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FACTORS THAT INFLUENCE MIDDLE SCHOOL MATHEMATICS TEACHERS'
WILLINGNESS TO COLLABORATE WITH SCHOOL LIBRARIANS

by

Stephanie L. Schnabel

A DISSERTATION

Presented to the Faculty of

The Graduate College of the University of Nebraska

In Partial Fulfillment of Requirements

For the Degree of Doctor of Education

Major: Educational Administration

Under the Supervision of Kay A. Keiser, Ed.D.

Omaha, Nebraska

December 2017

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FACTORS THAT INFLUENCE MIDDLE SCHOOL MATHEMATICS TEACHERS'
WILLINGNESS TO COLLABORATE WITH SCHOOL LIBRARIANS

Stephanie L. Schnabel, Ed. D.

University of Nebraska, 2017

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Collaboration between school libraries and classroom teachers can have a powerful impact on student learning. School librarians routinely collaborate with English language arts and social studies curriculum and less frequently with areas in STEM education. This research examines middle school mathematics teachers' extent of or willingness to collaborate with the school librarian in one large urban Midwestern school district. This quantitative descriptive study sought to answer the question "What factors influence middle school mathematics teachers' extent or willingness to collaborate with school librarian?" This research looks at, from the middle school mathematics teacher's perception, the roles and responsibilities of the school librarian. Specifically, this study looked at the professional library skills, instructional and teaching abilities, and the professional disposition of the school librarian to determine if these factors had any influence on the middle school mathematics teachers' extent or willingness to collaborate. This study was conducted through the lens of the theory of social constructivism. Data was collected through an online survey of one district's middle school mathematics teachers. Results of the research showed several things: 1) participants had an overall positive perception of the school library, 2) participants were often unaware of the resources and services available to the mathematics curriculum, 3)

currently there is a low incident of collaboration between mathematics teachers and librarians, and 4) a majority of participants would be willing to collaborate with the school librarian in the future. The results of this study have implications for school library professional development and school library preservice training.

Acknowledgements

“No matter what accomplishments you make, somebody helped you.” – Althea Gibson

More than one “somebody” helped make this accomplishment possible and I would like to acknowledge their help and support. Dr. Keiser, Dr. Cast-Brede, and Dr. Russell, I am truly grateful for the advice, suggestions, and encouragement. Thank you, Dr. Pasco, for the guidance, reassurance, and the crazy suggestion that I should join the NxtWave cohort and go for a doctorate.

I truly believe things are easier when you are part of a team and my cohort teammates, Sara, Angela, Kim, Stephanie, Jo, and Stacy, supported me through all of it. Thank you guys for the laughs, tech help, and long talks. Getting to know all of you has been the best part of this journey. I am truly happy we have all crossed the finish line.

Thank you to my family, particularly my sister, mom, and husband. Corie, thank you for carrying a heavy load over the last few years so I could concentrate on school. Mom, this process has made me appreciate you even more. Thank you for always having time for me and encouraging me. You taught me to love reading and learning and inspired me to become an educator. Finally, Griff, thank you for never questioning why I started this process in the first place. You never doubted that I would finish, never complained about giving up date night, and always had my back. I can’t wait to see what our new normal will bring.

Table of Contents

Abstract	
Acknowledgments and/or Dedication	i
Table of Contents.....	ii
List of Multimedia Objects.....	v
Chapter 1 Introduction.....	1
School Libraries.....	3
Why Collaboration.....	4
Theoretical Framework.....	5
Purpose Statement.....	6
Research Questions.....	7
Significance of the Study.....	7
Chapter 2 Review of Literature.....	9
Social Constructivism.....	9
Mathematics.....	10
Current Mathematics Results.....	11
The School Library Program.....	13
The School Librarian.....	14
School Librarians Dispositions.....	15
School Libraries Impact Student Learning.....	16
Collaboration.....	18
Models of Collaboration.....	19
Characteristics of Collaboration.....	27
Benefits of Collaboration.....	28

Mathematics and School Library Collaboration.....	29
Perceptions.....	30
Administrator Perceptions.....	30
Teacher Perceptions.....	31
Summary	32
Chapter 3 Methodology.....	33
Design.....	33
Research Questions.....	35
Participants.....	36
Construct Validity.....	39
Limitations.....	41
Data Collection.....	41
Data Analysis.....	41
Summary.....	42
Chapter 4 Results.....	43
Respondents to the Survey	43
Willingness to and/or Extent of Collaboration.....	59
Results for Survey Items Related to Research Sub-Question 1.....	66
Results for Survey Items Related to Research Sub-Question 2.....	77
Results for Survey Items Related to Research Sub-Question 3.....	97
Implications Research Sub-Question 1	113
Implications Research Sub-Question 2.....	114
Implications Research Sub-Question 3.....	117

Demographic Analysis.....	119
Trends and Patterns.....	119
Indicators Positively Influencing Collaboration.....	119
Indicators Negatively Influencing Collaboration.....	122
Survey Items Indicating “I don’t know”.....	123
Impact of Mathematics Resources on Willingness to Collaborate.....	125
Impact of Information Literacy on Willingness to Collaborate.....	126
Impact of Technology on Willingness to Collaborate.....	127
Summary.....	128
Chapter 5 Discussion.....	130
Discussion of Results.....	131
Social Constructivism.....	133
School Librarian Role as Teacher.....	134
Collaboration.....	134
Mathematics and School Library Collaboration.....	135
Significance of Study.....	136
Future Research.....	137
Conclusion.....	139
References.....	140
Appendix A: Survey.....	151

List of Multimedia Objects

Table 1.....		20
	<i>The Library Media Specialist Taxonomy</i>	
Table 2.....		21
	<i>The Teacher’s Taxonomy of Resource-based Teaching and Learning</i>	
Figure 1.....		23
	<i>Model A: Coordination</i>	
Figure 2.....		24
	<i>Model B: Cooperation/Partnership</i>	
Figure 3.....		25
	<i>Model C: Integrated Instruction</i>	
Figure 4.....		26
	<i>Model D: Integrated Curriculum</i>	
Table 3.....		38
	<i>Public Middle School Demographic Data</i>	
Table 4.....		44
	<i>Respondent Data by Years of Classroom Experience</i>	
Table 5.....		46
	<i>Respondents Data by Initial Teaching Certificate</i>	
Table 6.....		48
	<i>Respondent Data by Formal Training in Collaboration during Preservice Education</i>	

