The Status of Technology, Science and Mathematics in U.S. Middle School Media Centers: A National Survey

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In a national survey of U.S middle school library media specialists (SLMS) in 2005, respondents were asked about their roles in schools related to science, mathematics, and technology. Most indicated that they rarely collaborated with science or mathematics teachers and that their knowledge and professional development in these areas was limited. However, those SLMS who took an active role in the technology integration activities at their schools were more successful in the four roles defined in "Information Power": teaching, instructional partner, information specialist, and somewhat less, program administrator.

science and mathematics, middle schools, school technology support

Introduction

With a renewed emphasis on the importance of science and mathematics teaching as a national goal to increase general public science literacy as well as stimulate the future economy by developing scientists for the workforce, schools will be pressed to examine how they are meeting this challenge (Business Higher Education Forum, 2005; National Mathematics Advisory Panel, 2008; National Science Board, 2007). As part of this re-examination, school library media centers (SLMC) will be evaluated with a new focus on improving the role played by this key resource in achieving school goals for science and mathematics literacy.

There are many issues that have already been noted (Montiel-Overall, 2007; O'Neal, 2004). Previous studies have suggested that science collections in SLMC are dated (Mardis & Hoffman, 2007). Many school library media specialists (SLMS) have limited science and mathematics backgrounds and have few opportunities for professional development in these curricular areas. Science and mathematics teachers generally do not regard SLMS as a major source for information on digital resources for teaching (Hoffman, Lee, Mardis, & Falk, 2005). Despite this disconnect, studies have reported links between SLMC and general

student literacy (Lance, 2001) as well as science achievement, particularly in relation to visual, video resources (Gates, 2004; Mardis, 2006). Researchers examining the links between SLMC and science/mathematics teaching have urged SLMS to increase their use of digital libraries as a major part of school library resources and for SLMS to expand their collaborations with mathematics and science teachers (Mardis & Hoffman, 2006).

With this concern in mind, the researchers developed a series of studies under a National Science Foundation grant to examine the relationship between SLMS and science and mathematics teachers. The study was designed to examine the potential for the use of digital resources to support mathematics and science in middle schools. The following paper reports on the results of a survey of school librarian media specialists in the U.S.

Methodology

In spring 2005, surveys were mailed to teachers and media specialists at 150 public middle schools in the United States. Using a cluster sampling strategy, three schools were randomly selected within each state from the list of schools maintained by the U.S Department of Education National Center for Education Statistics (NCES). Following approval from the researcher's institutional review board, surveys were sent to the school media specialist (if there was one), along with a randomly selected seventh grade science teacher and mathematics teacher from each school. Personnel names were available for 70 of the 150 schools, and for these, surveys were addressed to specific individuals. For the remaining schools, a generic envelope to the schools' media specialist and seventh-grade science and mathematics teachers was sent. For the named teachers and media specialists, two follow-up postcards were mailed requesting return of the surveys to increase response rates. Each educator received a one-page, double-sided questionnaire, with a different instrument for the teachers and for the media specialists. The survey was intentionally short to encourage a higher return rate as part of a larger study done under a National Science Foundation (NSF) grant project.

Each SLMS completed a short survey instrument with 30 short-answer and Likert-scale questions. Thirteen of the questions covered demographics and background. Quantitative data from the surveys was entered into SPSS for statistical analysis, while open-ended responses were transcribed and coded for themes following standard qualitative procedures.

In the following report, where statistical significance is noted, it is at the $p < .05$ level.

Results

The respondents were 48 middle school SLMSs (32%), above the typical 25% common return rate on mailed surveys. The respondents represent 30 different states. Of the respondents, 29 were from the 70 schools for which personnel names were available.

Demographics

Of the respondents, 17 identified themselves as Librarian/School Librarian/Teacher Librarian (35.4%), 28 as School Library Media Specialist/Library Media Specialist (58.3%), and 3 as other (Library Aide, Library Media Tech, Media Generalist).

