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Educational Computing in Rural Versus Urban Settings[1]

JON C. MARSHALL[2] AND SUSAN H. BANNON[3]

A survey designed to assess access to, attitudes towards and knowledge about computers was administered to secondary level students and elementary and secondary level educators in rural and urban public schools. In general, differences in computer knowledge between rural and urban respondents were found. The rural respondents did have more positive attitudes toward computers than the urban respondents and they indicated having greater access to computers.

A catch word in education today is *computer.* Computer simulation, computerized scheduling, computer managed testing, pc, pc compatible are all words that are heard in educational circles these days. Many teachers are hurrying to become computer competent; others are shaking in their boots for fear that they are going to be confronted by a "blinking monster." Some administrators have computerized their schools; others keep hoping that the computer is nothing but a fad.

Information and misinformation about computers abounds. In a recent article in *U.S.A. Today* it was asserted that rural students have less microcomputer access than their urban counterparts. This was argued as a natural consequence of the more limited resources available in rural districts compared to urban districts. Is this really true? Are rural students deprived in computer access and computer knowledge? The study reported here was designed to shed light on this question.

ATTITUDES AND KNOWLEDGE

As recently as 1982, it was reported that few empirical studies on attitudes toward computers could be found in the literature [8]. Today, the bank of information on computer attitudes seems to be rapidly increasing. In general, teachers, students, parents and others have been found to have positive attitudes toward computers [1; 5; 7; 8; 9; 10]. Parents' attitudes toward their children using computers in school have been found to be positively related to income, negatively related to education level of parents, and unrelated to children's access to computers in the home [5]. Baker [2] reported that attitudes toward computers were not related to sex, age or job level relationships among cooperative extension workers, but that these attitudes were related to perceptions of math ability. Among college students, Griswold [4] reported that age was the best predictor of attitudes toward computers, followed by major.

Students have responded enthusiastically to the introduction of computers into the classroom [2; 7; 9]. The evidence indicates that teachers are generally positive toward computers, but this seems to be a function of the distance of computers from their classrooms [11]. The attitudes of teachers toward computers seems to be fairly constant, while their knowledge has been increasing [12].

The research reported has represented numerous populations, some urban or suburban and others small town or rural. Positive attitudes have been reported for the various populations. With differing instrumentation from study to study there has been no basis for comparison between the urban and rural communities. The common mythology seems to be that students in urban schools are advantaged in comparison to rural students in computer resources, affecting computer access, attitudes, and knowledge.

PURPOSE

The purpose of this study was to examine this assumption of disparate computer access, attitudes and knowledge between rural and urban students and educators.

METHODOLOGY

The procedure was to administer the Computer Survey to 262 rural and 2065 urban students in grades 7-12 and 37 rural educators and 665 urban educators representing grades K-12. The sample was drawn from a western and two midwestern states. The differences in sample sizes reflect differences in the relative populations of the districts sampled. The urban sample was drawn from schools throughout a large midwestern metropolitan area having a population of over 2 million. The rural sample

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[2]Jon Marshall is an associate professor of educational research methods at North Carolina State University. He obtained his Ed.D. from the University of Kansas in educatinal measurement and evaluation. His address is: Jon C. Marshall, Educational Leadership and Program Evaluation Department, Box 7801, North Carolina State University, Raleigh, NC 27695-7801.

[3]Susan Bannon is an assistant professor of educational media and assistant director of the Learning Resource Center at Auburn University. She obtained her Ed.D. from Louisiana State University in educational media. Her address is Susan H. Bannon, Learning Resource Center, 3402 Haley Center, Auburn University, Auburn, AL 36831.

was drawn from midwestern and western school districts serving towns of under 20,000 people and farm communities. Thirty-seven percent of the students were from grade 7 to 9 and 63% were from grades 10 to 12; for the educators, the sample was 78% classroom teachers and 22% administrators or supervisors.