Table 7.....	50
<i>Respondent Data by Professional Development on Collaboration</i>	
Table 8.....	52
<i>Respondent Data by Grade Level Assignment</i>	
Table 9.....	54
<i>Respondent Data by Course Taught</i>	
Table 10.....	56
<i>Respondent Data by Belief in the Need for Information Literacy Skills</i>	
Table 11.....	58
<i>Respondent Data by Gender</i>	
Table 12.....	60
<i>Approximate Number of Times Respondents Utilize School Library Services</i>	
Table 13.....	62
<i>Number of Times Respondents Collaborated with School Librarian for Instructional Purposes</i>	
Table 14.....	64
<i>Number of Times Respondents Would Consider Collaborating with the School Librarian in the Future</i>	
Figure 5.....	65
<i>Summary of the Results for Survey Items Related to the Middle School Mathematics Teachers Extent or Willingness to Collaborate with the School Librarian</i>	
Table 15.....	67
<i>Mathematics Teachers' Perceptions of the School Library Program's Collection of Resources that Meet the Goals/Objectives of the Mathematics Curriculum</i>	

Table 16.....	69
<i>Mathematics Teachers' Perceptions of the School Librarian's Ability to Assist Students and Staff in Identifying Appropriate Resources for Mathematics</i>	
Table 17.....	71
<i>Mathematics Teachers' Perceptions of the School Library Program's Promotion of Competency in Information Literacy across the Mathematics Curriculum</i>	
Table 18.....	73
<i>Mathematics Teachers' Perceptions of the School Librarian Guiding and Assisting Teachers in Evaluating and Selecting Resources for Mathematics</i>	
Table 19.....	75
<i>Mathematics Teachers' Perceptions of the School Librarian's Opportunity to Present Information Literacy Skills to Teachers as Essential Learning in all Subjects</i>	
Figure 6.....	76
<i>Summary of the results for Survey Items Related to Research Sub-Question 1: Do the professional library skills of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?</i>	
Table 20.....	78
<i>Mathematics Teachers' Perceptions of the School Library Program's Modeling of the Use of appropriate Assessments When Evaluating Students Work, Especially When Learning Objectives Include Various Types of Media</i>	
Table 21.....	80
<i>Mathematics Teachers' Perceptions of the School Library Program's Ability to Adapt and Modify Learning Activities Based on Feedback</i>	
Table 22.....	82
<i>Mathematics Teachers' Perceptions of the School Library Program's Promotion and Effective Use of Technology for Teaching and Learning</i>	

Table 23.....	84
<i>Mathematics Teachers' Perceptions of the School Library Program's Practice of Working Closely with Teachers in Designing Authentic Learning Tasks</i>	
Table 24.....	86
<i>Mathematics Teachers' Perceptions of the School Library Programs Practice of Modeling Collaboration by Working with Other Teachers</i>	
Table 25.....	88
<i>Mathematics Teachers' Perceptions of the School Library Program Ability to Create Independent Teaching and Learning Activities Reflective of Best Practice</i>	
Table 26.....	90
<i>Mathematics Teachers' Perceptions of the School Library Program Exhibiting Collaboration by Working with Teachers to Design and Implement Activities that Reflect Best Practice</i>	
Table 27.....	92
<i>Mathematics Teachers' Perceptions of the School Library Programs Promotion of Collaborating with Teachers to Ensure Students Develop Higher Level Thinking Skills for the Organization, Evaluation, and Use of Information and Ideas</i>	
Table 28.....	94
<i>Mathematics Teachers' Perceptions of the School Librarian's Knowledge of Mathematics Curriculum and Standards</i>	
Figure 7.....	95
<i>Summary of the Results for Survey Items Related to Research Sub-Question 2: Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate? Part A</i>	

Figure 8.....	96
<i>Summary of the Results for Survey Items Related to Research Sub-Question 2: Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate? Part B</i>	
Table 29.....	98
<i>Mathematics Teachers' Perceptions of the School Library Program's Ability to Effectively Communicate about Available Resources Related to the Math Curriculum</i>	
Table 30.....	100
<i>Mathematics Teachers' Perceptions of the Outreach of School Librarian in Regards to Collaboration on a Lesson or Unit</i>	
Table 31.....	102
<i>Mathematics Teachers' Perceptions of Communication with the School Librarian about the Subject Area of Mathematics</i>	
Table 32.....	104
<i>Mathematics Teachers' Perceptions of the School Librarians' Willingness to Team-Teach a Mathematics Lesson</i>	
Table 33.....	106
<i>Mathematics Teachers' Perceptions of the School Library Program's Schedule Flexibility</i>	
Table 34.....	108
<i>Mathematics Teachers' Perceptions of a Welcoming School Library Environment</i>	

Table 35.....	110
<i>Mathematics Teachers' Perceptions of the School Library Program's Ability to Encourage Life-Long Learning by Cultivating Curiosity in Students</i>	
Figure 9.....	111
<i>Summary of the Results for Survey Items Related to Research Sub-Question 3: Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate? Part A</i>	
Figure 10.....	112
<i>Summary of the Results for Survey Items Related to Research Sub-Question 3: Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate? Part B</i>	
Figure 11.....	121
<i>Summary of the Results for Indicators Positively Influencing Collaboration</i>	
Figure 12.....	123
<i>Summary of the Results for Indicators Negatively Influencing Collaboration</i>	
Figure 13.....	124
<i>Summary of the Results for Survey Items Indicating "I don't know" Responses</i>	
Figure 14.....	126
<i>Summary of the Results for Survey Items Relating to Mathematics Resources</i>	
Figure 15.....	127
<i>Summary of the Results for Survey Items Relating to Information Literacy</i>	
Figure 16.....	128
<i>Summary of the Results for Survey Items Relating to Technology</i>	

Chapter 1 Introduction

“A society in which only a few have the mathematical knowledge to fill crucial economic, political, and scientific roles is not consistent with the values of a just democratic system or its economic needs (National Council of Teachers of Mathematics [NCTM], 2000, p.5)

In order to have national prosperity, citizens need a more in-depth understanding of mathematical knowledge and STEM skills. Assuming that PreK – 12 education provides the foundation for this knowledge and skill development, it is evident math instruction, and more broadly STEM instruction, needs to be maximized in order to achieve the economic, political, and scientific needs of the nation. It can also be argued that in order to maximize instruction, collaboration with school librarians, who have skills, knowledge, and access to resources, can enhance student achievement in the areas of mathematics and STEM curriculum.

STEM stands for science, technology, engineering, and mathematics curriculum areas in education. STEM education is essential in providing the skills and understanding needed by students in the 21st century (Harlen, 2013) to be active, engaged, and knowledgeable members of society. As students move from PreK – 12 schooling to post-secondary opportunities, strong STEM skills offer a wide variety of opportunities in education, business, and industries. “Technology has become deeply entwined in virtually every facet of our modern lives, and the demand for capable workers with science and math competencies continues to grow.” (Carnevale, Smith, & Melton, 2011, p. 74). STEM jobs will continue to increase, and by the year 2018, there will be a need for 2.4 million STEM workers, according to Carnevale et al. (2011).