Seven (14.6%) are male, and 41 (85.4%) female. Forty-six (95.8%) indicated they were Caucasian, one Native American and one did not indicate ethnicity. The teachers ages are shown in Figure 1, with two-thirds (66%) in the 50 and over category, and just over 11% under forty, reflecting other studies showing the aging of the profession.

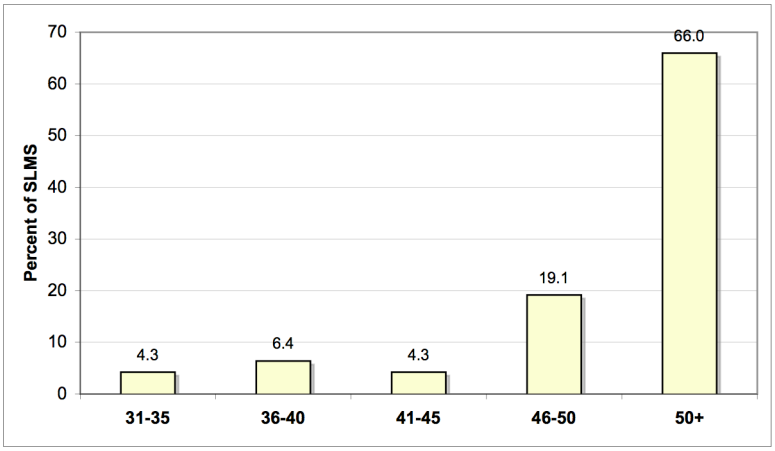

Figure 1. Age of responding SLMS

As suggested by the age ranges, these are generally highly experienced SLMS. They have been educators from three to 33 years, with a mean of 20 years. Figure 2 shows the number of years as SLMS, with 37% having more than 15 years in the field. 77.1% hold Master's degrees, and 43.8% indicated they are certified as teachers in their state. Two who identified their positions as aide or tech held only associate degrees.

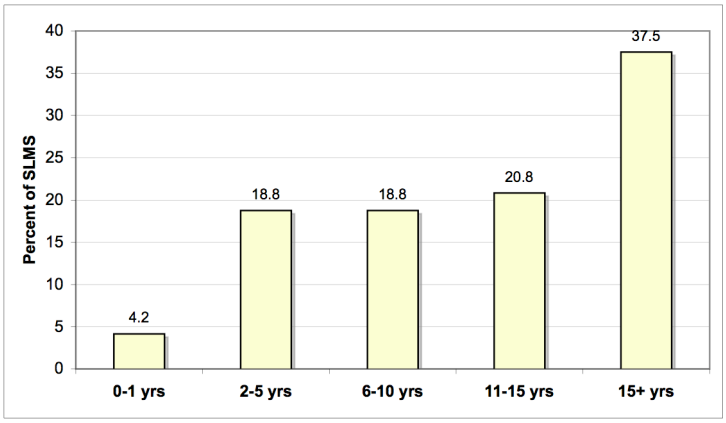

Figure 2. Number of years as SLMS

While all work with middle grade students, five (10.4%) have jobs that include more than a single school building. 81.3% cover all middle grades six through eight. Two teachers work at K-12 schools, two at K-8, and five include high school. While there is demographic variation among the respondents, there were no significant statistical effects based on age, years in the profession, or education levels with the variables in the study.

Technology Environment

With many studies including the larger one of which this is a part suggesting that technology access is a limiting factor in use of digital resources in schools, SLMSs were

asked about their perceptions of the technology environment in their schools. Most SLMS think their school districts are doing better than others districts is their areas in technology deployment, with almost three-quarters (73.3%) agreeing with this statement. Almost as many agreed that their schools have been successful in getting teachers to use computers in their classrooms (Figure 3). A larger number indicated they think that their teachers are doing better in technology integration than other districts (81.9%).

