# Distance Education Use in Rural Schools

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*A national survey of rural school systems in the United States was conducted to determine the extent to which distance education is being utilized by rural schools, the technologies used, the curriculum areas impacted, the perceived needs for distance education, their satisfaction with distance education, and the barriers to distance education use. Data were collected through telephone surveys with 394 school districts selected at random. Most rural school districts were currently using distance education. The subjects most often offered by distance education were math, foreign language, and English. A large majority of the districts indicated satisfaction with distance education courses; almost half stated they were very satisfied. The majority of students who enrolled in distance education courses completed these courses. Two-thirds of the districts indicated a need for additional distance education courses. Only a small portion of school districts indicated they are able to offer all the advanced and enrichment classes that students need without using distance education. The large majority of the districts did not see connectivity as a barrier to distance education use. Common barriers were funding, scheduling, and difficulty implementing distance education courses. The two most common formats for distance education courses in rural schools were two-way videoconferencing courses and online courses. Implications for future research are discussed.*

## Introduction

Rural schools face unique challenges associated with geographic isolation, racial segregation, and limited school and community resources (Johnson & Strange, 2007). Many rural schools experience difficulties attracting and retaining teachers for a variety of reasons including lower salary levels. Rural school districts can have difficulties offering a comprehensive curriculum that includes upper-level courses, advanced placement courses, and vocational courses because of financial and human capital constraints. Aronson and Timms (2004) indicated that faculty in some high schools lack the expertise to teach specialized or advanced courses, especially advanced placement courses. Gruber, Wiley, Broughhman, Strizek, and Burian-Fitzgerald (2002) note that about half of all U.S. high schools do not offer AP courses while those that do often offer only one or two courses. This situation is especially troublesome for rural schools that experience difficulty attracting and retaining qualified and experienced teachers (Hammer, Hughes, McClure, Reeves, & Salgado, 2005; Jimerson, 2006). Besides problems associated with a teacher shortage, rural schools also face circumstances in which it is not practical to offer specialized or advanced courses because there may be an insufficient number of students in a school that are adequately prepared or interested in taking such courses. For some years people including Barker and Hall (1994) have suggested distance education—including the use of Internet and web-based materials, interactive television, computer conferencing, and multimedia modules—as at least a partial solution to some of the problems rural schools face.

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The impact of teaching and learning with technology, including distance education technology, on student achievement has been investigated in numerous studies. In a review of studies on teaching with technology, Cradler, McNabb, Freeman, and Burchett (2002) indicate that research findings are consistent in finding a positive impact on achievement in content area courses, higher order thinking and problem-solving, and workforce preparation. In a meta-analysis of 42 research studies that used technology for teaching, Waxman, Lin, and Michko (2003) report an overall effect size of 0.41 for affective, behavioral, and cognitive outcomes. In a meta-analysis of the effects of distance education on K-12 students, Cavanaugh, Gillan, Kromrey, Hess, and Blomeyer (2004) reviewed 116 effect sizes and concluded that distance education was as effective as traditional, face-to-face instruction for K-12 students. They reported a non-significant overall mean effect size for all outcomes indicating little difference in the performance between students who participated in online programs and students who learned from traditional, face-to-face instruction. In a meta-analysis of the effects of distance education at all levels, Bernard et al. (2004) report a non-significant effect size of distance education on learning achievement. They also found evidence that distance education using asynchronous learning methods was superior to synchronous learning methods overall although they indicated that K-12 students likely needed the structure of synchronous learning. Research to date has shown that students who learn through technology, including distance education, typically have learning outcomes at least as good as students who learn through face-to-face instruction. This evidence supports the assertions by Clark (2003) and Hannum (2007) that technology itself does not produce learning gains; rather it is the pedagogy that matters. While there are calls for higher quality research and for more studies (Abrami & Bernard, 2006; Phipps & Merisotis, 1999), there is evidence to support consideration of distance education as a way to address some of the common problems facing rural educators.

Although distance education has been shown to be an effective way to offer courses to students, including courses they might not otherwise be able to take, there are barriers to the use of distance education. In a study of K-12 educators' perceptions of barriers to distance education, Berge & Muilenburg (2003) reported increased time commitment, lack of funding, organizational resistance, lack of shared vision for distance education, and lack of strategic planning as the top barriers. In a subsequent factor analytic study of student perceptions of barriers to distance education, Muilenburg & Berge (2005) found several factors including administrative issues, social interaction, academic skills, technical skills, motivation, time and support, costs and Internet access, and technical problems. While this was a large-scale study, it included postsecondary students, not K-12 students. The majority were in graduate courses (52.3%) or undergraduate courses (27.6%) with the remainder in business/corporate courses, military courses, or community college courses. Their study did not take into account the geographic location of the students nor indicate what portion, if any, may be rural students. Still it is possible, perhaps even likely, rural students may also encounter some of these barriers when taking distance education courses.

Although distance education could potentially address some of the issues rural schools face, the extent to which distance education is being used in rural schools is not well documented nor are the barriers rural schools may face when using distance education. Watson and Ryan (2007) reviewed state policies regarding the use of online learning and reported that 42 states have significant supplemental or full-time online programs. While informative, their work did not focus specifically on rural schools nor did it document the use of distance education by school districts; rather they sought to examine the policy environment at the state level. This report indicated that distance education did allow rural districts to provide access to highly qualified teachers in courses they previously could not offer. In a report to Congress, Secretary Spellings and Stroup (2005) reported on a distance education demonstration project in terms of completion rates and students and financing, however this project was exclusively postsecondary. A study by Setzer and Lewis (2005) for the National Center for Educational Statistics reported on distance education use in elementary and secondary schools. This report indicated that about a third of school systems have some students enrolled in distance education courses. The majority of students who were taking distance education were enrolled in high schools. Only 1% of elementary schools and 4% of middle schools were using distance education. The report further documents the increased use of distance education programs in K-12 schools that Cavanaugh et al. (2004) reported. In a report on virtual high schools, Tucker (2007) indicated that virtual schools served 700,000 students in 2005-06. While this is a small percentage of all elementary and secondary school students, it was double the estimate from three years earlier. Tracing the history of virtual schools, Davis et al. (2007) also note the recent growth in distance education in the form of virtual K-12 schools. They indicate the need to prepare teachers to be effective as virtual teachers. Clark (2008) discussed the growth and potential of online learning for K-12 schools and noted an increase in the public's approval of high school students earning credits in online courses. While there is a sharp growth in distance education use in K-12 schools, the extent of distance education use in rural schools specifically has rarely been examined although several mention the potential benefits of distance education to small, rural schools.