While on the surface it may not appear to be a natural match, school libraries and STEM content areas share common ideas. Science standards and school library standards both use inquiry as an important strategy in teaching and learning. Technology is infused throughout a quality school library program in the teaching of digital literacy and citizenship. Engineering principles are applied in the library through Makerspace programs which are social, hands-on ways to innovate and create using technology. Mathematics and school libraries both rely heavily on the ability to effectively communicate problems, the path to the conclusion, and why that conclusion is important. (American Association of School Librarians [AASL], 2007; International Society for Technology in Education [ISTE], 2016; NCTM, 2000; Next Generation Science Standards [NGSS], 2013; & Young Adult Library Services Association [YALSA], 2014).

In keeping with the importance of STEM education, specifically mathematics, the National Council of Teachers of Mathematics (NCTM) asserts mathematical understanding is essential to the success of our country. In order to best prepare students for their future it is essential that they have a deep understanding of mathematics (NCTM, 2000). Science Pioneers, a group that has worked for over 50 years to encourage student participation in the STEM curriculum areas, states that “every other STEM field depends on mathematics.” Because of the importance of mathematics to society, this study aims to discover how school library programs can better serve mathematics teachers resulting in improved student achievement.

School Libraries

School librarians are in a unique position to impact each student's educational journey in all curriculum areas, including STEM. According to the American Association of School Librarians (AASL), "an effective school library program plays a crucial role in preparing students for informed living in an information-rich society" (2016b, p.1). School libraries provide a safe place for students to explore their personal interests and inquiries and promote equity and access for all students. School libraries provide both digital and print resources that students may access for both academic achievement and personal enjoyment. As stated in *Information Power: Building Partnership for Learning*, "Creating a foundation for lifelong learning is at the heart of the school library media program" (AASL & Association for Educational Communications and Technology [AECT], 1998, p. 1).

School librarians keep student learning at the center of their focus. Creating authentic student learning experiences within the curriculum is a crucial element of the school librarians' position. In order to accomplish authentic student learning experiences, school librarians must collaborate with classroom teachers. To achieve meaningful collaboration, the school librarian must develop professional relationships with teachers, demonstrate what the school library program can provide, be familiar with all areas of curriculum, connect information literacy to the content, develop collections that support learning in each classroom, and be creative and flexible with scheduling and resources (AASL & AECT, 1998).

Why Collaboration

The goal of a 21st century school library program is to create engaging learning environments and learning experiences for students to promote their academic and personal growth. The job of the school librarian has evolved over time into the multi-faceted role it is today to help accomplish this goal. The school librarian functions as an “instructional leader, program administrator, teacher, collaborative partner, and information specialist” (AASL, 2016a, p. 1). Collaboration, in the most simple terms, is working together to create something. Collaboration is key in all the roles a school librarian plays.

AASL (2016a) specifically defines collaboration as “working with a member of a teaching team to plan, implement, and evaluate a specialized instructional plan” (p. 2).

Montiel-Overall (2005b) defines collaboration even more in-depth as:

Collaboration is a trusting, working relationship between two or more equal participants involved in shared thinking, shared planning, and shared creation of integrated instruction. Through a shared vision and shared objectives, student learning opportunities are created that integrate subject content and information literacy by co-planning, co-implementing, and co-evaluating students’ progress throughout the instructional process in order to improve student learning in all areas of the curriculum (p. 5).

Professional collaboration has been shown to be an effective tool to improve student achievement (AASL & AECT, 1998; NCTM, 2000; Wilson & Blednick, 2011). School libraries have a long history of working in partnership with English language arts,

reading, and social studies classes. There, however is little evidence of the same frequency of collaboration with mathematics (Minkel, 2004; Subramaniam & Edwards, 2014). The work of school librarians needs to be seen as critical across the curriculum. STEM coursework is a major portion of today's curriculum and collaboration with mathematics can no longer be ignored. Through collaboration, the school librarian and the mathematics teacher have untapped potential to impact the future lives of students.

Theoretical Framework

Constructivism is an educational theory that is based upon the philosophies of Piaget, Vygotsky, and Bruner. This theory recognizes that student learning is an active process and not a passive pursuit. "This view of learning led to the shift from the 'knowledge-acquisition' to 'knowledge-construction' metaphor" (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2004). A theory that developed out of constructivism is social constructivism. A unique aspect of social constructivism is that learning is not an individual activity, but a shared activity (Prawat & Floden, 1994). In traditional instruction, students are often inactive and the teacher is responsible for transferring information. Authentic learning allows for the students to connect concepts to aspects of their lives, both educationally and culturally. According to Beck and Kosnik (2006), "...social constructivism implies a form of learning in which students are fully engaged, find the process meaningful, and relate ideas to the real world to a considerable extent. Only in this way can they participate in constructing their knowledge and acquire the habits that make them lifelong learners" (p. 2).

The framework for this study was social constructivism. Social constructivism is the theory that learning is not a passive activity but one where a person is actively

engaged in the learning process through inquiry, questioning, and social interactions. The 21st century school librarian incorporates the central ideas of social constructivism into an effective school library program by collaborating with classroom teachers to create authentic learning experiences for students. School librarians encourage active learning in authentic situations that allow students the opportunity to apply knowledge to real-life situations. Both AASL and the NCTM recognize the importance of engaging and authentic learning experience and collaboration, therefore the theory of social constructivism suits the purpose of this study

Purpose Statement

While STEM encompasses a variety of disciplines, this study focuses on mathematics curriculum. Mathematics is the foundation that all other STEM curriculum is built upon. This study examines the factors that influence middle school mathematics teachers' willingness to collaborate with school librarians. Nationally, large numbers of students are underperforming in the area of mathematics (National Assessment of Educational Progress [NAEP], 2015; National Center for Educational Statistics [NCSE], 2015; & Provasnik et al., 2016). Both the NCTM and AASL principles and standards speak to the importance of professional collaboration as a positive factor in student success (American Library Association [ALA] & AASL, 2010; NCTM, 2000). Collaboration with a certified school librarian has been found to positively impact student achievement (Lance, Welborn, & Hamilton-Pennell, 1993). At this time, there are a limited number of studies that focus on collaborative efforts between middle school mathematics teachers and school librarians. In an effort to understand how to make collaboration between these two groups a more common occurrence, this research

focuses on the factors that may influence middle school mathematics teachers' willingness to collaborate with school librarians.

