existence. In regard to technology, their report addressed the technical alternatives currently being debated by the educators in the state. It was clearly outlined that the

telecommunication industry is pushing ahead in ways that may soon overtake this debate. They suggested instead the focus should be on the following recommendations:

1. All educational agencies should review their missions and develop appropriate telecommunications strategies.
2. The Council should become a clearinghouse for statewide telecommunications standards, shared applications, and advocacy.
3. The Council should create a formal grant award process, develop a comprehensive planning model for future ITV cluster development, and develop a plan for program delivery to non-clustered schools.
4. The university system should work with the Council and the state government system to better clarify the role of the university's interactive video network for non-university users.
5. The state government telecommunications system and the Council should explore the potential for central leasing.

In regard to the underlying structural and organizational makeup of the Council, the report developed the following six recommendations:

1. The Council should have a full-time Executive Director and at least one additional staff employee. (Current legislation prohibits this from occurring at the present time.)
2. The state government telecommunication agency should assume responsibility for operational activities, and should become the state's telecommunication acquisition coordinator.
3. The Council should be recreated with a revised mandate and membership.
4. A new board should have a new organization location and the state should further review and determine the roles of the new board and the state educational agency in representing K-12.
5. User Councils should be formed to participate in the new board's activities.
6. A non-voting Industry Council should be formed to advise this new board.

Additional studies were recommended to ascertain specifics about technology limits to support further additions to the telecommunications infrastructure. The Council was urged to work with rural school administrators and leaders of all other agencies to review such options and opportunities to begin developing models for the proposed reorganization of the North Dakota Educational Telecommunications Board.

Number of Courses Offered over High School
Fully Interactive Television Networks in North Dakota

| 1991-1992 School Year High School courses | Number offered | 1992-1993 School Year High School courses | Number offered |
|---|---|---|---|
| Accounting II | 1 | Accounting II | 1 |
| Advanced Biology | 1 | Advanced Biology | 2 |
| Advanced Computers | 3 | Advanced Composition | 2 |
| Advanced Math | 1 | Advanced Computers | 1 |
| Anatomy | 2 | Advanced Math | 1 |
| Applied Communications | 1 | Agriculture | 1 |
| Applied Geometry | 1 | Anatomy | 2 |
| Biotechnology | 1 | Animal Science | 1 |
| Calculus | 1 | Applied Geometry | 2 |
| Child Development | 1 | Art | 2 |
| Creative Writing | 2 | Biotechnology | 1 |
| Criminal Law | 1 | Child Development | 3 |
| Drawing | 1 | College Calculus | 2 |
| Electronics | 1 | College English | 2 |
| Family Living | 2 | Creative Writing | 4 |
| French I | 2 | Criminal Law | 1 |
| French II | 1 | Drafting | 2 |
| German I | 3 | Drama | 1 |
| German II | 1 | Drawing | 1 |
| Health Careers | 3 | Ecology | 1 |
| Home Economics | 1 | Electronics | 2 |
| Intro. to Art | 2 | Entrepreneurship | 2 |
| Latin | 1 | Environmental Science | 2 |
| Marketing I | 3 | Family Living | 3 |
| Marketing II | 1 | French I | 2 |
| Marriage and Parenting | 2 | French II | 2 |
| Mass Media | 1 | German I | 4 |
| Modern Literature | 1 | German II | 1 |
| Novels | 1 | Health Occupations | 3 |
| Parenting | 1 | Independent Living | 2 |
| Probability/Statistics | 2 | Interior Design | 2 |
| Psychology | 3 | Intro. to Calculus | 2 |
| Senior Math | 1 | Latin | 1 |
| Sociology | 2 | Management | 2 |
| Spanish I | 7 | Marketing I | 3 |
| Spanish II | 5 | Marketing II | 2 |
| Speech | 2 | Probability/Statistics | 1 |
| Vocational-Agriculture | 1 | Psychology | 5 |
| World Geography | 3 | Saxon Math | 2 |
| | | Senior Math | 1 |
| | | Sociology | 4 |
| | | Spanish I | 8 |
| | | Spanish II | 6 |
| | | Speech | 3 |
| | | Sports Nutrition | 2 |
| | | Tribal Government | 1 |
| | | Trigonometry | 1 |
| | | Vocational-Agriculture | 1 |
| | | World Geography | 5 |

