Editor's Note: North Carolina Libraries *presents this feature in recognition of the increase in excellent unsolicited manuscripts that merit publication, but are not necessarily related to each issue's specific theme.*

Technology Use in North Carolina Public Schools:

The School Library Media Specialist Plays a Major Role

by *Carol Truett*

Editor's Note: The original research study referred to in this article was published in the May 1994 *Reference Librarian,* "New Technologies in Reference Services for School Libraries: How Their Use Has Changed the Teaching of Library and Research Skills in North Carolina," by Dr. Truett. That study focused upon school media specialists, the following one upon classroom teachers, and the update at the end of the article on both media specialists and teachers.

Rationale, Purposes, and Research Design of the Study

A major purpose of this research study is to build upon earlier research findings by including teachers and students, in addition to librarians, in a comprehensive survey of the use of new technology in North Carolina schools, and to examine its effectiveness on student achievement. The researchers were particularly interested in the role that the school library media specialist plays in providing technology in the media center, and in staff development and student instruction in use of technology. They were also interested in confirming whether or not teachers saw the technology as changing the role of the library media specialist in their schools.

Critical questions the researchers felt it important to ask included the following: 1) Are school districts in North Carolina actually providing the necessary access to technology required for both teachers and students to become computer literate? 2) Are sufficient and appropriate professional development opportunities provided ? Who is conducting professional development and is the school media specialist involved? 3) How adequate is the planning and budgeting for new technologies, especially in terms of allocation and coordination of technology resources? 4) In what ways and to what extent are computer skills integrated into instruction across the curriculum and, in particular, related to library information skills? 5) How are teachers in the content areas incorporating computer skills, databases, and information sources such as CD-ROM and laserdiscs into learning experiences? 6) To what extent are teachers and students using these technologies? How does teacher and student use compare? 7) And, finally what effect is all this technology having on student learning? How do teachers and students evaluate the effectiveness of these expensive and often very complex new learning tools? Are the new technologies really worth the enormously high expenditures in money, time, and training? This report will discuss those questions related directly to the role of the school library media specialist *vis a vis* technology in the schools of North Carolina.

The research was conducted in two parts. Part One consisted of a one-page mail survey sent to 500 randomly selected North Carolina public schools. The major purpose of this initial mailing was to identify a sampling of schools which actually have technology in place, and to ascertain if those schools have a library media specialist and/or a computer education teacher. Part Two was a follow-up to Part One. It provided an in-depth, on-site survey of both teachers and students in twenty-four schools randomly selected from respondents to the initial survey and identified as "high technology" because of the availability of a wide range of technologies.

Results of Part I:

Identifying High Technology Schools

Two hundred and twenty-one responses were received from the original mail survey, resulting in a return rate of 44.2%. Of this group, 215 schools (97.7%) had a library media specialist, but only 80 (36.2%) had a computer teacher. The librarian was almost universally (98.6%) a full-time employee in these schools, but only a little over a third (39.7%) of the schools with a computer teacher received services full-time from this person.

Schools responding to the original survey were categorized into high and low technology schools; a school had to have at least five of the tech-

Table 1 Part One Respondents Categorized into High Versus Low Technology Schools		
Technology Level	Frequency	Percent
Low Tech	152	68.8
High Tech	69	31.2
Total	221	100.0

nologies to be considered high tech. Table 1 summarizes the data regarding high versus low technology schools. Using this categorization, over two-thirds of the respondents were considered low technology and less than a third were "high tech."

Only schools considered "high technology" during the initial survey were included in Part Two of the study. From each of 24 randomly selected schools, one intact group of students in either English, social studies, science, or any other traditional "academic" curriculum course (but *not* a computer education class) was surveyed along with a companion or corresponding group of 20-25 teachers.

Results of Part Two:

High Technoloy Presence, Low Integration and Use

The responses from the second part of the technology survey consisted of a total of 852 usable surveys, including 494 student and 358 teacher respondents. Two hundred ninety were from elementary schools, 326 from middle level schools, and 234 from secondary schools; 472 were from urban schools and 373 from rural schools. There was an average or mean number of 35.5 respondents per school. Faculty respondents included 309 (93.4%) who were classroom teachers, 16 (4.8%) media specialists, and 6 (1.8%) who were computer teachers.