The present study examined the prevalence of distance education in a randomly selected sample of rural school districts. For the purposes of this investigation rural schools were selected based on their qualification for the Rural Education Achievement Program (REAP). This program is designed to identify and assist the neediest rural schools. The small or low income rural schools such as those identified in REAP may be likely to have challenges meeting the educational needs of their students. For example, Crews (2002) and Holloway (2002) have shown that these rural schools have difficulties attracting certified teachers. Further, low-income and small rural schools have higher rates of teacher turnover and often must have teachers teach in fields they were not trained for and must hire teachers with temporary licenses or who are in process of obtaining certification (Hammer et al., 2005). These schools often reduce courses offered when such vacancies are not filled.

Building on prior work, we examine factors related to distance education course offerings in rural schools. Five general questions are addressed:

- What is the prevalence of distance education by subject and course level?
- What is the prevalence of distance education by delivery types (technology used)?
- What types of barriers are related to distance education course offerings?
- How satisfied are rural school districts with the distance education they have used?
- How well prepared are students in rural schools to take distance education courses?

## Method

### *Sample and Design*

A random sample of 417 school districts was selected from all districts in the United States that qualified for the REAP in the 2004-2005 school. The REAP program is split into two parts, the Small Rural School Achievement program (SRSA) and the Rural Low Income School program (RLIS). Districts that qualify for the SRSA program must have fewer than 600 students in average daily attendance and be located in a county with fewer than 10 people per square mile. In addition, all schools in the district must be in communities with a locale code of 7 or 8 (i.e., fewer than 2,500 residents). To qualify for the RLIS program, a school district must satisfy two conditions: (1) at least 20% of the students in the district are from families with incomes below the Federal poverty line; and (2) each school in the district has a locale code designation of 6, 7, or 8 (i.e., population less than 25,000 located outside a Metropolitan CBSA or inside a Micropolitan CBSA). To ensure adequate representation of both programs, a 10% sample was randomly selected for participation from each of these programs. Of the 417 districts recruited to participate in the study, 311 were involved in the SRSA program and 106 in the RLIS program.

### *Measure*

The study utilized a survey developed for this study by researchers at the National Research Center on Rural Education Support (NRCRES) entitled the Rural Distance Education Survey (RDES). This survey is a 43-item questionnaire assessing the prevalence of distance education in rural districts by course type (e.g., math, science, foreign language, etc.,) and course level (general & honors, advanced placement). The survey also examines general issues related to distance education and district needs. Open and closed ended items were designed to identify distance education delivery types (e.g., web-based/online course, cable television, two way video conferencing, etc.), providers (local, state, regional), barriers to distance education (e.g., funding, connectivity, facilitators), and district needs (e.g., lack of AP courses and foreign language). Information about what courses and levels of courses were offered by each district was assessed by the survey. The survey also assessed for each offering the level of the course: general or honors, Advanced Placement (AP), and credit recovery.

Information about the technologies used to deliver distance education courses was assessed in the RDES. Delivery types were classified into two major categories: asynchronous and synchronous. Asynchronous courses were defined by the existence of a time lag between the interactions of the instructor and students as well as interactions among students so that these interactions did not happen in real time. The asynchronous delivery types were: mail, e-mail, self-instructional computer based tutorials, and web-based online courses. Synchronous courses were those where interactions between instructors and students and between students and students were in real time or that the potential for those interactions were in real time. The synchronous delivery types were: two-way and one-way video conferencing, satellite, and cable television.

The RDES asked participants thirteen dichotomous questions (“yes” or “no” response choices) in relation to issues or barriers that limit their district’s ability to offer distance education courses. The questions asked about potential barriers within four categories of barriers: district barriers (not a district priority, not needed for curriculum requirements, not part of strategic plan, lack sufficient

funding); logistical barriers (problems scheduling, difficult to implement, difficulty finding courses needed); personnel barriers (personnel not trained to support, do not have personnel to support, lack technical expertise); and technology barriers (lack technology enhanced classrooms/ labs, technology inadequately maintained, insufficient connectivity).

*Procedures*

For each of the 417 districts, NCRES researchers identified one district contact from the district website or by calling the central office of the district. In the spring 2005, each district contact was sent a letter describing the survey and informing them that the district had been randomly selected to participate in the survey. The letter stated that they would receive a call in one to two weeks about participating in the study. A trained survey coordinator called each contact to confirm receipt of the letter and to answer any questions about the study. The survey coordinator asked each contact to identify the most qualified in the district to answer questions about distance education. If another person was recommended, that person was contacted and the survey was described. After informed consent was obtained from the most qualified district contact, the survey coordinator transferred the individual to a trained phone interviewer to conduct the telephone survey or set up an appointment to conduct the survey. The telephone surveys took an average of 20 minutes. A total of 394 district contacts completed the survey for a 95% participation rate.

Each telephone interviewer participated in a half-day training session conducted by an experienced director of survey research projects who had both trained and managed telephone interviewers in large-scale studies for several years. During the training, numerous scenarios related to this particular RDES were used so that the telephone interviewers would learn to be consistent in how they recorded survey responses from the school administrators. During the extended practice in the training session, responses were explained and any discrepancies or misunderstandings regarding how to administer the survey in a standardized manner including asking follow-up probes and recording responses were resolved. The telephone interviewers participated in role-playing exercises during training to prepare them for the variety of responses they may encounter and to ensure that each interviewer would record survey responses in an identical fashion. Following the training, the project coordinator acted as a school administrator and had each telephone interviewer conduct a complete interview with him to fill out the survey. The project coordinator followed an identical script when completing the survey for each interviewer to determine the degree of agreement among telephone interviewers and to provide them with feedback on their performance. The project coordinator supervised the telephone interviewers when they were collecting the survey data and was available to handle any issue that arose. These steps helped to ensure consistency in data collection among the telephone interviewers.