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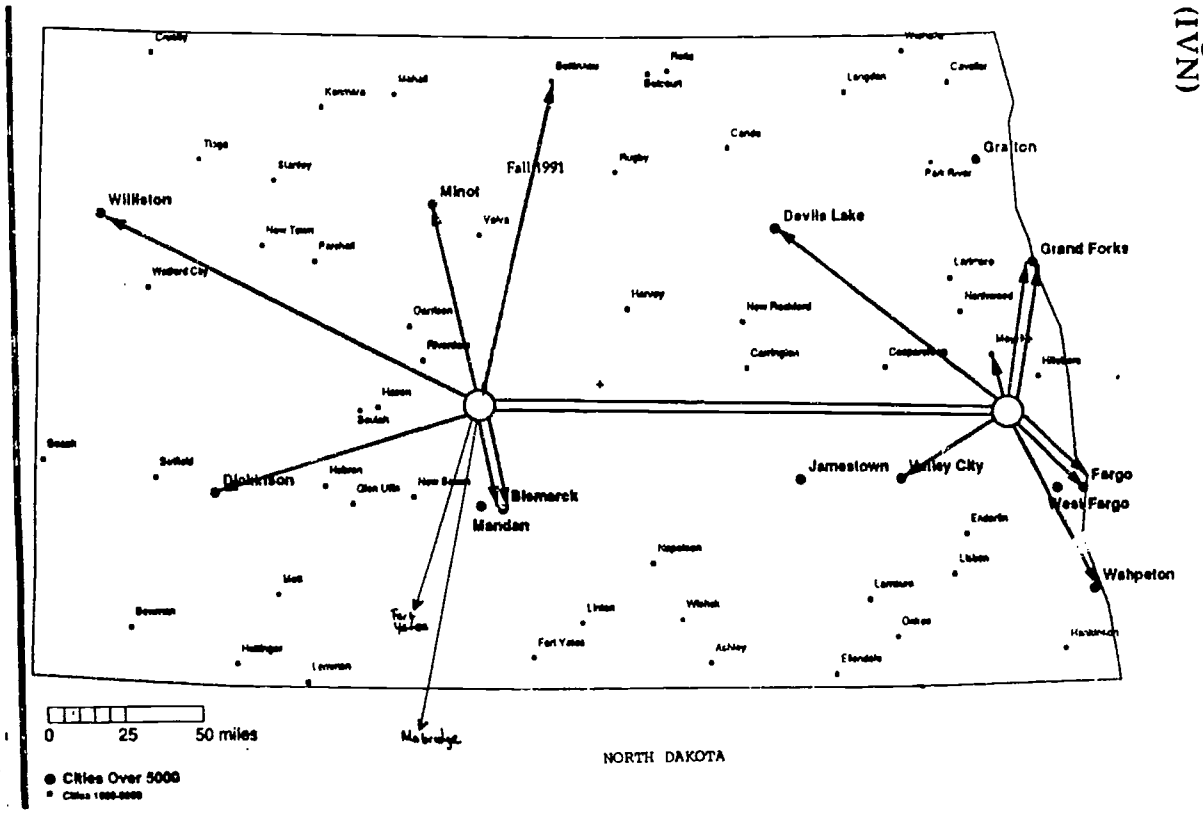
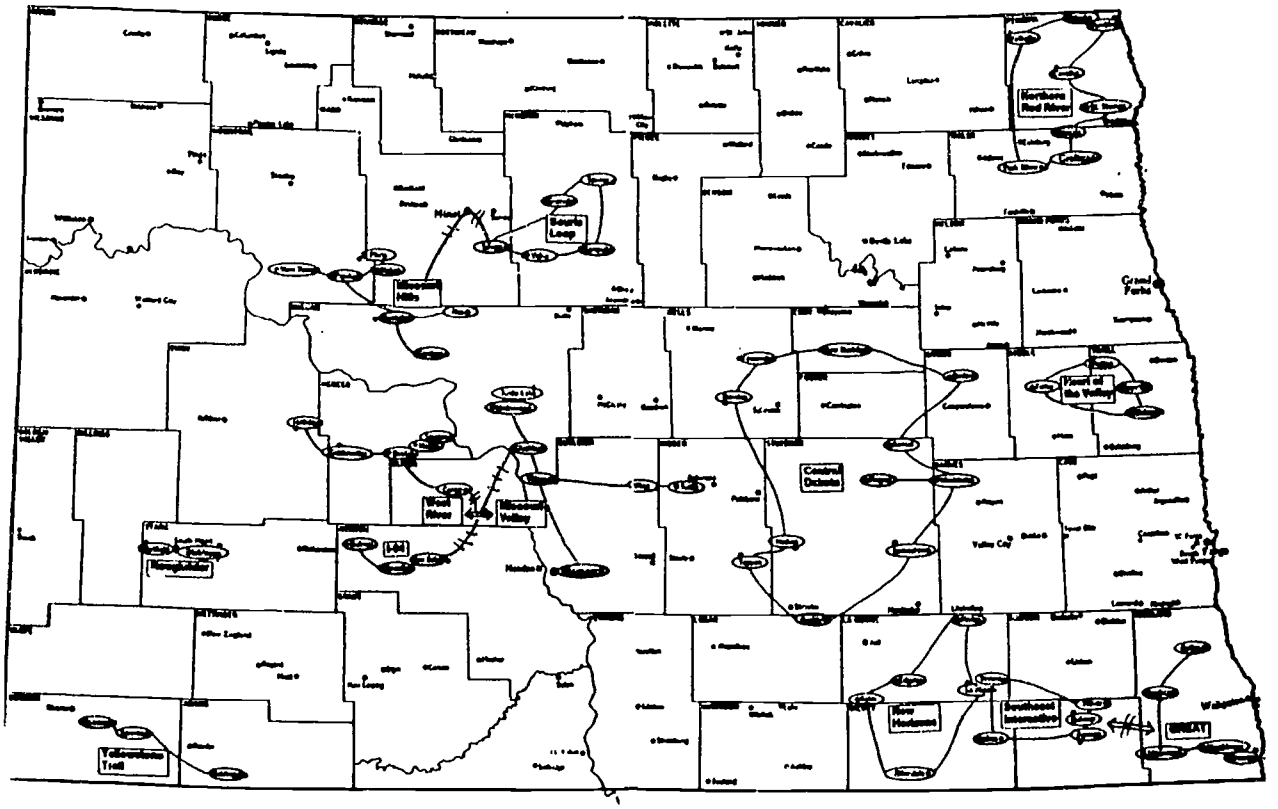
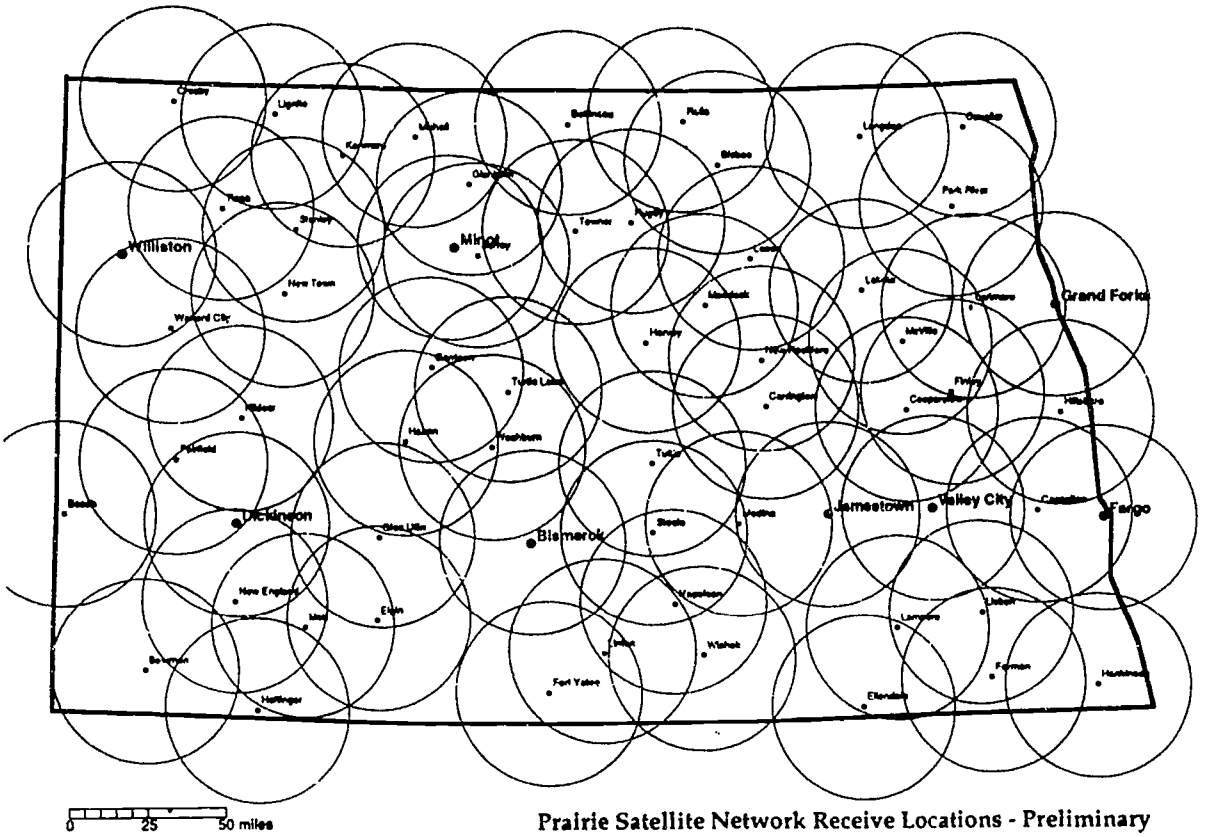



Higher Education Interactive Video Network (IVN)

## Interactive Video Clusters






**Prairie Satellite Network Receive Locations - Preliminary**
Providing Service in 63 Communities,
Within 30 Miles Of Every Resident

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Frame Relay

## North Dakota