Table 2 indicates which technology was reported to be in the schools by teachers and students, respectively. The presence of computers, VCRs, and CD-ROM was almost universal in these schools, and videodisc technology was quite common. Given this prevalence, it is surprising that two-thirds of the teachers reported never or infrequently using CD-ROM, and over four -fifths of them said they never or infrequently used videodisc technology. Students also reported a very low use of these technologies. Fifty-eight percent of students never or infrequently used CD-ROM and almost 85 percent of them reported likewise for use of videodisc technology.

Table 3 shows the reported use of technology with certain types of classes or student groups. Fully two-thirds (66.0%) said it was used in all classes. Usage varied slightly among intellectual content classes and was lowest in physical activity classes.

Twenty indicators, drawn from the research literature, were used to ascertain how teachers incorporated technology into instruction. Table 4 lists the indicators in rank order beginning with the most frequently cited. Teachers were encouraged to mark as many indicators as were appropriate for their instructional situation and an average of almost eight responses per person were given. In general, teacher responses regarding CD-ROM integration tended to be geared toward rather traditional research uses.

Table 5 summarizes responses to how teachers integrated videodisc technology into their instruction. The most frequent use, cited by almost three-fourths (74.8%) of respondents, was to add visual and aural components to presentations. The average number of methods for incorporating videodisc technology into instruction reflects its lesser use in general by teachers. Of the 18 possible methods, respondents used an average of less than six methods, which is less than a third of the possible uses.

Table 6 summarizes the number of minutes per day of technology use reported by teachers and

Table 2
Types of technology present in high tech schools
Teacher and student reports

	Teacher Frequency* and Percent	Student Frequency** and Percent
Have computers	339 (98.3)	481 (98.0)
Have VCR	339 (98.3)	476 (97.1)
Have CD-ROM	324 (92.8)	449 (93.0)
Have videodisc	282 (86.0)	379 (79.8)
Have modem	206 (59.7)	322 (65.6)
Have satellite/ distance learning	122 (35.4)	197 (40.1)
Have hypercard	118 (34.2)	181 (36.9)

*345 faculty respondents reported 1,124 total responses
**491 students reported 1,657 total responses

Table 3
Classes in which technology is used

Technology is used in:	Frequency	% of Responses*	% of Cases
All classes	210	20.1	66.0
Computer technology	146	14.0	45.9
Library media classes	144	13.8	45.3
Academic classes	112	10.7	35.2
Remediation classes	110	10.5	34.6
Average classes	104	10.0	32.7
Accelerated classes	90	8.6	28.3
Identified students	75	7.2	23.6
Fine arts classes	39	3.7	12.3
PE classes	14	1.3	4.4

*318 respondents provided 1,044 total responses
Missing: 42

Table 4
How teachers incorporate CD ROM technology into instruction

	Frequency	% of Responses*	% # of Cases
Look up facts	209	10.9	85.0
Teach research skills	157	8.2	63.8
For personal curiosity or interest	146	7.6	59.3
Encourage students to explore library media resources	146	7.6	59.3
Meet a variety of learning styles	125	6.5	50.8
Help students produce research documents	120	6.2	48.8
Pique student interests	113	5.9	45.9
Integrate instruction	100	5.2	40.7
Develop lifelong learning skills	93	4.8	37.8
Incorporate into group projects	88	4.6	35.8
Provide learning flexibility	86	4.5	35.0
Meet the needs of the citizens of the 21st century	85	4.4	34.6
Add visual and aural components to presentations	85	4.4	34.6
Incorporate into individualized lessons	81	4.2	32.9
Stimulate critical thinking & reasoning	81	4.2	32.9
Use in the form of interactive instruction	65	3.4	26.4
Authentically develop thinking skills such as analyzing, interpreting, and synthesizing	64	3.3	26.0
Use in activity centers	50	2.6	20.3
Construct test items	17	.9	6.9
Redefine homework to include"video work"	12	.6	4.9

*246 respondents reported 1,923 total responses
Mean = 7.8 average methods per respondent