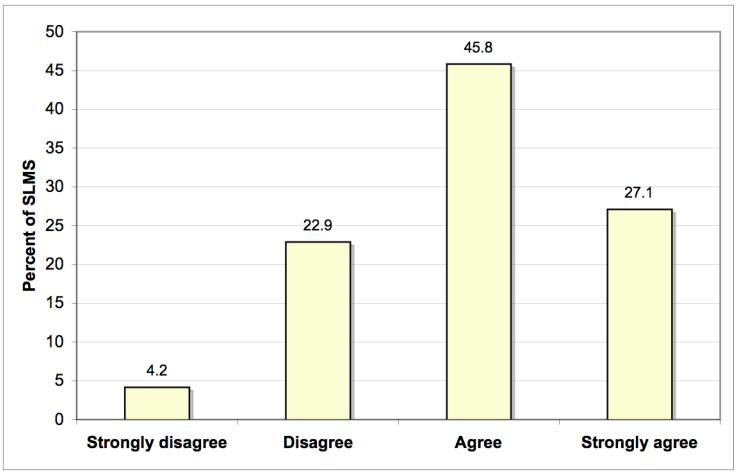

Figure 3. SLMS who indicated their schools have been successful in getting teachers to use computers in their classrooms

The SLMSs had mixed reactions as to whether technology access was a major barrier to technology integration in the classrooms at their schools (Figure 4), with 61.9% indicating they did not think this was the case. More than half (57.4%) agreed that state testing priorities had decreased emphasis on technology implementation locally.

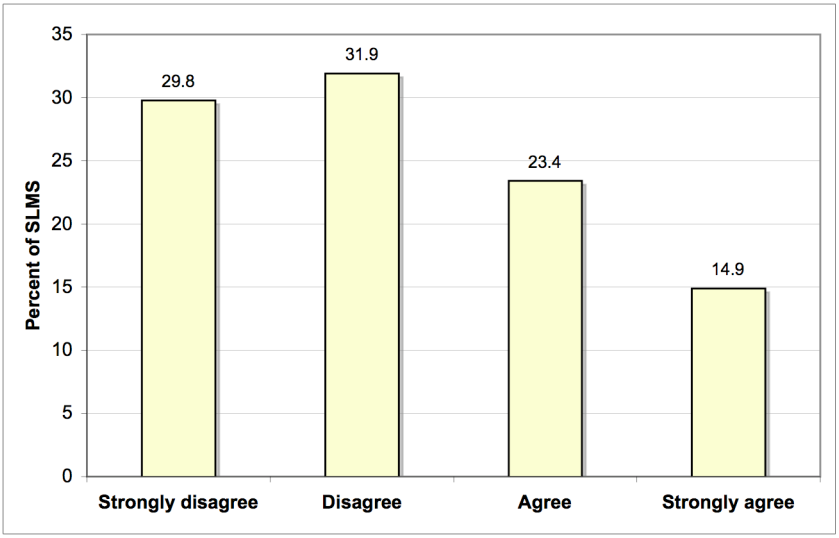

Figure 4. SLMS who agreed that technology access in their schools was a major barrier to classroom integration

SLMS Roles

While SLMS are commonly recognized for their roles in managing the school library media center, their professional competencies are equally important for the support roles that they offer to teachers and students. Four roles are identified for SLMS in *Information Power: Building Partnerships for Learning* (American Association of School Librarians & Association for Educational Communications and Technology, 1998) In the teaching and instructional partnering roles, the SLMS supports the instructional goals of the school in both content (standards and curriculum) and process (synthesis and exegesis). The information access and delivery role includes the traditional responsibilities of SLMS, like developing the media center's collections and services. The program administrator role includes management of the library media program as well as broadly focused training and advocacy functions within the school and district.

For those SLMSs who work with middle grade students, the role most often identified as the strongest was information specialist (Figure 5). Over 80% indicated this was important in their work. By contrast, instructional partner was important to just over half (52%), suggesting that in general, collaboration with teachers is not as easily integrated into their current professional activities.