The telephone interviewers entered the responses to the survey directly into an Access database as they were administering the survey by telephone. The software was programmed to prompt them on an item-by-item basis and to make any necessary adjustment in subsequent questions as a result of responses to prior questions. That is, the database automatically handled any skip patterns in the survey, e.g., if the person completing the survey said they were not teaching any mathematics courses by distance education in their schools, it would go to another category rather than ask which specific mathematics courses were taught by distance education. The data were kept secure and were backed-up each night. When the data collection was complete, the data were analyzed using SPSS.

## Results

*Prevalence of Distance Education*

In terms of prevalence, most school administrators reported that their district was using or had used distance education. Specifically, 85.0% of rural districts had used distance education at some time. Furthermore, 69.3% indicated that their district was currently using distance education; 15.7% had previously used distance education but were not currently doing so. Few districts had never used distance education (15.0%). School administrators in districts that were currently using or had previously used distance education were asked to estimate the percent of students in their district that enrolled in and completed distance education courses. On average, approximately 12% of students were reported to have taken distance education courses ($M$ = 12.15, $SD$ = 16.18). Districts that had previously used distance education indicated that a significantly lower proportion of students ($M$ = 5.41, $SD$ = 0.71) had been enrolled in these courses than districts currently using ($M$ = 13.99, $SD$ = 17.11), $t(325) = -4.57$, $p < .001$. School administrators also estimated that 89% of students who enrolled in distance education courses completed them ($M$ = 89.10, $SD$ = 24.56). There was not a significant difference in reported completion rates between districts that had previously used ($M$ = 87.67, $SD$ = 26.71) and districts currently using distance education ($M$ = 89.39, $SD$ = 24.15), $t(320) = -0.47$, $p > .05$.

Table 1

*Need for Distance Education Courses by Usage*

| | | Use of Distance Education | | | |
|---|---|---|---|---|---|
| | Total | Never used | Stopped using | Currently using | $\chi^2$ |
| Need DE to offer advanced/enrichment courses | 318 (81.3) | 32 (55.2) | 44 (71.0) | 242 (89.3) | 41.85*** |

*Note*. Values are observed count and proportion in parentheses.
* $p < .05$. ** $p < .01$. *** $p < .001$.

*Need for and Satisfaction with Distance Education*

One aspect of this study was to document the need for distance education in rural high schools. As is apparent in Table 1, most districts felt that distance education was needed to provide students advanced or enrichment courses. Specifically, 81.3% of school administrators reported that they needed distance education to provide the advanced or enrichment courses that students wanted. Only 18.7% of respondents said they did not need distance education for this purpose.

In addition, district use of distance education was related to their need to use it for providing advanced or enrichment courses, $\chi^2(2, N = 391) = 41.85$, $p < .001$. Districts that had never used (55.2%, Fisher's exact probability < .001) or had stopped using (71.0%, Fisher's exact probability < .001) distance education both indicated that they needed distance education to provide advanced and enrichment courses significantly less often than was expected by chance. Districts currently using distance education significantly more often reported that they needed distance education to offer advanced or enrichment courses than was expected by chance (89.3%, Fisher's exact probability < .001).

Administrators were asked to indicate how satisfied they were with distance education courses used by their district on a scale that included very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied. The results are summarized in Table 2. Overall, a majority of districts were either very satisfied (47.3%) or somewhat satisfied (44.8%) with their use of distance education. District use of distance education was related to satisfaction with it, $\chi^2(3, N = 328) = 39.84$, $p < .001$. Specifically, districts that had stopped using distance education reported that they were very satisfied (19.0%) significantly less frequently than was expected by chance (Fisher's exact probability < .001). In addition, 53.3% of districts currently using distance education were very satisfied significantly more often than was expected by chance (Fisher's exact probability < .001). Districts that had stopped using distance education reported that they were somewhat dissatisfied (20.7%) with it significantly more often than was expected by chance (Fisher's exact probability < .001). Conversely, districts currently using distance education were somewhat dissatisfied (3.0%) significantly less often than was expected by chance (Fisher's exact probability < .001).

*Reasons Stopped Using Distance Education*

The 62 districts that indicated they had previously used distance education but were not currently using it were asked to identify the main reasons they stopped. Table 3 shows data on why districts discontinued distance education use. The most frequently cited reason districts reported for not continuing to use distance education was lack of student interest and participation (40.3%). The next most frequently noted reason was time or scheduling issues (16.1%) followed

Table 2

*Satisfaction with Distance Education Courses by Usage*

| | | Use of Distance Education | | | |
|---|---|---|---|---|---|
| | Total | Never used | Stopped using | Currently using | $\chi^2$ |
| Satisfaction with distance education | | | | | 39.84*** |
| Very satisfied | 155 (47.3) | - | 11 (19.0) | 144 (53.3) | |
| Somewhat satisfied | 147 (44.8) | - | 33 (56.9) | 114 (42.2) | |
| Somewhat dissatisfied | 20 (6.1) | - | 12 (20.7) | 8 (3.0) | |
| Very dissatisfied | 6 (1.8) | - | 2 (3.4) | 4 (1.5) | |

*Note*. Values are observed count and proportion in parentheses. Empty cells are items not asked.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3

*Reasons Stopped Using Distance Education*

| | |
|---|---|
| Lack of interest or participation by students | 25 (40.3) |
| Time or scheduling issues | 10 (16.1) |
| Lack of support personnel | 7 (11.3) |
| Money | 6 (9.7) |
| Equipment or infrastructure | 6 (9.7) |
| No longer needed | 6 (9.7) |
| Hired qualified teacher | 2 (3.2) |
| Policy issues | 0 (0.0) |

by lack of support personnel (11.3%). Finally, an equal number of districts (9.7%) also reported that they no longer used distance education because of money, equipment or infrastructure, or because it was no longer needed.