Research Questions

“What factors influence middle school mathematics educators' extent or willingness to collaborate with the school librarian?”

1. Do the professional library skills of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?
2. Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?
3. Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?

Significance of the Study

This study contributes to research and practice in both school library and STEM education. A body of research shows that school libraries routinely collaborate with multiple curriculum areas such as English language arts, social studies, and technology (Achterman, 2008; Eastman & McGrath, 2006; Todd, 2005; & Williamson, Archibald, & McGregor, 2010). Historically, there has been little research on collaboration between school libraries and mathematics curriculum. Studies show that collaboration between a certified school librarian and classroom teachers can positively impact student achievement (Lance et al., 1993). This study adds to the body of knowledge regarding the perceptions classroom teachers specifically, mathematics teachers, have of school librarians and their professional skills. The results have the potential to influence the development of best practices and improve collaboration practices between school library

programs and the mathematics curriculum area. The study is of significant interest to school librarians, mathematics teachers, and school administration personnel.

Chapter 2 Review of Literature

“STEM education is closely linked with our nation’s economic prosperity in the modern global economy; strong STEM skills are a central element of a well-rounded education and essential to effective citizenship” (STEM Education Coalition, 2014).

This study examines the factors that influence middle school mathematics teachers’ willingness to collaborate with school librarians. It is important to understand how today’s school librarians can better support and assist mathematics teachers, curriculum, and student success. The following review discusses current literature related to the topics of social constructivism, mathematics, school libraries, collaboration, and perceptions of school librarians.

Social constructivism

The theoretical framework for this study was based on social constructivism. Social constructivism asserts that knowledge is constructed and reconstructed through “discourse communities” (Green & Gredler, 2002). Discourse communities are beneficial to both teacher development and student learning. The ideas that the learner construct knowledge and that learning is a social process are grounded in the work of Vygotsky (Vygotsky & Kozulin, 2000). Deep, meaningful learning can be attained “from discussion, collaboration, sharing and building knowledge with peers, as well as with those who are more experienced or advanced in the topic or area of inquiry” (Fulton, 2003, p.32). Both AASL and NCTM standards call for students to have real-life learning experiences. Quality, authentic learning environments are created through collaboration which corresponds with a social constructivist view of learning. Social constructivism

supports collaboration which can result in new learning opportunities for students and educators (Fulton, 2003). Collaboration assumes “meaning and knowledge are co-constructed” which aligns with the social constructivist theory (Montiel-Overall, 2005b, p. 3). In this chapter, mathematics, school libraries, and collaboration are viewed through the lens of social constructivism.

Mathematics

The National Commission on Mathematics and Science Teaching for the 21st Century (NCMST), states math and science skills are essential to American society. These skills enable Americans to participate in the global economy, are linked to national security, and aide informed decision-making. The Commission further asserted “the future well-being of our nation and people depends on not just how well we educate our children generally, but how well we educate them in mathematics and science specifically (NCMST, 2000, p. 4).

In keeping with the importance of STEM education, specifically mathematics, The NCTM also asserts mathematical understanding is essential to the prosperity of our country. “A society in which only a few have the mathematical knowledge needed to fill crucial economic, political, and scientific roles is not consistent with the values of a just democratic system or its economic needs (NCTM, 2000, p. 5). The global community faces many challenges and opportunities related to securing nations power grids, rebuilding infrastructure, meeting heath care needs, climate change and developing renewable resources. The next generation will need mathematical literacy to understand

and meet these demands. In order to best prepare students for their future it is essential that they have a deep understanding of mathematics (NCTM, 2000).

Current Mathematics Results

A quality mathematics program is based on six principals: equity, teaching, learning, assessment, technology, and curriculum (NCTM, 2000). However, according to Marshall, Horton, Igo, & Switzer (2009) providing high quality mathematics instruction is not a reality in the majority of PK – 12 classrooms. “Despite the clear and focused goals, recommendations, and standards of the NCTM (2000) set, a majority of classrooms continue to fall short in implementation and direction, especially in urban high-poverty schools” (McKinney, Chappell, Berry, & Hickman, 2009, p. 278).

The Trends in International Mathematics and Sciences Study (TIMSS) test is used to gauge how United States students fare in the application of skills and knowledge in mathematics and science when compared to other nations around the world. The National Science Foundation (NSF) reports that in 2011, the average 8th grade student scored 509 on the TIMSS test, slightly above the average of 500 but still significantly lower than six other countries (NSF, 2014). NSF also reports that according the 2012 PISA (Program for International Student Assessment) test, 15 year-olds test scores drop below the average score on mathematics proficiency and the US score, is significantly less than 21 other countries. Even when comparing 12th grade students within the US only 26% scored proficient level on the National Assessment of Educational Progress (NAEP) test in 2009. More alarming is the 6 – 12% rate at which African Americans,

Hispanics, and American Indian/Alaska Native students were proficient or above in mathematics (NSF, 2014).

United States students are not performing in the area of mathematics at a level to allow them to continue their studies in mathematics at a post-secondary level.

Low expectations are especially problematic because students who live in poverty, students who are not native speakers of English, students with disabilities, females, and many nonwhite students have traditionally been far more likely than their counterparts in other demographics to be the victims of low expectations.

Expectations must be raised – mathematics can and must be learned by *all* students (NCTM, 2000, p. 13).

McKinney et al. cites research that indicates countless students are not learning important mathematics concepts through traditional instructional methods that are predominately used (2009).

Sandall (2016) identifies the library as a support structure for integrated STEM education that can do more to assist teachers in these areas. School librarians are in a position to collaborate with mathematics teachers to help the current math realities. Critical thinking and problem solving are central to both mathematics and school libraries. School librarians should be making more of an effort to support this curriculum area.

The School Library Program

At the heart of every school library program is the goal to help students develop the capacity to understand the ever changing information landscape and become lifelong learners. As a vital component of the learning community, the school library program must provide information access, teaching and learning opportunities and effective program administration (AASL & AECT, 1998). According to *Information Power: Building Partnerships for Learning* (1998), “the mission of the library media program is to ensure that students and staff are effective users of ideas and information” (p. 6). All learners need to be able to find information, critically examine that information, and use it in a way that is meaningful to them. School library programs achieve this mission by “providing intellectual and physical access to materials in all formats; by providing instruction to foster competence and stimulate interest in reading, viewing, and using information and ideas; by working with other educators to design learning strategies to meet the needs of individual students” (AASL & AECT, 1998, p. 6).

A student-centered school library program uses collaboration, technology, and information access to empower students to develop the tools needed to become responsible for their own learning. A welcoming school library program invites all students to be an active part of the learning community. Today’s school libraries, afford students the opportunities to investigate topics of interest and curiosity that the student finds exciting. (AASL, 2016b; & AASL & AECT, 1998).