Computer Survey

The "Survey of Computer Attitudes and Knowledge" was designed by the authors to obtain information from students and educators pertaining to computer access, computer attitudes and computer knowledge. The first section of the instrument contained 18 attitude items reflecting both cognitive and affective attitudes. Fourteen of the items formed two 7-item computer attitude scales [3]. Sample items are as follows:

1. Cognitive Attitudes
   Computers can improve learning of higher-order skills.
   Computers are a tool, just like a hammer or lathe.
2. Affective Attitudes
   Computers are beyond the understanding of the typical person.
   Computers will displace teachers.

The items were scored using a five-point Likert-type scale ranging from 0 for strongly agree to 4 for strongly disagree. The scale alpha-reliabilities were 0.93 and 0.90, respectively.

The knowledge section of the survey consisted of 15 multiple-choice items designed to assess basic computer awareness, advanced awareness, and advanced skills. There were five items at each level. Sample items are as follows:

1. Awareness
   What is a program called that is read into a computer?
   A. Software
   B. Firmware
   C. Proware
   D. Basicware
   E. Hardware
2. Advanced Awareness
   What is a printer?
   A. External Memory
   B. I/O Device
   C. CPU
   D. Interleaver
   E. Connected Transporter
3. Advanced
   An operand is an:
   A. operation to be performed.
   B. input value.
   C. address
   D. output value.
   E. instruction.

The items were pretested on non-computer science students at the university level. The alpha-coefficient reliability for the 15 item test was 0.87.

Additional items surveyed respondent demographics and computer access.

Administration

The surveys were administered at the school sites by school personnel. Students were administered the survey in classrooms by teachers selected by school administrators. All types of classes were used. The educators were asked to complete the survey on their own time and return it for forwarding to the researchers. Responses to the survey were coded on NCS general purpose answer sheets for processing.

Analyses

Four sets of analyses were run. The first set used chi-square to determine the relation between computer access items and rural-urban classification. Three-way analyses of variance were used to determine the significance of differences between group means for cognitive computer attitudes, affective computer attitudes, and computer knowledge. The classification variables were sex, location [rural-urban], and group [student-educator]. Tukey's Honestly Significant Difference test was used for all post hoc comparisons following significant omnibus *F*-tests.

RESULTS

Computer Access

Computer access was assessed for both students and educators. The teachers were asked whether or not students had daily time on a computer in the classroom; all the respondents were asked whether or not they had a computer at home. The chi-square test of independence was used to test the relation between each of these items and the rural-urban location respondents. The results are presented in Table 1.

It can be noted from Table 1 that there was a significant relation between computer access in the classroom and rural-urban classification. Twice the proportion of rural [42%] as urban [20%] teachers indicated that their students had daily time on computers in the classroom. Similarly, a significantly greater proportion of rural students [60%] than urban students [49%] said they had a home computer. There was no relation between rural-urban classification and the proportion of educators who had home computers. Nearly two-thirds of the educators indicated that they had some type of computer at home. It should be noted that these home computers included both the "personal-type" hardware and the "game" machines.

Computer Attitudes

Computer attitudes were analyzed using two three-way factorial designs. The independent variables were sex,

TABLE 1

Analysis of Computer Access

Variable	Group	Chi-Square	% Rural	% Urban
Students have time on computer in the classroom	Yes	8.21**	41.94	20.19
	No		58.06	79.81
	N Teachers		(31)31	(515)
Students who have home computers	Yes	12.00**	59.77	48.51
	No		40.23	51.49
	N Students		(266)	(2109)
Educators who have home computers	Yes	0.67	59.46	66.03
	No		40.54	33.97
	N Educators		(37)	(686)

*$p<.05$ **$p<.01$

location [rural-urban], and group [students-educators]. The dependent variables were affective and cognitive computer attitudes [3]. Tukey's HSD test was used for all post hoc comparisons following significant omnibus *F*-tests. The results of the factorial analyses are presented in Table 2 and the means are provided in Table 3.

Affective Computer Attitudes. Significant differences for affective attitudes were found for the main effects of location and group, and for the sex by group interaction. The overall mean was 16.98 out of 28 points reflecting a positive affective attitude. Examination of the subgroup means reveals that the rural respondents had significantly more positive affective computer attitudes than the urban respondents. The educators were significantly more positive than the students. Analysis of the interaction indicated no significant differences in simple effects. The significant interaction *F* likely reflected the pattern reversal that female students demonstrated the *lowest* attitude level while the female educators demonstrated the *highest* attitude level. Attitudes of the male students and educators were between their female cohorts.