*Barriers to Distance Education*

All school administrators were asked whether various factors were barriers that limited their use of distance education courses. Table 4 shows these barriers. Some of the most frequently mentioned barriers were related to district level or policy issues and included that distance education courses were not needed to meet curriculum requirements (67.7%) and were not a district priority (53.2%). These barriers were also related to districts' use of distance education, $\chi^2(2, N = 390) = 15.76$, $p < .001$ and, $\chi^2(2, N = 393) = 41.54$, $p < .001$, respectively. Specifically, districts that had never used or had stopped using distance education

Table 4

*Barriers to Distance Education by Usage*

| | | Use of Distance Education | | | |
|---|---|---|---|---|---|
| | Total | Never used | Stopped using | Currently using | $\chi^2$ |
| District barriers | | | | | |
| Not needed for curriculum requirements | 264 (67.7) | 46 (79.3) | 52 (83.9) | 166 (61.5) | 15.76*** |
| Not a district priority | 209 (53.2) | 43 (74.1) | 50 (80.6) | 116 (42.5) | 41.54*** |
| Not part of strategic plan | 109 (28.3) | 31 (54.4) | 32 (51.6) | 46 (17.3) | 51.59*** |
| Lack sufficient funding | 247 (63.7) | 43 (75.4) | 42 (67.7) | 162 (60.2) | 5.24 |
| Logistical barriers | | | | | |
| Problems scheduling | 226 (58.7) | 29 (52.7) | 38 (61.3) | 159 (59.3) | 1.03 |
| Difficult to implement | 173 (45.2) | 33 (63.5) | 36 (58.1) | 104 (38.7) | 15.79*** |
| Difficulty finding courses needed | 116 (31.1) | 21 (39.6) | 22 (37.9) | 73 (27.9) | 4.34 |
| Personnel barriers | | | | | |
| Personnel not trained to support | 182 (46.8) | 47 (81.0) | 44 (72.1) | 91 (33.7) | 61.63*** |
| Do not have personnel to support | 131 (33.7) | 24 (43.6) | 23 (37.1) | 84 (30.9) | 3.72 |
| Lack technical expertise | 67 (17.1) | 18 (31.0) | 9 (14.5) | 40 (14.7) | 9.34** |
| Technology Barriers | | | | | |
| Lack technology enhanced rooms | 59 (15.1) | 18 (31.6) | 7 (11.3) | 34 (12.5) | 14.22** |
| Technology inadequately maintained | 37 (9.5) | 3 (5.2) | 11 (17.7) | 23 (8.5) | 6.51* |
| Insufficient connectivity | 29 (7.4) | 3 (5.2) | 5 (8.2) | 21 (7.7) | 0.51 |
| Total number of barriers, *M* (*SD*) | 4.70 (2.59) | 6.19 (2.42) | 5.98 (2.29) | 4.10 (2.45) | |

*Note*. Values are observed count and proportion in parentheses.
* $p < .05$. ** $p < .01$. *** $p < .001$.

more often reported that it was not needed to meet curriculum requirements (79.3%, Fisher's exact probability < .001; and 83.9%, Fisher's exact probability < .001; respectively) and that distance education was not a district priority (74.1%, Fisher's exact probability < .001; and 80.6%, Fisher's exact probability < .001; respectively) than was expected by chance. Though distance education not being part of districts' strategic plan was less frequently reported to be a barrier, it was related to districts' use of distance education, $\chi^2(2, N = 385) = 51.59$, $p < .001$. In particular, districts that had never used (54.4%, Fisher's exact probability < .001) or had stopped using (51.6%, Fisher's exact probability < .001) distance education more often indicated that this was a barrier than was expected by chance whereas those currently using distance education less often indicated such (17.3%, Fisher's exact probability < .001). A majority of districts indicated that they had experienced funding difficulties (63.7%). Funding was consistently reported as being a barrier across districts that had never or previously used and currently were using distance education.

The next group of barriers that were more common involved the logistics of utilizing distance education courses. A majority of districts indicated that they had experienced scheduling difficulties (58.7%). Furthermore, this was consistently reported as being a barrier across districts that had never or previously used and currently were using distance education. However, districts that had never (63.5%) or previously used (58.1%) distance education more often indicated that it was seen as difficult to implement, $\chi^2(2, N = 383) = 15.79$, $p < .001$. It is also interesting to note that availability or knowledge of how to obtain distance education courses was not an issue for most districts, as only 31% reported having difficulty finding the distance education courses they needed.

Overall, less than 50% of respondents indicated that their district had barriers related to personnel. Results indicate that those districts that had never used distance education (81.0%) or those that stopped using it (72.1%) reported that lack of personnel was a barrier more often than expected and that districts currently using distance education less often indicated this was a barrier, $\chi^2(2, N = 389) = 61.63$, $p < .001$. In addition, this was one of the most frequently reported barriers by districts that had never used or stopped using distance education. While the number of districts reporting a lack of technical expertise was not large (17.1%), 31.0% of districts that never used distance education reported this as a barrier, which is higher than expected. Finally,14.7% of districts currently using distance education reported a lack of technical expertise as a barrier, which is lower than expected, $\chi^2(2, N = 392) = 9.34$, $p < .01$.