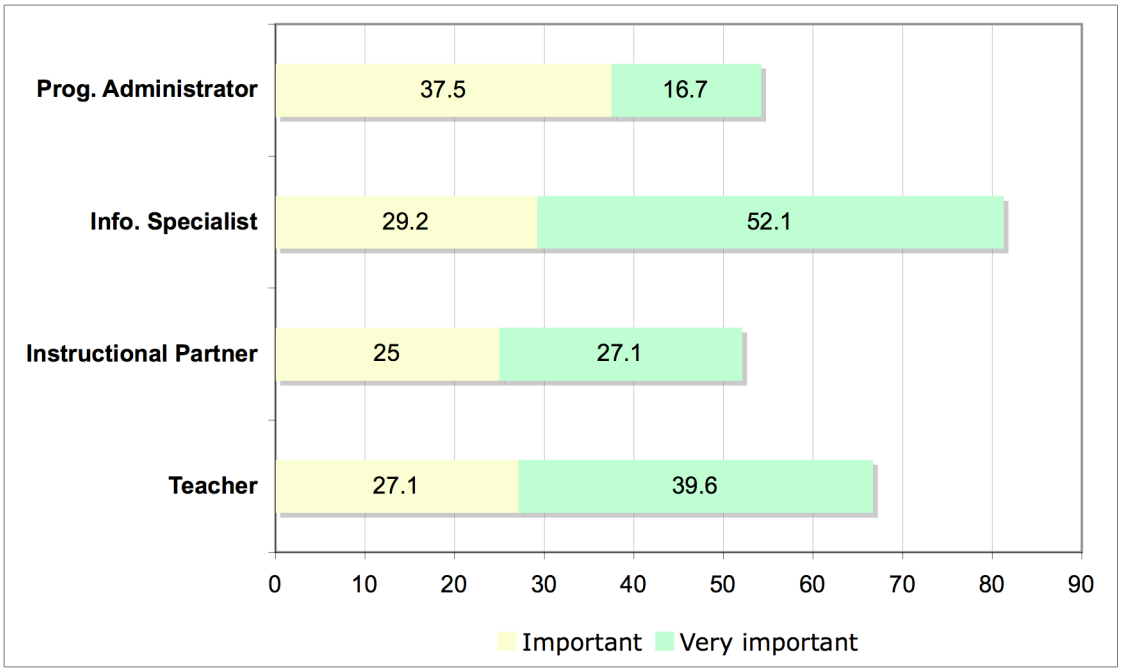

Figure 5. Percent of SLMS indicating role was important

The Science-Mathematics Connections

The smaller role of instructional partner is particularly clear when looking at collaborations with mathematics and science teachers. While a single respondent worked regularly with a science teacher, the majority of SLMSs in the study collaborate less than once per month with either mathematics or science teachers, and 40% never collaborate with mathematics teachers.