Cognitive Computer Attitudes. Significant differences in cognitive attitudes were found by location and group. On this scale a high score reflected a negative attitude, thus the lower the score, the more positive the attitude. The overall mean of 8.13 out of 28 points reflected a positive overall cognitive attitude. For the subgroup differences, the urban respondents demonstrated more positive attitudes than the rural respondents and the educators had more positive attitudes than the students.

Computer Knowledge

The same design was used for analyzing computer knowledge that was used to analyze the attitude scores. The independent variables were sex, location, and group; the dependent variable was computer knowledge. The results of the factorial analysis are presented in Table 4 and the means are provided in Table 5.

Significant differences in computer knowledge were found by sex and group, and for sex by group and location by group interactions. The overall mean knowledge score was 5.58 which reflected achievement at the top of the basic awareness level. The mean achievement level was higher for males than females and for educators than for students. There was not a significant difference between male and female educators, but male students obtained a significantly higher mean knowledge level than did female students. Between educators, the rural respondents obtained significantly higher mean scores than did the urban respondents. The highest scores were obtained by the rural educators with the mean of 7.73, reflecting the middle of the advanced awareness level.

CONCLUSIONS

This study indicates that the majority of educators and students have access to microcomputers at home and about one-fourth of the students have daily access in the classroom. Interestingly, the rural students had greater

TABLE 2

Analyses of Affective and Cognitive Computer Attitudes

Dependent Variable	Source of Variance	*SS*	*df*	*F*
Affective Computer Attitudes	Sex	13.27	1	0.83
	Location	125.05	1	7.79**
	Group	4553.33	1	283.76**
	S by L	8.99	1	0.56
	S by G	113.15	1	7.05**
	L by G	46.98	1	2.93
	S by L by G	8.27	1	0.47
	Within	47625.75	2968	
Cognitive Computer Attitudes	Sex	19.38	1	1.51
	Location	52.08	1	4.06*
	Group	3556.71	1	277.01**
	S by L	1.24	1	0.10
	S by G	18.25	1	1.42
	L by G	11.62	1	0.91
	S by L by G	23.37	1	1.82
	Within	38210.37	2976	

TABLE 3

Means for Affective and Cognitive Computer Attitudes

Dependent Variable	Independent Variable 1	Independent Variable 2	N	Mean	Sig*
Affective	Overall		2976	16.98	
	Location				
	Rural		291	17.60	A
	Urban		2685	16.91	B
	Group				
	Students		2283	16.32	A
	Educators		693	19.16	B
	Sex	Group			
	Female	Students	1268	16.04	A
		Educators	471	19.28	B
	Male	Students	1015	16.65	A
		Educators	222	18.90	B
Cognitive	Overall		2984	8.13	
	Location				
	Rural		292	8.53	A
	Urban		2696	8.09	B
	Group				
	Students		2286	8.74	A
	Educators		698	6.14	B

*Effects analyzed using Tukey's HSD test [$p<.05$]; means with the same letter are not significantly different.

access than the urban students. This finding is contrary to the commonly accepted myth that rural students are "computer deprived" compared to urban students. It is doubtful that this reflects more resources available in the rural districts. More likely it indicates priority differences in resource utilization between schools. Interestingly, the computer offers an outreach capability similar to that offered by television and other technological innovations. The fact that instruction can be individualized with computers enables the microcomputer to be rich in educational potential. Of importance here is that the potential of the microcomputer can be realized in the most remote

TABLE 4

Analysis of Computer Knowledge

Source of Variance	*SS*	*df*	*F*
Sex	289.93	1	41.47**
Location	22.93	1	3.28
Group	1210.95	1	173.21**
Sex by Location	6.34	1	0.91
Sex by Group	47.14	1	6.74**
Location by Group	33.23	1	4.75*
Sex by Location by Group	1.33	1	0.19
Within	21120.62	3021	