Table 5

*Student Preparation for Distance Education Courses by Usage*

| | | Use of Distance Education | | |
|---|---|---|---|---|
| | Total | Stopped using | Currently using | $\chi^2$ |
| Prepared in academic background | | | | 3.52 |
| Very well | 165 (49.8) | 27 (45.8) | 138 (50.7) | |
| Somewhat well | 151 (45.6) | 27 (45.8) | 124 (45.6) | |
| Not very well | 14 (4.2) | 5 (8.5) | 9 (3.3) | |
| Not well at all | 1 (0.3) | 0 (0.0) | 1 (0.4) | |
| Prepared in study skills | | | | 3.92 |
| Very well | 93 (28.4) | 15 (26.8) | 78 (28.8) | |
| Somewhat well | 195 (59.6) | 30 (53.6) | 165 (60.9) | |
| Not very well | 36 (11.0) | 10 (17.9) | 26 (9.6) | |
| Not well at all | 3 (0.9) | 1 (1.8) | 2 (0.7) | |
| Prepared in computer skills | | | | 0.80 |
| Very well | 250 (76.7) | 43 (74.1) | 207 (77.2) | |
| Somewhat well | 74 (22.7) | 15 (25.9) | 59 (22.0) | |
| Not very well | 2 (0.6) | 0 (0.0) | 2 (0.7) | |
| Not well at all | 0 (0.0) | 0 (0.0) | 0 (0.0) | |

*Note*. Values are observed count and proportion in parentheses.
$^{*}$ $p < .05$. $^{**}$ $p < .01$. $^{***}$ $p < .001$.

Issues with technology itself were least frequently reported as being a barrier. Nonetheless, districts that had never used distance education more often reported that they lacked technology enhanced classrooms (31.6%), $\chi^2(2, N = 391) = 14.22$, $p < .01$. Connectivity did not seem to be a barrier to distance education use. Only 7.4% indicated that their schools had insufficient connectivity.

There was a significant difference between the total number of barriers by districts' use of distance education, $F(2, 390) = 28.06$, $p < .001$. Pairwise comparisons with Tukey's test indicated that districts that have never used or stopped using distance education reported significantly more barriers than districts currently using distance education.

*Student Preparation for Distance Education Courses*

Administrators in districts that were using or had used distance education were asked to rate how well prepared their students were for such courses in terms of their academic background, study skills, and computer skills. As Table 5 shows, over 95% of respondents indicated that their students were very well (49.8%) or somewhat well (45.6%) prepared for distance education courses in terms of their academic background. While 28.4% indicated that their students were very well prepared in their study skills, 59.6% reported that their students were somewhat well prepared in study skills. A substantial majority of administrators (76.7%) indicated

Table 6

*Type of Courses by Usage*

| | | Use of Distance Education | | |
|---|---|---|---|---|
| | Total | Stopped using | Currently using | $\chi^2$ |
| Foreign Language | | | | |
| General/honors | 118 (35.2) | 15 (24.2) | 103 (37.7) | 4.06* |
| AP | 8 (2.4) | 2 (3.2) | 6 (2.2) | 0.23 |
| Algebra | | | | |
| General/honors | 41 (12.2) | 7 (11.3) | 34 (12.5) | 0.06 |
| AP | - | - | - | - |
| Psychology/Sociology | | | | |
| General/honors | 39 (11.6) | 4 (6.5) | 35 (12.8) | 1.99 |
| AP | 15 (4.5) | 2 (3.2) | 13 (4.8) | 0.28 |
| Language/Composition | | | | |
| General/honors | 37 (11.0) | 5 (8.1) | 32 (11.7) | 0.69 |
| AP | 12 (3.6) | 4 (6.5) | 8 (2.9) | 1.81 |
| U.S. History | | | | |
| General/honors | 27 (8.1) | 3 (4.8) | 24 (8.8) | 1.07 |
| AP | 11 (3.3) | 0 (0.0) | 11 (4.0) | 2.58 |
| Calculus | | | | |
| General/honors | 22 (6.6) | 4 (6.5) | 18 (6.6) | 0.002 |
| AP | 21 (6.3) | 5 (8.1) | 16 (5.9) | 0.42 |
| Physics | | | | |
| General/honors | 19 (5.7) | 3 (4.8) | 16 (5.9) | 0.10 |
| AP | 6 (1.8) | 3 (4.8) | 3 (1.1) | 4.02* |
| Biology | | | | |
| General/honors | 19 (5.7) | 2 (3.2) | 17 (6.2) | 0.85 |
| AP | 1 (0.3) | 0 (0.0) | 1 (0.4) | 0.23 |
| Literature | | | | |
| General/honors | 18 (5.4) | 2 (3.2) | 16 (5.9) | 0.69 |
| AP | 10 (3.0) | 0 (0.0) | 10 (3.7) | 2.34 |

that students were very well prepared in terms of computer skills while 22.7% reported their students were somewhat well prepared in computer skills. It is only in the area of study skills that the largest proportion and a majority of administrators (59.6%) rated students as being somewhat well prepared rather than very well prepared. This contrasts with the pattern on academic background and computer skills in which the largest proportions for each indicated that their students were very well prepared. Districts use of distance education was not related to administrators' responses regarding students' preparation.

*Types of Distance Education Course Subjects*

The data indicating the percentage of districts that offer specific courses as distance education courses are shown in Table 6. As is evident in this table, administrators' responses indicated that nearly all subjects were more often taken as a general or honors course rather than as an AP course. There were, however, a comparable proportion of districts indicating that students took a subject as a general or honors and an AP course in calculus and chemistry (6.6% versus 6.3% and 2.7% versus 2.7%, respectively). In addition, statistics was the only course that more administrators indicated that students took as an AP course (2.4%) rather than as a general or honors course (1.2%).

The five most frequently taken distance education courses included a foreign language, algebra, psychology or sociology, language/composition, and U.S. history. The use of distance education by school districts was generally not related to whether students in their district had taken or were taking a particular subject. There were two exceptions to

Table 6 (continued)