Table 5
How teachers incorporate videodisc technology into instruction

	Frequency	% of Responses*	% # of Cases
Add visual and aural components to presentations	113	12.7	74.8
Meet a variety of learning styles	91	10.3	60.3
Pique student interests	81	9.1	53.6
Integrate instruction	76	8.6	50.3
Provide learning flexibility to learning in the classroom	69	7.8	45.7
Meet the needs of the citizens of the 21st century	63	7.1	41.7
Use in the form of interactive instruction	61	6.9	40.4
Stimulate critical thinking & reasoning	52	5.9	34.4
Incorporate into group projects	42	4.7	27.8
Teach research skills	41	4.6	27.2
Encourage students to explore library media resources	40	4.5	26.5
Incorporate into individualized lessons	39	4.4	25.8
Authentically develop thinking skills such as analyzing, interpreting, and synthesizing	39	4.4	25.8
Use in activity centers	33	3.2	18.5
Help students produce research documents	21	2.4	13.9
Make hypertext presentations	15	1.7	9.9
Construct test items	8	.9	5.3
Redefine homework to include "video work"	8	.9	5.3

*151 respondents provided 887 responses. **Missing 209
Mean = 5.9 average methods per respondent

shows that two-thirds of them used technology 30 or less minutes a day in instruction. Almost 20 percent reported using it from one-half to an hour a day. Given the high use of technology in today's work and leisure world, education appears to once again fall behind expectations. Teachers do not appear to be modeling in their classroom the technology skills and concepts students need to have to be successful in the world of the 21st century.

Table 6 Minutes Per Day of Technology Use by Teachers			
Minutes	Frequency	%	Cumulative %
0	52	18.2	18.2
1-10	31	10.7	28.9
15-20	35	12.1	41.0
21-30	69	24.9	65.9
31-60	56	19.3	85.2
61-120	24	8.3	93.5
2+ hrs.	19	6.3	98.8
Total	286		
Missing	74		

School Library Media Specialists Are Major Technology Instructors for Teachers and Students

Numerous questions addressed the issue of staff development, who was delivering it, and the extent and quality of the instruction provided. Table 7 summarizes teacher responses to the survey question, "Who taught you to use CD-ROM and videodisc technology?" It is apparent that library media specialists are the major providers of this technology training in their schools. About half of both teachers and students said their librarian taught them (tables 7 and 8). But many are obviously floundering around on their own, as 41.1% of teachers and 28.9% of students report they are self-taught. Teachers, not surprisingly, picked up the training slack for students; however, only about a fourth of teachers taught other teachers. Other trainers included outside consultants, technology specialists, district personnel, library classroom assistants, and students.

Table 9 indicates the nature of the staff development delivered. The most popular methods of staff development appeared to be on-site demonstrations, hands-on experience,

Table 7 Who taught teachers CD-ROM and videodisc technology		
	Frequency*	Percent
Librarian	156	53.4
Self-taught	120	41.1
Teacher (another)	75	25.7
Outside consultant/ workshop instructor	67	22.9
Technology specialist	63	21.6
Student	18	6.2
Library/classroom aide	14	4.8
District personnel	33	9.6
*297 respondents reported 541 total responses Missing: 68		

Table 8 Who taught students CD-ROM or videodisc technology			
	Frequency	Percent	Missing
Librarian	229	50.3	39
Teacher	199	43.6	38
Self-taught	32	28.9	38
Another student	42	9.2	38
Teacher's asst.	25	5.5	38

Table 9 Staff development methods			
	Frequency*	% of Responses	% of Cases
On-site demonstrations	213	16.0	78.6
Hands-on experience	207	15.6	76.4
How to operate programs	187	14.0	69.0
Play time with the technology	151	11.3	55.7
Periodic training and updating	138	10.4	50.9
Equipment set up	110	8.3	40.6
How to integrate technology materials into the curriculum	104	7.8	38.4
How to search CD-ROM databases	79	5.9	29.2
Crash course in interactive video	65	4.9	24.0
How to team teach with the library media specialist	57	4.3	21.0
Designing interactive mats. through "repurposing"	20	1.5	7.4
Missing: 89			

and instruction on how to operate programs. Several areas especially appeared to be slighted, including training on videodisc use and CD-ROM database searching. This is unfortunate since database searching is an excellent tool for teaching general search strategies, including Boolean theory, which carries over to online searching. These findings in regard to videodisc and CD-ROM training are consistent with the reported low use of these technologies by teachers despite their prevalence in the schools, and raises the question of whether lack of training in use of these two technologies contributes to their low use. Since they are both actually relatively easy to use, why is this training not taking place?

Unfortunately, although library media specialists play a major role in teaching technology to both teachers and students, team teaching with the library media specialist was reported to occur in only a fifth of staff development experiences. It appears that very limited effort has been given to teaching teachers how to integrate technology into classroom instruction.