*$p<.05$
**$p<.01$

TABLE 5

Means for Computer Knowledge

Variable 1	Variable 2	Number	Mean	Sig*
Overall		3029	5.58	
Sex				
Female		1766	5.32	A
Male		1263	5.94	B
Group				
Students		2327	5.25	A
Educators		702	6.66	B
Sex	Group			
Female	Students	1290	4.85	A
	Educators	476	6.58	BC
Male	Students	1037	5.75	B
	Educators	226	6.84	C
Location	Group			
Urban	Students	2065	5.23	A
	Educators	665	6.60	B
Rural	Students	262	5.40	A
	Educators	37	7.73	C

*Effects analyzed using Tukey's HSD test [$p<.05$]; means with the same letter are not significantly different.

areas as well as more populated ones. Actually, some of the greatest educational benefits of the microcomputer may be in the communicative power it can bring to isolated areas. The point is that this greater access of computers in the rural [as compared to urban] classroom may reflect a realization of its potential in rural education.

Educators and students in both rural and urban areas hold positive attitudes toward computers. The finding that educators are more positive and knowledgeable about computers than students seems to contradict the general perception that it is the youth that are in the forefront of the microcomputer movement.

No major sex differences were apparent in computer attitudes. But, males had higher computer knowledge scores than females. This finding suggests that the sex equity concerns commonly expressed may be appropriate. This difference may reflect, in part, the typical placement of computer instruction in secondary school mathematics departments. These departments usually have fewer female than male students which could result in fewer female than male students taking computer courses.

The rural versus urban results were particularly interesting. In most analyses, there were either no differences or the differences favored the rural respondents. The rural respondents had more positive affective computer attitudes than the urban respondents, and the rural educators demonstrated a higher computer knowledge level than the urban educators. The greater computer access of rural students has already been discussed. Of importance here is that rural educators and, thus, rural students, are at least equal to their urban counterparts in computer attitudes and knowledge. In terms of knowledge, the rural educators surveyed here appear to be at an advanced awareness level while the urban educators are closer to a basic awareness level. The computer knowledge levels of both rural and urban students are at the basic awareness level.

REFERENCES

1. Ahl, D.H. Survey of public attitudes toward computers in society. In D.H. Ahl (Ed.), *The Best of Creative Computing* (Vol. 1). Morristown, NJ: Creative Computing Press, 1976.

2. Baker, J.W. Attitudes of Maine cooperative extension service personnel towards computerization. *Research in Rural Education,* 1985, *2,* 159-162.

3. Bannon, S.H., Marshall, J.C., & Fluegal, S. Cognitive and affective computer attitude scales: A validity study. *Educational and Psychological Measurement,* 1985, 679-681.

4. Griswold, P.A. Differences between education and business majors in their attitudes about computers. *AEDS Journal,* 1982, *18,* 131-138.

5. Healy, P., & Schilmoeller, G.L. Parent attitudes toward computer use by young children. *Research in Rural Education,* 1985, *2,* 135-140.

6. Lawton, J., & Gerschner, V.T. A review of the literature on attitudes toward computers and computerized instruction. *Journal of Research and Development in Education,* 1982, *16,* 50-55.

7. Lichtman, D. Survey of educators' attitudes toward computers. *Creative Computing,* 1979, *5,* 48-50.

8. Loyd, B.H., & Gressard, C. The effects of sex, age and computer experience on computer attitudes. *AEDS Journal,* 1984, *18,* 67-77.

9. Marshall, J.C., & Bannon, S.H. Computer attitudes of students and teachers. *AEDS Journal,* in press.

10. Marshall, J.C., & Bannon, S.H. Computer attitudes and knowledge in rural settings. *Research in Rural Education,* 1985, *2,* 155-158.

11. Norris, C.M., & Lumsden, B. Functional distance and the attitudes of educators toward computers. *T.H.E. Technological Horizons in Educational Journal,* 1984, *11,* 129-132.

12. Stevens, D.J. Educators' perceptions of computers in education: 1979 and 1981. *AEDS Journal,* 1982, *16,* 1-15.

13. Williams, F., Coulombe, J., & Lievrouw, L. Children's attitudes toward small computers: A preliminary study. *Educational Communications and Technology,* 1983, *31,* 3-7.