*Type of Courses by Usage*

| | | Use of Distance Education | | |
|---|---|---|---|---|
| | Total | Stopped using | Currently using | $\chi^2$ |
| Pre-calculus | | | | |
| General/honors | 13 (3.9) | 1 (1.6) | 12 (4.4) | 1.05 |
| AP | - | - | - | - |
| World History | | | | |
| General/honors | 11 (3.3) | 1 (1.6) | 10 (3.7) | 0.67 |
| AP | 0 (0.0) | 0 (0.0) | 0 (0.0) | - |
| Chemistry | | | | |
| General/honors | 9 (2.7) | 0 (0.0) | 9 (3.3) | 2.10 |
| AP | 9 (2.7) | 2 (3.2) | 7 (2.6) | 0.09 |
| Earth Science | | | | |
| General/honors | 8 (2.4) | 0 (0.0) | 8 (2.9) | 1.86 |
| AP | - | - | - | - |
| Latin | | | | |
| General/honors | 6 (1.8) | 1 (1.6) | 5 (1.8) | 0.01 |
| AP | 0 (0.0) | 0 (0.0) | 0 (0.0) | - |
| Statistics | | | | |
| General/honors | 4 (1.2) | 0 (0.0) | 4 (1.5) | 0.92 |
| AP | 8 (2.4) | 3 (4.8) | 5 (1.8) | 1.96 |
| European History | | | | |
| General/honors | 2 (0.6) | 0 (0.0) | 2 (0.7) | 0.46 |
| AP | 0 (0) | 0 (0) | 0 (0) | - |

*Note*. Values are observed count and proportion in parentheses. Empty cells reflect absence of a class or statistic could not be computed.

$^{*}$ $p < .05$. $^{**}$ $p < .01$. $^{***}$ $p < .001$.

Table 7
*Delivery Type by Usage*

| | Total | Use of Distance Education | | $\chi^2$ |
|---|---|---|---|---|
| | | Stopped using | Currently using | |
| Asynchronous | | | | |
| Any asynchronous | 269 (80.3) | 46 (74.2) | 223 (81.7) | 1.79 |
| Web-based/online courses | 195 (58.2) | 26 (41.9) | 169 (61.9) | 8.28** |
| E-mail | 141 (42.1) | 20 (32.3) | 121 (44.3) | 3.02 |
| Self-instructed computer-based tutorials | 128 (38.2) | 19 (30.6) | 109 (39.9) | 1.84 |
| Mail | 121 (36.1) | 23 (37.1) | 98 (35.9) | 0.03 |
| Synchronous | | | | |
| Any synchronous | 217 (64.8) | 36 (58.1) | 181 (66.3) | 1.50 |
| Two-way video conferencing | 181 (54.0) | 27 (43.5) | 154 (56.4) | 3.37 |
| Satellite | 68 (20.3) | 16 (25.8) | 52 (19.0) | 1.43 |
| Cable | 44 (13.1) | 6 (9.7) | 38 (13.9) | 0.80 |
| One-way video conferencing | 31 (9.3) | 3 (4.8) | 28 (10.3) | 1.77 |

*Note*. Values are observed count and proportion in parentheses.
* $p < .05$. ** $p < .01$. *** $p < .001$.

this. First, more districts that were currently using distance education (37.7%) indicated that their students were taking a foreign language as a general or honors course, $\chi^2(1, N = 335) = 4.06$, $p < .05$. Second, more districts that stopped using distance education (4.8%) reported their student had taken physics as an AP course, $\chi^2(1, N = 335) = 4.02$, $p < .05$.

*Type of Delivery*

To examine the types of technologies utilized in the delivery and completion of distance education courses, administrators were asked whether those listed in Table 7 were used. The most frequently used delivery format for distance education was asynchronous online courses (58.2%). The use of online, or web-based, courses was related to districts' previous or current use of distance education, $\chi^2(1, N = 335) = 8.28$, $p < .01$. The next most frequently used technology to deliver distance education courses was synchronous two-way video conferencing (54.0%). Following that the next most frequently used technologies were e-mail (42.1%), self-instructional computer-based tutorials (38.2%), and postal mail (36.1%).

*Provision and Selection of Distance Education Courses*

Administrators were asked to indicate who pays for, provides, selects the providers, and selects the subjects for the distance education courses in their district. As is evident in Table 8, the district most often pays for distance education courses (55.2%). Students or their families were reported to pay frequently as well (42.4%). Regional consortiums were the most frequently reported provider of distance education courses to students (23.3%) followed by the state (15.2%) and the local district (11.9%). However, 58.8% of respondents indicated that some other entity provided the course. In this category of other provider, the most frequently reported was a community college, four-year college, or university ($n = 153$, 45.7%). In terms of course selection, the district most often selects distance education courses either on their own (59.4%) or from an approved provider list (23.0%). Finally, the school personnel most often selecting distance education courses was the high school principal (61.8%) and the superintendent or assistant superintendent (35.1%). The selection of distance education courses by the high school principal was related to the districts' use of distance education, $\chi^2(1, N = 393) = 6.84$, $p < .05$. Specifically, districts that stopped using distance education less frequently indicated that the high school principal selected those courses (48.4%, Fisher's exact probability < .05).

## Discussion

This survey was conducted to examine distance education use in a national sample of rural high schools. The findings not only present a detailed picture of distance education use in rural schools, but also reveal some

Table 8

*Provision and Selection of Distance Education Courses by Usage*

| | Total | Use of Distance Education | | | $\chi^2$ |
|---|---|---|---|---|---|
| | | Never used | Stopped using | Currently using | |
| Who pays for course | | | | | |
| District | 185 (55.2) | - | 32 (51.6) | 153 (56.0) | 0.40 |
| Student | 142 (42.4) | - | 21 (33.9) | 121 (44.3) | 2.26 |
| State | 13 (3.9) | - | 2 (3.2) | 11 (4.0) | 0.09 |
| Other | 37 (11.0) | - | 9 (14.5) | 28 (10.3) | 0.93 |
| Who provides course | | | | | |
| Regional consortium | 78 (23.3) | - | 13 (21.0) | 65 (23.8) | 0.23 |
| State | 51 (15.2) | - | 8 (12.9) | 43 (15.8) | 0.32 |
| Local district | 40 (11.9) | - | 5 (8.1) | 35 (12.8) | 1.09 |
| Private | 21 (6.3) | - | 3 (4.8) | 18 (6.6) | 0.27 |
| Public out-of-state virtual high school | 17 (5.1) | - | 3 (4.8) | 14 (5.1) | 0.01 |
| Private out-of-state virtual high school | 10 (3.0) | - | 1 (1.6) | 9 (3.3) | 0.50 |
| Other | 197 (58.8) | - | 30 (48.4) | 167 (61.2) | 3.41 |
| Who selects provider | | | | | |
| District selects | 199 (59.4) | - | 33 (53.2) | 166 (60.8) | 1.20 |
| District selects from approved provider list | 77 (23.0) | - | 14 (22.6) | 63 (23.1) | 0.01 |
| Externally selected | 50 (14.9) | - | 11 (17.7) | 39 (14.3) | 0.48 |
| Who selects courses | | | | | |
| High school principal | 243 (61.8) | 41 (70.7) | 30 (48.4) | 172 (63.0) | 6.84* |
| Superintendent/assistant superintendent | 138 (35.1) | 27 (46.6) | 22 (35.5) | 89 (32.6) | 4.09 |
| Guidance counselor | 131 (33.3) | 14 (24.1) | 19 (30.6) | 98 (35.9) | 3.22 |
| Teacher | 40 (10.2) | 10 (17.2) | 4 (6.5) | 26 (9.5) | 4.24 |
| School board | 39 (9.9) | 8 (13.8) | 8 (12.9) | 23 (8.4) | 2.27 |
| Other | 104 (26.5) | 14 (24.1) | 19 (30.6) | 71 (26.0) | 0.75 |