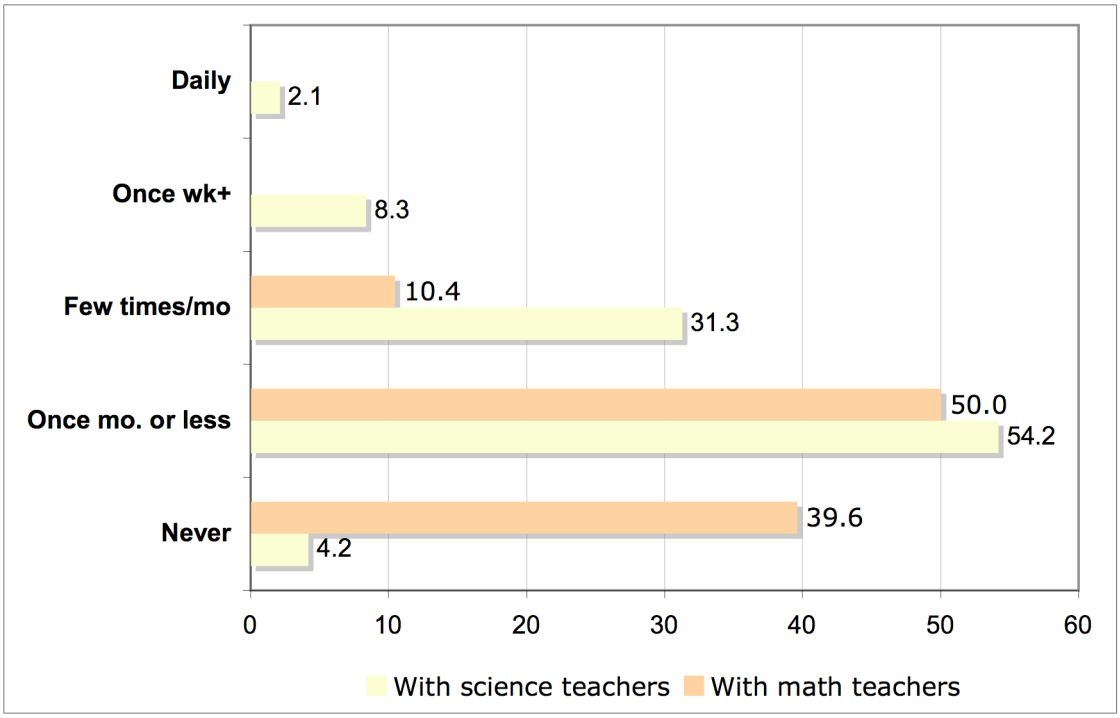

Figure 6. Frequency of SLMS collaborations with mathematics and science teachers

When it comes to the use of digital resources for instruction, SLMSs see clear distinctions in terms of the importance these play in the two disciplines (Figure 7). While 68.1% do not see digital resources as important in mathematics, almost the same number (64.6%) agree they are important for science.

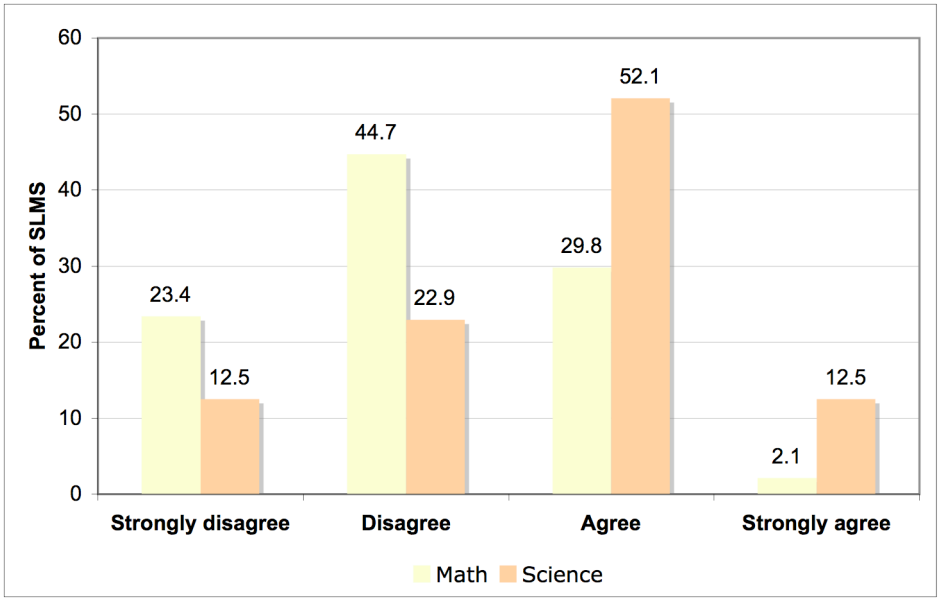

Figure 7. Percent of SLMS indicating agreement that digital resources are important in supporting mathematics and science instruction in their schools

Subscription streaming video services are found at just under a third of the schools (31.2%). However, the SLMSs in the study do note that visual resources such as videos, DVDs, and streaming video are important in STEM teaching in their schools (Figure 8). In

open-ended responses, those who mentioned having streaming video said they typically had a role in supporting this, that teachers liked the services, but often they had little to do with initial decisions to adopt this technology. Some indicated their schools had an interest in streaming video but technical problems were preventing them from moving forward, including one SLMS who noted they had subscribed a year ago but the district had yet to deploy it due to limited bandwidth.