Amount of staff development also can be considered an indicator of staff development quality. Table 10 summarizes this data. Almost two-thirds of all responding teachers received no more than one day's technology training, and half received far less than this. Only a little over one-third of respondents received as much as 2 to 3 days of technology training. Keep in mind that this data reflects what is happening in high technology schools.

Role of the School Media Specialist and Technology:

High Expectations Are Held By Teachers

Over half the teachers responding stated that the school library media specialist is a key figure in training teachers to use both CD-ROM and video-disc technology. Tables 11 and 12 indicate the role that teachers reported the media specialist plays in helping teachers use CD-ROM and laserdisc technology in instruction, and how the concept of the library media specialist has changed as a result of technology. We concluded that teachers held high expectations for their school library media specialist in terms of technology, and looked to the latter to play a leadership role in both implementation and training. Their expectations appeared lower, however, in regard to technology curriculum integration and team teaching with the librarian.

Most teachers apparently felt the concept of the library media specialist *had* changed as a result of technology; only 12% said it had not changed. The major ways in which the teachers felt the concept of the SMLS had changed were: guide for faculty in technology use, guide for student learning, supervisor of technology stations, and technical advisor of special student projects. This is consistent with the findings in Table 11. There was an increasing awareness of the

Table 10 Length of staff development			
	Frequency	%	Cum. %
No in-service	46	17.8	17.8
1-2 hours	50	19.4	37.2
1/2 days	32	12.4	49.6
I day	33	12.8	62.4
2-3 days	97	37.6	100.0
Total	258		
Missing: 102			

Table 11
Role played by school media specialist in helping teachers use CD-ROM and laserdisc technology in instruction

Library media specialist:	Frequency	% of Responses*	% of Cases
Shows individuals how to use technology in the library	236	23.6	86.8
Provides technology in library for teacher use and checkout	218	21.8	80.1
Provides technology in library for student use	208	20.8	76.5
Provides teacher in service	140	14.0	51.5
Models curriculum use	104	10.4	38.2
Team teaches their use with subject/grade level teachers	94	9.4	34.6

*272 respondents provided 1,000 total responses
Missing: 88

Table 12
How concept of library media specialist has changed as a result of technology

	Frequency	% of Responses*	% of Cases
Guide for faculty in technology use	210	27.9	73.9
Guide for student learning	152	20.2	53.5
Supervisor of technology stations	144	19.1	50.7
Technical advisor of special student projects	129	17.2	45.4
Guide for community understanding in use of technology	57	7.6	20.1
Concept of SLMS has *not* changed	34	4.5	12.0
Active in remediation or makeup learning	26	3.5	9.2

*284 respondents provided 752 total responses
Missing: 76

importance of librarians guiding teachers in the use of technology. Apparently teachers felt the new technologies had a definite place in the school media center, and that the specialist should teach, promote, and assist in its use. It seems evident that school library media specialists have incorporated technology into their collections and centers and sold their constituencies on the appropriateness of this role.

Table 13 bears out the conclusion that school libraries are playing a major role in technology implementation and integration, as library skills are the fourth ranked subject in which teachers use CD-ROM technology, exceeded only by social studies, science, and English. It ranked *ahead* of computer education.

In terms of subject area uses of CD-ROM reported by students (Table 14), library skills ranked ahead of all subject areas except social studies and science. This same usage pattern appears in regard to videodisc use, as indicated by the student responses summarized in Table 15. Thus, technology appears to be well integrated into the teaching of library information skills.

Table 13
Subjects in which teachers reported using CD-ROM in rank order

	Frequency	% of Responses*	% of Cases
Social Studies	105	21.7	47.7
Science	105	21.7	47.7
English	76	15.7	34.5
Library Skills	48	9.9	21.8
Computer Education	43	8.9	19.5
Other	37	7.6	16.8
Math	29	6.0	13.2
Fine Arts	20	4.1	9.1
Business	12	2.5	5.5
Physical Education	9	1.9	4.1

*220 respondents provided 484 total responses
Missing: 140

Table 14
Use of CD-ROM in content areas — student responses

	Frequency	Percent	Missing
Social Studies	278	61.1	39
Science	256	55.9	36
Library Skills	225	49.1	36
All other subjects	209	45.7	37
English	153	33.4	36
Math	98	21.4	37
Fine Arts	82	17.9	37
Business	60	13.1	36
Physical Education	51	11.2	38