*Note*. Values are observed count and proportion in parentheses. Empty cells are items not asked.
$^{*}$ $p < .05$. $^{**}$ $p < .01$. $^{***}$ $p < .001$.

important areas for further research. A large majority of rural school districts (69%) were already using some form of distance education, and a substantial portion (85%) had used distance education in the past. These data concerning distance education use in rural schools contrast somewhat with those reported by Setzer & Lewis (2005) for distance education use in rural schools. They reported that 46% of all rural public school districts used distance education. Their data were collected two years prior to the data in the current study. Given the steep growth in distance education use in recent years, this may account for the finding of greater use in the present study. Another factor that may account for the greater use found in the present study was that it collected data from rural schools eligible for REAP, and these schools may be more likely to need distance education because of greater isolation and teacher shortages than in other rural schools.

A substantial majority of rural schools reported a need for distance education to be able to offer advanced/enrichment courses. This is consistent with the literature that documents problems recruiting and retaining teachers in rural schools, especially teachers able to teach advanced

courses (Monk, 2007). Many have suggested distance education as a way for rural schools to be able to offer these courses (Barbour & Mulcahy, 2006). These suggestions seem to have been heeded. Overall the rural schools indicated considerable satisfaction with distance education. This satisfaction likely contributed to the growth in distance education use in rural schools and the high proportion of these schools currently using distance education. This satisfaction may reflect the administrators' belief in or knowledge of distance education's effectiveness in terms of producing learning outcomes. However, it may only reflect their level of satisfaction as a result of being able to offer a course they otherwise could not offer because they did not have a teacher available for this course.

When rural schools stopped using distance education to offer a course or courses, it was often the result of the demand for that specific course, not their opinions about the effectiveness or appropriateness of distance education. However, districts that had stopped using distance education also indicated they were more often "somewhat dissatisfied" by distance education. Lack of interest and participation by students was given as the reason to discontinue using distance education twice as frequently as the next most common reasons, which were scheduling issues and lack of support personnel. While the data in the current study did not associate the reasons for discontinuing distance education with the specific technologies used, it is likely that scheduling issues arose for those schools that used synchronous technologies for distance education and participated in courses offered to more than one school or district. Others have reported scheduling to be an issue in synchronous online courses (Park & Bonk, 2007). In the case of a synchronous course, all the schools participating in the distance education course must be on the identical schedule for that course. This poses scheduling difficulties when schools have different starting and ending times for their classes, and they want to be in the same synchronous distance education class.

Future studies of distance education can be informed by the topic of barriers to distance education use among schools that do not currently use distance education. Distance education has the potential to provide rural schools with access to qualified instructors and expanded course offerings, so it is particularly important to understand what barriers exist that prevent some rural schools from implementing any form of distance education. This study indicated that schools that have not used distance education report not doing so for reasons that could be considered "start-up barriers." These are problems associated with starting a distance education program, but problems that would need to be resolved only once. Examples of start-up barriers include lacking technology enhanced classrooms, lacking trained personnel, and distance education being viewed as difficult to implement. Further research is needed to understand how to best overcome these types of start-up barriers in order to expand the use of distance education among rural schools. Administrators in rural high schools using distance education identified several common barriers including lack of funding, problems scheduling courses, not a district priority and not needed in order to meet curriculum requirements. Administrators did report some barriers associated with personnel, but these barriers posed fewer challenges than those associated with district or logistical issues. They rarely reported barriers associated with technology or infrastructure. The barriers found in this study are similar to some of those reported by Berge and Muilenburg (2003) as well as by Muilenburg and Berge (2005). However, technical or academic issues posed fewer challenges to distance education use in the present study.

The most common subjects taught by distance education were foreign language, mathematics, English, psychology and/or sociology, and U.S. history in that order. Since both mathematics and English are core courses, it is not surprising these are among the most commonly offered distance education courses. While science is also a core course, it is possible some districts do not offer science by distance education due to the difficulty of including a lab component. History might be offered less by distance education as a result of state specific curriculum requirements. Psychology and sociology courses are typically electives, and therefore it is expected that these courses would not be offered as much as other courses whether face-to-face or by distance education. Foreign language via distance education seems particularly appropriate for rural schools, since many rural schools have difficulty attracting and retaining foreign language teachers. The type of technology used to provide a foreign language course likely impacts student success, since learning spoken foreign language requires audio capabilities. This would generally eliminate e-mail and correspondence courses as desirable choices. One-way videoconferencing, cable TV, and satellite courses allow students to hear spoken foreign language but not to interact verbally with their instructor. Two-way videoconferencing and web-based courses, if they use voice over Internet protocol (VoIP), could allow students to interact verbally with their instructor.