For students the school library represents one of America’s most cherished freedoms: the freedom to speak and hear what others have to say. Students have

the right to choose what they will read, view, or hear and are expected to develop the ability to think clearly, critically, and creatively about their choices, rather than allowing others to do this for them (AASL, 2016b, p.1).

The School Librarian

The school librarian has many roles and responsibilities. AASL organizes these diverse roles and responsibilities in the ALA/AASL Standards for Initial Preparation of School Librarians (2010) which provide the benchmark for professionals. The standards are arranged into four sections. Standard 1 focuses on the three key elements: teaching, learning, and collaborative planning. Standard 2 centers on literacy and supporting reading for multiple purposes. At the core of Standard 3 is providing guidance to all members of the learning community on ethical and efficient use of information. Standard 4 spotlights the school librarian as a leader in the school by advocating for strong library programs which promote student success (AASL, 2010). According to *Information Power: Building Partnerships for Learning* (AASL & AECT, 1998), the school librarian has five main objectives that support the professional standards. School librarians should “collaborate with teachers, administrators, students, parents, and others to create programs, facilities, services, and schedules that students and others find welcoming and appealing” (AASL & AECT, 1998, p. 88). Other objectives focus on creating an appealing, well organized physical space and providing engaging programs that support student learning. School librarians should have a positive energetic attitude that promotes the school library program as an essential part of the school community (AASL & AECT, 1998).

Collaborating and being an instructional partner is an essential piece of the school librarian's job. "The role of the school librarian is to guide students and fellow educators through the intersection of formal and informal learning (AASL, 2016, p.1). There is a long history of successful collaboration between school librarians and English language arts and social studies curriculum. Lamb (2011) advocates that the most effective school librarians are teachers who use their knowledge of best practices in instruction and collaborates with other educators in planning and delivery content. School librarians are distinct in their ability to assist with differentiation of instruction to help teachers reach all students including students of varying ability levels and cultural backgrounds (Lamb, 2011). Today's certified school librarians are master teachers who understand their communities and individual students to create the most effective learning environment possible. "As the instructional partner, the library media specialist joins with teachers and others to identify links across students information needs, curricular content, learning outcomes, and a wide variety of print, nonprint, and electronic information resources" (AASL & AECT, 1998, p. 4).

School Librarian Dispositions

The Council for the Accreditation of Educator Preparation (CAEP) defines dispositions as "the habits of professional action and moral commitments that underlie an educator's performance" (Council for the Accreditation of Educator Preparation [CAEP], 2013). Prior to the inception of CAEP, the National Council for Accreditation of Teacher Education (NCATE) defined professional dispositions as "professional attitudes, values, and beliefs demonstrated through both verbal and non-verbal behaviors as educators interact with students, families, colleagues, and communities. These positive behaviors

support student learning and development” (National Council for Accreditation of Teacher Education, 2010). A school librarian’s disposition is his or her mind set and influences how he or she views their overall roles and responsibilities in the school library.

Bush and Jones (2010) explored the professional dispositions of school librarians in a Delphi study. The findings show the expert panel identified eleven dispositions that are important to the position of school librarian. Those dispositions are: teaching, collaborating, leading, lifelong learning, creative thinking, empathy, critical thinking, professionalism, ethics, advocacy, and reading. Teaching, collaboration, empathy, and professionalism, as described by Bush and Jones, particularly align with the focus of this study. School librarians with a strong teaching disposition use guided inquiry, evidence-based practices, and make the learning student-centered. Collaboration as a disposition is exemplified by bringing people and ideas together and building partnerships. School librarians who demonstrate empathy show “compassion, honors diversity, kindness, open-mindedness, [and] listens to all points of view” (Bush & Jones, 2010, p. 8). Professionalism in the school library can be practiced through stewardship, a service mentality, and professional conduct.

School Libraries Impact Student Learning

Since the 1990’s there has been a renewed effort from researchers to identify the impact school libraries have on student achievement. In multiple studies in both the United States and Canada, school libraries have been found to positively impact student achievement. Keith Curry Lance, who has been a leader in this area of research, first

published *The Impact of School Library Media Centers on Academic Achievement* in 1993. This study investigated 221 public schools in Colorado and found a positive relationship between better funding for school libraries and student achievement regardless of the school communities socio-economic status or the educational level of the adults in that community. The research also indicated that when school librarians collaborated in the instructional process, students had greater academic achievement (Lance, et. al., 1993). “Among predictors of academic achievement, the size of the LMC staff and collection is second only to the absence of at risk conditions, particularly poverty and low educational attainment among adults” (Lance, et al., 1993, p. iv).

Since this study, “school library impact studies,” have been conducted across the country and the findings continue to be similar to those of the original Colorado study. More than 98% of students who had a certified, full-time school librarian reported receiving assistance in their learning. This Delaware study also determined students were able to link the assistance they received from the school librarian to their improved performance in school (Todd, 2005). Lance and Schwarz, in a 2012 Pennsylvania study, concluded students who had a certified, full-time school librarian tested higher in reading and writing. The research established that students from diverse cultural, socio-economic, and ability backgrounds showed greater gains than the general student body (Lance & Schwarz, 2012). Results of a study in Kansas, established that in middle schools with school librarians, students “yield notably higher proficiency rates in all five subject areas” (Dow, Lakin, & Court, 2012, p. 10). The subject areas were reading, math, science, history, and writing.

Collaboration

Collaboration provides a vehicle for social constructivism to take place for both the educators and students. “Collaboration has the potential for creating a renewal in education by combining the strengths of two or more individuals in productive relationships that can positively influence student learning” (Montiel-Overall, 2005b, p. 21). Educators have long believed that collaboration is important to student learning. Even though there can be barriers to collaboration such as inflexible scheduling, prescribed course content and pacing, and lack of support, many educators find a way to make it happen. The NCTM identify the importance of collaborating with other educational specialists in order to maximize learning potential for each mathematics student (NCTM, 2014). School librarians recognize their important role as instructional partners in every curriculum areas to create authentic, meaningful learning experiences for all students (ALA & AASL, 2010, & AASL & AECT, 1999).