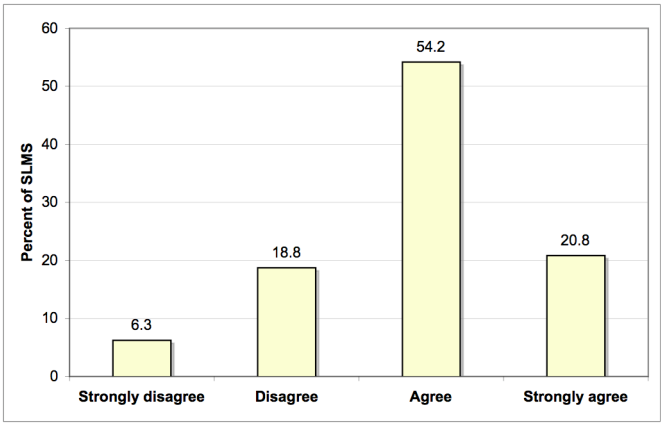

Figure 8. SLMS indicating visual resources such as videos, DVDs, and streaming video play an important role in STEM teaching in their schools

The Relation Between Technology Integration and Collaboration

The most notable finding is that in those schools where the SLMS both perceived that technology was important and where she was active in integration efforts, her role as instructional partner was rated highly. This relationship is significantly correlated ($r(46)=.53$, $p < .001$). These schools are active in making technology a part of teaching and the SLMS is a key player in this goal.

This relationship is reflected in open-ended responses as those who indicated that they played a strong role in technology support for teachers in their schools also were more likely to rate *all* four SLMS roles higher except that of program administrator. For example, one teacher who rated all four role areas as highly important (5 rating on each) indicated that she was "highly involved and always looking for ways to collaborate and integrate technology." Of the 13 SLMS who rated the instructional support role highest (5 on a one to five scale), 11 noted their active role in technology support, one indicated she was an active user and one did not respond to the question.

By contrast, of the eight who rated the instructional support role as ranked first or second, six of these responded to the open-ended question. All six indicated they at best used technology themselves but did not play a role in technology support. One of these ranked all her roles as limited, indicating her position was "minor. Librarians are mostly ignored." A similar response came from a respondent who had only time for the teaching role, who suggested "Our school is still in the 1900's when it comes to instruction methodology—and our administration likes it that way."

Curriculum and Professional Development

Issues relating to the relationship of the SLMS to science and mathematics teachers also showed that technology and instructional support roles related. Where the school is perceived to have been more successful in technology integration into STEM generally by the SLMS, she indicated a higher importance seen for the instructional role in her job (correlation $r(46)=.34$ $p<.001$). While there was no significant relationship to self-reports of time collaborating with mathematics teachers, those teachers who rated the instructional support role as most important in their jobs spend more time collaborating with science teachers with correlation $r(46)=.39$, $p<.001$. The more time spent collaborating with science teachers also correlates with higher ratings on the information specialist ($r(46)=.34$, $p<.001$) role.

For the SLMS in the survey group, professional development is common with 95.7% indicating they have had formal PD within the past year. But on open-ended responses asking about topic areas, three major areas emerged: technology, library management, and reading, the latter being the only content area mentioned in all the responses. None had been to any kind of PD for mathematics or science. The prevalence of PD in technology is a further indication of the critical role SLMS are playing in this generally within their schools.

Conclusions

Despite what are still limited collaborations between SLMS and science or mathematics teachers, the concerns that SLMC are not relevant to a digital age are clearly not the case. If SLMS are in schools where technology is moving forward and they are active in this transition, their roles are important and critical. Those who indicate a full range of importance in *all* four roles described in *Information Power* are those who are leveraging their technology expertise in their work with students and teachers.

While this study did not specifically cover the barriers that are keeping some SLMS from moving more actively into a digitally-centered professional role, the results, even though the sample is small, do suggest that not only is this recommended direction occurring. Expansion of the focus on technology is a way for those who feel less critical to their schools to find a direction that will improve their perception among other school personnel.

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Biographical Notes

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Statement of Originality

This statement certifies that the paper above is based upon original research undertaken by the author and that the paper was conceived and written by the author(s) alone and has not been published elsewhere. All information and ideas from others is referenced.