Subsequent research should explore any possible selection bias that may be operating in distance education in rural high schools. It is possible that the students selected for distance education courses are not broadly representative of all students but perhaps are the better-prepared students. The present study found that administrators rated the preparation of the students taking distance education courses as high in terms of academic backgrounds, study skills, and computer skills was rated so highly because the students selected to participate in distance education courses are the better students, not a representative group of students. If so, this

would raise questions of equity in educational opportunity brought about by access to a more comprehensive curriculum for some via distance education. However, issues surrounding the access of distance education for all students are complex in several respects and argue against a possible selection bias.

Administrators in 81% of SRSA and RLIS districts indicated that they need distance education to offer advanced or enrichment courses. This suggests that rural districts may not be using distance education to provide regular courses for all students or courses that all students would be prepared for or interested in taking. As such, the students taking distance education courses may be inherently a different and select group (i.e., those prepared for and interested in taking advanced or enrichment courses). An additional point is that since rural schools are likely using distance education only when necessary to offer a course they otherwise could not offer, they are probably not picking some favored students and assigning them to a course taught by distance education while the remaining students take the same course in a conventional classroom. These rural districts most likely do not have courses taught both through distance education and traditional classroom based instruction.

Issues of access to distance education can also be thought of at the district level. The sample in this study represented rural districts that were eligible to participate in REAP. This program identifies rural districts that likely need distance education to provide advanced courses because of a lack of teachers to teach advanced courses, resource issues and the small number of students in these schools prepared to take advanced courses. Part of the intent of the present study was to identify factors that may prevent or limit rural schools' use of distance education including barriers they encounter, student preparation for distance education, and infrastructure issues. By identifying factors that may limit use of distance education by rural schools that need distance education to offer a comprehensive curriculum, this study may help ensure that rural schools and their students have more access to distance education.

Finally, it is important to note that this study found overwhelmingly positive support for distance education. The vast majority of rural school administrators were satisfied with the district education programs provided by their districts, and they felt that these programs met the needs of their students. Almost all school administrators felt that the students in their school districts were well prepared for their distance education courses in terms of having the necessary academic background, study skills, and technological skills to be successful. Given the potential benefits of distance education to rural students across the country, the findings from this survey should be seen not only as a valuable overview of distance education use in rural environments, but also as indicators of important directions for future research.

*Limitations*

This study is limited by the sample and the participants who completed the telephone survey and supplied data. The results are generalizable to rural schools meeting the definitions in the REAP Program. The results may or may not be the same in urban, suburban, or rural schools other than those identified in the REAP definition. These data were collected at one point in time and thus do not provide information about possible trends. The results may differ in subsequent years. While trained interviewers using a standard protocol conducted the telephone surveys, some of the administrators may have understood some questions in a fashion that differed from how most administrators understood the question. This could have had an impact on their responses. It is possible that some of the data reported by administrators could have been erroneous due to their incomplete knowledge of the circumstances in their schools. As in any self-reported data, some of the results may have been overly optimistic as administrators attempted to place their schools in what they might have perceived as a more favorable light. Caution should also be taken in interpreting these results because it is possible, but not likely, that only students who are performing well in traditional classrooms are given the opportunity to take distance education courses. If most rural students have the background skills needed to learn successfully via distance education, and most rural school administrators feel that students benefit from these programs then expanding distance education in rural schools is clearly important under certain circumstances such as when a school lacks a teacher for a subject or has too few students to constitute a traditional class. This further demonstrates the need to focus on research that can identify barriers to more extensive distance education implementation in rural schools.

*Future Directions*

This study established the extent of distance education usage among rural schools as well as documented the dimensions of usage. Based on the analysis of these data it is reasonable to conclude that distance education has an important role in rural education that will likely expand. Subsequent research should focus on exploring how to enhance the effectiveness of distance education in rural schools. Attention should be placed on questions of effectiveness of distance education in rural schools that extend beyond establishing who uses distance education and their perceptions of its effectiveness. Clearly distance

education is important to rural education as a way to provide a comprehensive curriculum for students and to compensate for some of the issues these schools face. These issues include difficulties recruiting and retaining qualified teachers in some subject areas as well as small numbers of students especially in some courses. The question now should be, "How can we ensure better learning outcomes from distance education courses?" This requires controlled experiments that investigate factors that have the potential to improve the learning outcomes.

Questions regarding the comparative effectiveness of distance education and traditional classrooms seem less relevant for a number of reasons. Considerable research has established that distance education is at least as effective as traditional classroom instruction (Bernard et al., 2004). It is more likely that factors other than mechanisms of delivery are the factors that impact learning. This reaffirms the position taken by Clark (2003) that technology itself adds little to the quality of the learning outcomes. Examining those factors that have been shown to influence learning outcomes in situations other than distance education can be productive when seeking to establish how to improve the learning outcomes in distance education (Hannum, 2007).

From a policy perspective, studies comparing distance education with traditional classroom instruction do not seem relevant. In many rural schools, administrators do not have a choice between the two when seeking to offer many courses. They either do not have a teacher available to teach a specific course they need to offer or they do not have a sufficiently large number of students to constitute a full class for a course. Without a qualified teacher or with only a handful of students, if rural schools are going to be able to offer some courses they will have to use distance education. Thus, the issue to them is how to have a good distance education course—not whether this course may be as good as, worse than, or better than a traditional classroom course. Distance education may be their only option for some courses. This argues for studies that explore how to enhance the effectiveness of distance education courses.

Subsequent research may focus on determining the impact of distance education on a broad range of students, not just the better prepared students. An aspect of this would be to explore ways to prepare students to be successful learners in distance education courses, especially those students who may not have the best academic backgrounds or the best study skills. Other research may focus on how to prepare personnel in local schools to support students who are taking distance education courses to ensure that these students will be successful.

Another area that may warrant additional research is that of exploring further the barriers to distance education in rural schools. The present study identified these barriers from the administrators' perspective. It would be useful to explore ways to reduce these barriers and increase distance education use in schools that have a need for courses taught in this manner. It may be useful to examine the perceptions of both teachers and students in rural schools with regards to barriers to distance education use. While this study documented the use of distance education in rural schools it did so at one point in time. It may be desirable to repeat a similar study at a subsequent time to document trends in distance education usage among rural schools.

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