Table 15
Use of videodisc in content areas — student responses

	Frequency	Percent	Missing
Social Studies	185	55.6	161
Science	182	54.5	160
Library Skills	160	36.6	161
English	78	23.4	161
Math	61	18.2	159
Fine Arts	49	14.7	161
Business	35	10.5	160
Physical Education	28	8.4	160

In summary, the following conclusions may be drawn from the findings of this research:

1. School library media specialists are playing a leadership role both in providing technology and in training teachers and students. This may be related to the fact that the position of school library media specialist is much more common in schools than that of computer or technology teacher. Almost 98% have a librarian, but only a little over a third have computer teachers.

2. Teachers almost universally agreed that technology has changed the role of their school library media specialist. Only 12 percent felt there had been *no* such change.

3. While we may identify schools where a lot of technology is available, its presence in no way ensures that it will be used either by teachers or students. Use of CD-ROM and videodisc technologies was reported to be extremely low for both groups. Judging by the amount of time they report using technology each day, teachers' use of technology even in high tech schools is extremely low.

4. Not surprisingly, technology integration into instruction is relatively low. Less than half of the possible CD-ROM integration methods are used by most teachers, and less than a third of the possible methods for videodisc integration generally were used. However, both teachers and students cited library information skills as a major vehicle for teaching technology.

5. Teacher integration of both CD-ROM and videodisc technologies into instruction tended toward traditional uses of technology, such as looking up facts and teaching research skills. Developing authentic skills, such as analyzing, interpreting, and synthesizing; stimulating critical thinking and reasoning; learner interactivity; or encouraging students to make their own hypertext presentations (i.e., the encouragement of active student learning), appears much less common for both technologies.

6. Student awareness of technologies in their schools was generally higher than that of teachers, except for videodiscs.

7. Despite their overwhelming presence in schools, both CD-ROM and videodisc technology have been virtually ignored in terms of instructional integration and in-service training. Thus, it is not enough for a school merely to have tech-nology available in the building. Teachers also must be trained how to incorporate it into instruction.

8. Currently, technology staff development is inadequate in terms of both methods being employed and the quantity of time provided.

Recommendations Based on the Study Conclusions

1. Schools must provide more and better in-service for their teachers for technology to become an integral part of the teaching and learning environment. Methods of integrating the technologies should be a special focus of such training. CD-ROM and videodisc should be particular targets of curriculum integration in staff development because of their overwhelming presence in schools, their relative ease of use, and their current lack of use by teachers and students.

2. Because of their key leadership role in actually providing technology and training others in its use, school library media specialists should be given priority for in-service training outside the school and/or district. The fact that both school library media specialists themselves, as reported in the earlier study by Truett, and teachers report that the role of the school media specialist is changing as a result of technology adds further strength to the argument that these individuals need additional in-service training in technology use.

3. Administrators and other instructional leaders should explore a variety of means for ensuring technology use in their schools. The presence of technology does not mean it is being used, and integration into all curriculum areas needs to be a major focus of staff development and all teacher training in the future.

Technology Study Update 96

In 1996, a shorter, slightly modified version of the North Carolina technology survey was given to several groups of new respondents. These included attendees at a North Carolina Association of School Librarians conference; graduate students at Appalachian State University, including practicing teachers, who in many cases were also Master's in Library Science graduate students; and teachers who worked in the schools where these MLS degree students were employed as school media specialists. There were 49 respondents to the second study and the purposes of this update were twofold: 1) to determine if significant changes had occurred in the intervening period, and 2) to lend validity or credibility to the earlier study findings.

School library media specialists comprised 53.8% of this new group, while 41.7% were teachers. The original study contained only 4.8% media specialists, and less than 2% were computer teachers; the remainder were teachers. An even greater majority of the respondents (70.8%) were from rural schools while 29.2% were from city or suburban schools. A little over half (55.1%) worked in elementary schools, 16.3% in middle, and 26.5% in secondary. One respondent worked in a PreK-12 school. The average or mean student enrollment of their schools was 600, with a median of 526 students.

As Table 1 shows availability of technology improved during the time that elapsed between the two surveys. The availability of modems increased dramatically. While hypercard

software availability increased 10%, it still was not available to the majority of respondents.