AASL (2016a) specifically defines collaboration as “working with a member of a teaching team to plan, implement, and evaluate a specialized instructional plan” (p. 2). Montiel-Overall (2005b) defines collaboration as “a trusting, working relationship between two or more equal participants involved in *shared thinking, shared planning and shared creation of integrated instruction*” (p. 4). Loertscher (2014) recognizes collaboration and coteaching as being similar acts, describing coteaching as, librarians and teachers who plan, teach, and assess learning experiences. Montiel-Overall (2005b) draws from the literature to suggest several characteristics of collaboration: reciprocity, congeniality, partnerships, cooperation, information sharing, shared vision, shared power, dialogue, joint construction of knowledge, joint planning, complementarity of skills,

efforts, roles, teaming strategic alliances, and creating new value together. A variety of combinations of these characteristics serve as the basis for developing successful partnerships. Collaboration is often associated with networking, coordination, cooperation, and partnerships (Montiel-Overall, 2005a). Working together benefits both the teachers and the students. Montiel –Overall states “the learning experiences created through collaboration engage students in a process that makes learning more meaningful and less difficult” (2005b, p.6).

Models of Collaboration

Loertscher developed taxonomies to describe the varying roles of a school librarians and the various degrees of resource based teaching in 1988. The following organizational charts (table 1 and table 2) identify collaboration between the school librarian and teacher as a common thread in student achievement. Collaboration is an element that unites school librarian and classroom teachers’ efforts to improve student achievement. These taxonomies begin with no collaboration on the lowest level and move to high collaboration.

Table 1

The library media specialist taxonomy (Loertscher, 2000)

Level of Library Media Specialist Taxonomy	Description
1. No Involvement	The LMC [Library Media Center] is bypassed entirely.
2. Smoothly Operating Information Infrastructure	Facilities, materials, networks, and information resources are available for the self-starter delivered to the point of need.
3. Individual Reference Assistance	The library media specialist serves as the human interface between information systems and the user.
4. Spontaneous Interaction and Gathering	Networks respond 24 hours a day and 7 days a week to patron requests, and the LMC facilities can be used by individuals and small groups with no advanced notice.
5. Cursory Planning	There is informal and brief planning with teachers and students for LMC facilities or network usage – usually done through casual contact in the LMC, in the hall, in the teacher’s lounge, in the lunch room, or by email. (For example: Here’s an idea for an activity/web site/new materials to use. Have you seen...? There’s a software upgrade on the network.)
6. Planned Gathering	Gathering of materials/access to important digital resources is done in advance of a class project upon teacher or student request.
7. Evangelistic Outreach/Advocacy	A concerted effort is made to promote the philosophy of the LMC program.
8. Implementation of the Four Major Programmatic Elements of the LMC Program	The four LMC program elements – collaboration, reading literacy, enhancing learning through technology, and information literacy – are operational in the school. The LMC is on its way to achieving its goal of contributing to academic achievement.
9. The Mature LMC Program	The LMC program reaches the needs of every student and teacher who will accept its offerings in each of the four programmatic elements.
10. Curriculum Development	Along with other educators, the library media specialist contributes to the planning and organization of what will actually be taught in the school or district.

Table 2

The teacher's taxonomy of resource-based teaching and learning (Loertscher, 2000)

Level of Resource Based Teaching	Description
1. Self-Contained Teaching	The teacher delivers instruction and creates learning activities with materials and technology in a single classroom environment with no real need for the LMC facilities, materials, or information technology. Materials are either owned by the teacher or accessed via networks from the classroom.
2. Teaching with a Borrowed or Electronically Accessible Collection	When materials or equipment are lacking for a particular instructional sequence, the teacher borrows materials from the LMC, the public library, or other sources for use in the classroom during a unit of instruction.
3. Using the Library Media Staff as an Idea Resource	The teacher relies on the library media staff and the technology resource persons for ideas and suggestions for new materials to use, activities to pursue, training in the use of all forms of media and technology, reference professional materials and information.
4. Using the Library Media Staff and Resources for Enrichment of a Unit	The teacher uses the LMC facilities, materials, activities, and staff to supplement unit content – to provide the “icing on the cake” for a unit. These activities are not considered essential to the central elements of teaching but do enrich the learning experience.
5. Using library Media Resources as a Part of Unit Content	Library media center materials/activities are integral to unit content rather than supplementary in nature. Students are required to meet the teacher’s objectives while using library media information.
6. The Teacher and Library Media Specialist Experiment with Partnerships in Teaching and Learning	The teacher and library media staff experiment by working as teaching partners to construct teaching strategies and learning experiences that will increase student achievement. One or both partners are testing collaborative strategies, new ideas, or changes in learning activities or are experimenting with new technologies.
7. Teacher/Library Media Specialist Partnerships Become a Natural Part of Teaching and Learning	Teachers and library media specialist enjoy partnerships as they plan, execute, and evaluate learning experiences. Their collaboration is a natural part of the professional experience.
8. Curriculum Development	Teachers consult with library media specialists as curriculum changes are being considered. Advanced planning for changes and their impact on LMC materials, facilities, technology, and activities are considered.

In 2005, Montiel–Overall proposed four models of collaboration based on the work of Loertscher. The models progress from less elaborate forms of school librarian and teacher interaction to more evolved collaboration. The models vary by the purpose of the working agreement, the extent of participation by the teacher and the school librarian, and the level of importance placed on student achievement. Model A is Coordination, Model B is Cooperation/Partnership, Model C is Integrated Instruction, and Model D is Integrated Curriculum.

Model A Coordination: In this model, participants work together to make their individual endeavors run more smoothly or efficiently. Common interests or mutually beneficial activities focus on efficiency rather than student achievement. It is the least intense form of collaboration. Examples of coordination between school librarians and classroom teachers could include hosting an author visit or book fair for different grade levels. According to Montiel-Overall, coordination requires, “less formal relationships, commitments, resources and time” (2005b, p. 12).