Actual technology use was an important question asked in both surveys. Table 2 summarizes responses to the number of minutes the second group reported using technology in a typical day. With a mean or average number of 92 per day, and a median of 60 minutes of use, this group was comprised of much higher technology users than the original study. Over 70% of the current survey group reported using technology *over* half an hour a day, while only 33.4% of the original group, who were mainly teachers, reported using technology this frequently. The second group reported that almost one-fifth of them used technology one to two hours a day and over another fifth used it more than two hours daily. This is in contrast to the earlier survey results where only a *total* of 14.6% reported more than an hour's technology use per day.

Higher use of CD-ROM was also reported by the update group. In fact, their use was almost the reverse of the first group, two-thirds of whom had reported that they never or infrequently used CD-ROM, while over two-thirds of the predominately media specialist update group used CDs weekly or more frequently. Videodisc use for both groups was infrequent; only 7.3% of the earlier group used videodiscs frequently (defined as weekly or more often) while only 12.8% of the update group used videodisc frequently. Thus, even though videodisc might appear to be considered more of a teaching tool than a library resource, it is still used somewhat more by media specialists, although its lack of frequent use is still high considering its prevalence in schools.

Table 2
Minutes of Reported Technology Use Per Day

Minutes	# Reporting	%	Cum. %
0	1	2.1	2.1
10	1	2.1	4.3
15-20	3	6.4	10.7
21-30	9	19.1	29.8
31-60	14	29.7	59.5
61-120	9	19.1	78.6
2+ hrs.	10	21.3	99.9

Mean = 92 mins.   Median = 60 mins.

Table 1
Technology Available — Update Survey

Technology	# of Respondents	% of Respondents	Previous Survey
Computers	49	100.0	98.3
CD-ROM	48	98.0	92.8
Videodiscs	40	81.6	86.0
VCRs	49	100.0	98.3
Hypercard software	22	44.9	34.2
Modems	40	81.6	59.7
Distance learning satellites	15	30.6	35.4

Table 3
Role Played by School's Media Specialist in Helping Teachers Use CD-ROM and Laserdisc Technology as Part of Instruction

Role	Current Study Percent	Rank	Previous Study Percent	Rank
Show individuals how to use technology in the library	81.6	1	86.8	1
Provide technology in library for teacher use and checkout	71.4	2	80.1	2
Provide technology in library for student use	69.4	3	76.5	3
Provide in-service	55.1	4	51.5	4
Model curriculum use	44.9	5	38.2	5
Team-teach their use with subject/grade level teachers	36.7	6	34.6	6

Table 4
How the Concept of Library Media Specialist Has Changed as a Result of Technology

How Changed	Current Study Percent	Rank	Previous Study Percent	Rank
Guide for faculty in technology use	67.3	1	73.9	1
Guide for student learning	55.1	2	53.5	2
Supervisor of technology stations	49.0	3	50.7	3
Technical advisor of special student projects	42.9	4	45.4	4
Guide for community understanding in the use of technology	22.4	5	20.1	5
It hasn't changed	12.2	6	12.0	6
Active in remediation or makeup learning	12.2	6	9.2	7

Integration of technology was another important question in the original study. The incorporation of two particular technologies, CD-ROM and videodisc, was specifically examined in the update survey. In the earlier survey, only five out of a total of 20 possible methods for CD-ROM integration were reported to be used by half or more of respondents. The update group reported much higher CD-ROM incorporation into their teaching, with nine of the possible methods being used by over half of the group. In order of usage ranking, but including only those used by half or more of respondents, the latter group incorporated CD-ROM into instruction in the following percentages: 1) To look up facts (81.6%); 2) To pique student interests (77.6%); 3) To teach research skills (75.5%); 4) To meet a variety of learning styles (69.4%); 5) To encourage students to explore library media resources (67.3%); 6) To integrate instruction (61.2%); 8) To meet the needs of 21st century citizens (55.1%); and, 9) To help students produce research documents (53.1%). This higher integration for CD-ROM is borne out by mean or average number of integration methods used as well: for the more current group, the mean was 9.3 while for the earlier group it was only 7.8 methods, although this still was less than half of the 20 possible methods used by both groups on the average.