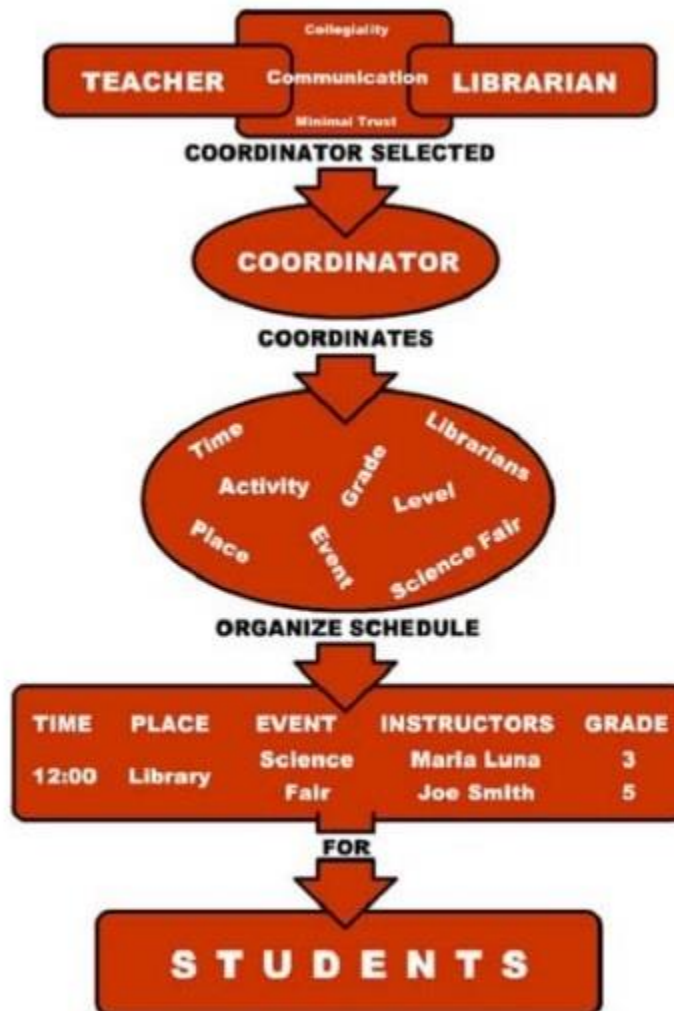


Figure 1. Model A: Coordination (Montiel-Overall, 2005b)

Model B Cooperation/Partnership: This next model involves more commitment by school librarians and teachers to a common goal. Typically, one participant has more power and the other is there to help, support, or assist in accomplishing the common goal. An example of cooperation/partnerships with the school librarian could include gathering resources for a teacher to use in a class project. In this model, students often benefit from

the work of both parties involved but responsibilities are often divided up, with no overlap between the two.



Figure 2. Model B: Cooperation/Partnership (Montiel-Overall, 2005b)

Model C Integrated Instruction: According to Montiel-Overall, “SLMSs and teachers are involved in *shared thinking*, *shared planning*, and *shared creation of integrated instruction* when their collaborative effort integrates content instruction and library instruction” (2005b, p. 14). In this model, both the school librarian and teacher are equal partners who share responsibilities for planning and teaching and are focused on enhancing the students’ learning experience. “Through this process teachers and SLMSs expand their individual potential and create jointly what would be beyond their

capacity individually” (Montiel-Overall, 2005b, p. 14). This model represents collaboration as defined by Montiel-Overall.

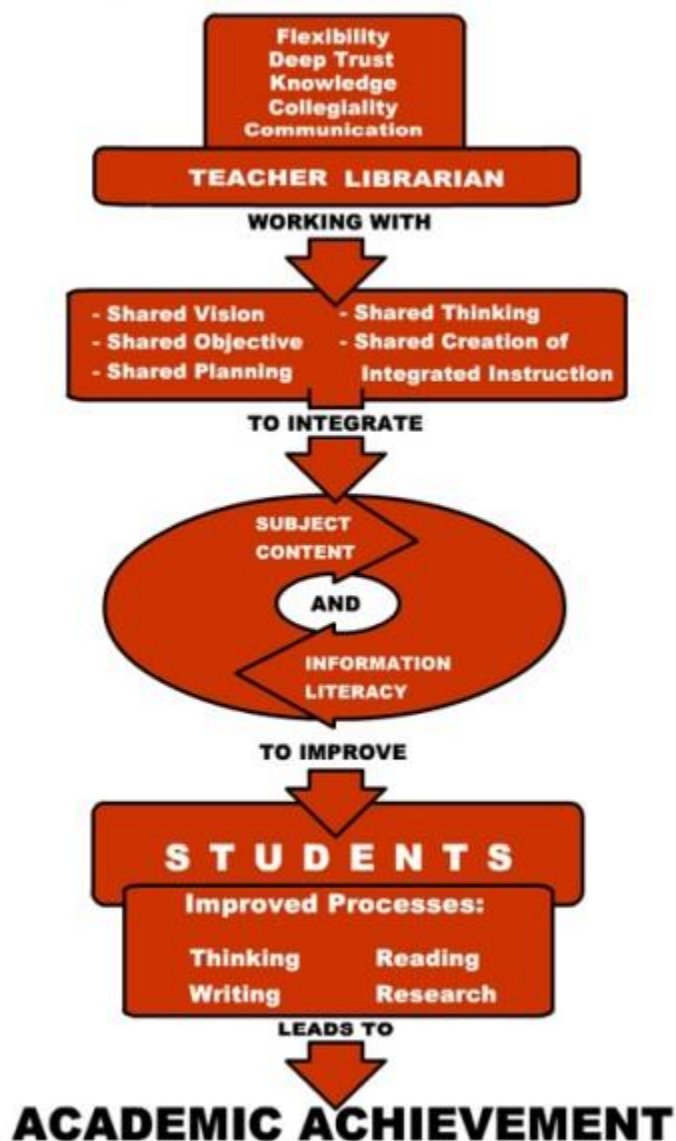


Figure 3. Model C: Integrated Instruction (Montiel-Overall, 2005b)

Model D Integrated Curriculum: This model only happens when Model C is applied across all content areas throughout the school year. The building leader is vital to this model because he or she sets the schedule, provides the resources, and sets the

expectation that collaboration should occur in all classes at all levels (Montiel-Overall, 2005b).