Videodisc integration by the mainly media specialist update group was, interestingly, lower than it was for the earlier group despite their reported higher use on a previous survey question. The librarians only used 3 of the 18 possible videodisc integration methods with any frequency, defined as over 40% or more of the time. These top three methods were: 1) To add visual and aural components to presentations (45.8%); 2) To meet a variety of learning styles (43.8%); and 3) To integrate instruction (41.7%). Their mean or average number of methods used was 3.9, with a median of 3. This is in contrast to a mean of 5.9 methods used to integrate videodisc by the earlier group, with 7 methods used by two-fifths or more of respondents. These results would tend to confirm the hypothesis that in general, despite low use overall, videodiscs are used more by teachers than media specialists.

Tables 3 and 4 compare both groups' responses to two significant questions asked on each survey; namely, what role does the school media specialist play in helping teachers use CD-ROM and laserdisc technology as a part of instruction, and how has the concept of library media specialist changed as a result of technology. The amazing, indeed startling, thing about these comparisons is how similar the results were for the majority of items. Indeed, rankings were virtually identical. Note, in particular, in Table 4 that both groups disagreed with the statement that the library media specialist role had not changed, thus *implying that both study groups felt (88% of each) that the role of the school librarian* **had changed** *as a result of technology.* The second group felt their in-service role to be somewhat more important than the teacher group, with showing individuals how to use technology, and providing technology in the library for teacher and student use, all ranking high by two-thirds to over three-fourths of the respondents.

Differences in percentage responses for the SLMS concept changes appear even less noticeable when the figures are shown side by side. It is interesting to note that the more current group, with its higher proportion of librarians, felt guiding faculty in technology use was somewhat less important. It is also somewhat discouraging that both groups ranked modeling curriculum use and team teaching technology use so low.

In terms of staff development, the current group reported less methods used on the average (3.2 versus around 5 methods) with a median of only 3 out of a possible 11 methods

used. Only two methods were reported by at least half of respondents: 1) Hands-on experience (59.2%) and 2) How to operate programs (55.1%) in contrast to 5 reported by the other group.

The second group also reported an *increase* in shorter technology sessions: half-hour sessions increased by 11.1%, half-day sessions by 10%, and one day sessions by 4.5%. On the other hand, two to three day sessions, a preferred time frame for more effective in-service, decreased by 17.2%. However, those reporting no inservice in technology decreased by 11.7%. Once again, librarians were the highest group overall cited as delivering staff development—over two-thirds (69.4%) reported this was who taught them to use CD-ROM and videodisc technology. This was 15% higher than the 53.4% reported by the earlier group. More of the current group also cited they were self-taught—53.1% versus only 41.1% before. An increased percentage of technology specialists (30.6%) and district personnel (22.4%) taught this group than the earlier one. Once again, survey respondents appeared to be unaware of the percentage of their school budget which was spent on technology staff development despite the state mandate to set 20-30% of each technology budget aside for this purpose. Eighty-seven and a half percent said they *did not know* this figure; only four respondents said they knew (or at least they gave a percentage), while two reported zero percent.

Finally, it is interesting to compare the two groups' reports on student use of CD-ROM and videodisc technology. The initial group claimed that over half (56.4%) of students used these technologies infrequently or never. Slightly over a third (37.5%) of the second group felt this was still true; however, this group reported frequent use by students (weekly or more often) of these technologies almost twice as often as the earlier group (42.8% versus only 24.2%).

Summary of Update Findings

In conclusion, while a number of technologies would appear to have become more prevalent in North Carolina schools since the 1992 survey (e.g., modems, hypercard software), this has not necessarily resulted in greater use of these technologies if we look at both reported use and integration. While we see CD-ROM integration somewhat higher, media specialists are not integrating videodisc technology as much as teachers in general appear to be. Certainly this group of respondents appears to have a high reported use of technology overall, greater than 1 1/2 hours per day, but this perhaps reflects their changing role in regard to technology, not necessarily use or integration of the two technologies specifically studied.

Results of the earlier, more comprehensive, study largely appear to be confirmed by the results of the update in regard to both the roles and concept of the school library media specialist *vis a vis* technology. In fact, in terms of ranking these roles and concepts, the two studies produced virtually identical results. Overwhelmingly, one could say, teachers and librarians see technology dramatically changing the role of the school librarian.

Short technology sessions appear to be on the increase, as does technology in-service overall. Both faculty use, including that for media specialists, and reported student use of technology appear to have increased noticeably. And, once again, school library media specialists are the major group delivering technology in-service. Thus, in conclusion, while there are certain notable differences in the results of the surveys of the two groups — many of them quite positive in nature — the second study both validated and, in large part, corroborated the results of the original study.