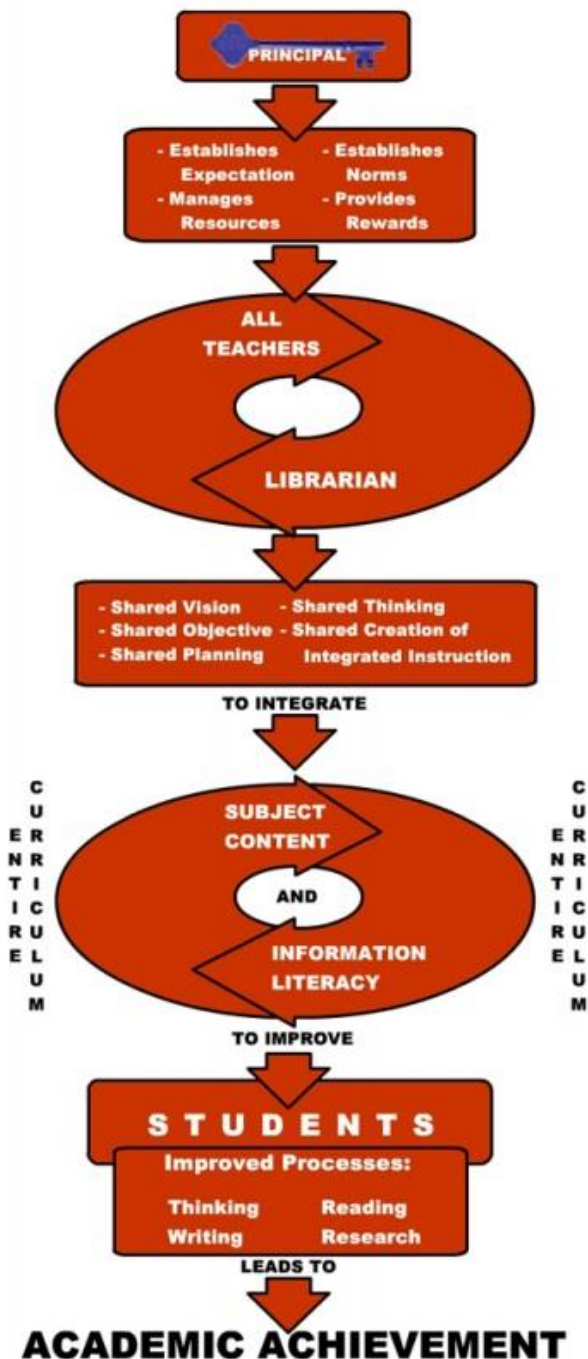


Figure 4. Model D: Integrated Curriculum (Montiel-Overall, 2005b)

Characteristics of Collaboration

Collaboration is not always easy. There are many factors that influence successful collaboration. In order to move along the continuum of collaboration, teachers and school librarians must share certain qualities. Each must bring to the table an interest in either the subject matter or the expertise; a degree of commitment; a want to improve learning for the student; an innovative idea or practice; and a willingness to integrate all the parts to create an improved learning experience. Partners in collaborations must also be respectful, congenial, trustworthy, good communicators, and possess self-advocacy skills (Brinkmann & Twiford, 2012; Haycock, 2007; Montiel-Overall, 2005a, 2010, & Williamson, Archibald, & McGregor, 2010). Collaboration is also directly affected by the school climate (Haycock, 2007; Slygh, 2000).

Currently research indicates that most collaboration between school librarians and classroom teachers takes place on the lower end of the spectrum (Hockersmith, 2010; Montiel-Overall & Jones, 2011). Activities that are typically on the lower end of the collaboration spectrum include scheduling classes to use the library space, to use technology, and to identify and collect resources. School librarians “more often provide instructional resources, in their traditional role, than they provide instructional goal setting, design, and co-teaching experiences” (Hockersmith, 2010, p. 21). Hockersmith found over 60% of teacher respondents acknowledged that all roles of the school librarian were important or extremely important, such as providing resources, incorporating information and technology skills, planning, and collaborating. While current school librarians and teachers may not be collaborating on the upper end of the spectrum, studies find that they still believe these roles are important (McCracken, 2000; Ragle, 2009).

Benefits of Collaboration

Collaboration is beneficial to professional educators by improving professional growth, student engagement and achievement, and learning environments. Cate (1998) examined a yearlong collaborative relationship between a school librarian and a fifth grade classroom teacher. Findings indicate that through collaboration, both the school librarian and classroom teacher grew professionally. A feeling of greater satisfaction and appreciation was reported by educators who participated in the collaborative process with the school librarian (Loertscher 2014, and Hockersmith, 2010). Testing schedules, classroom discipline, and increasing paperwork are all factors that increase the stresses of the teaching profession. The collaboration between the school librarian and the classroom teacher can help ease the pressure classroom teachers often feel. Hockersmith reported that “perhaps the most telling information was in the faculty perception that collaboration made a difference in the quality of their students’ products” (2010, p. 34).

Montiel-Overall states “through a shared vision and shared objectives, student learning opportunities are created that integrate subject content and informational literacy by co-planning, co-implementing, and co-evaluating students’ progress throughout the instructional process in order to improve student learning in all areas of the curriculum” (2005b, p.4). When teachers and school librarians work together on a unit students have a more positive experience. Increased curiosity, interest in additional resources, and extended learning opportunities are often the product of these positive experiences. Collaboration and coteaching improve student engagement and student achievement (Achterman & Loertscher, 2008; Branchard & Quinnwilliams, 2012; Cramer & Nevin, 2006; Lance, et al., 2010; & Maharaj, 2015).

In a qualitative study by Cate, the results showed that collaboration between a teacher and school librarian produced an improved learning experience. “The classroom teacher and library media specialist were able to create an instructional environment for the fifth grade students that was more than either created in isolation” (Cate, 1998, p. 262). Combining strengths of two education professionals utilizes the best of each to improve the outcome for the students. In a Baber Research Project of the American Library Association conducted Loertscher (2014), teacher who taught alone in the classroom reported 50% of their students met or exceeded the teachers’ expectations. In the same study, when teachers co-taught with the school librarian, teachers reported 70 – 100% of the students met or exceeded the teachers’ expectation on an assessment.

Mathematics and School Library Collaboration

In a study done by Subramaniam and Edwards (2014), it is reported that there is little collaboration between mathematics teachers and school librarians. In the study, school librarians reported a minimal level of collaboration by providing space, resources, and infusing mathematics standards into other content area projects. School librarians interviewed felt mathematics and school libraries were not a natural pairing. Mathematics teachers interviewed had a similar viewpoint and were “convinced that school librarians could only make contributions to content such as English, World Studies, etc.” (Subramaniam & Edwards, 2014, p. 194). Subramaniam and Edwards concluded that in order to increase the probability of collaboration between these two groups of educators, their perceptions of each other need to change (2014).

Perceptions

Understanding other educators' perception of school librarians is critical to cultivating communication, building professional relationships, enhancing collaboration, and ultimately improving student achievement. Often times, awareness of the roles and responsibilities of a school librarian and the services they can provide other educators are minimal. Research has been conducted that examines the perceptions that school administrators and teachers have of school librarians and their different roles.

Administrator Perceptions

According to Alexander, Smith, and Carey (2003), less than 10% of principals had received information about collaborating with school librarians in a college course. Principals who had obtained information on school libraries rated the importance of school libraries at a significantly higher rate than principals who had not. The researchers also found "the higher a principal rated the adequacy of funding, the higher a principal rated the overall importance of the SMLS" (p. 11). Page (2013) found the reason school administrators lack an understanding of the roles and responsibilities of a school librarian is because they do not receive training on this issue. School administrators who did have an understanding reported gaining this knowledge through personal experiences. Church (2007) found similar results reporting that administrators who understood the role of the school librarian pertaining to instruction did so because they had received information from the school librarian about the role. Principals in this study also indicated support for school librarians who taught instructional skills and were instructional partners.

Teachers Perceptions

A qualitative study in 2000, conducted by Hayden, interviewed three experienced middle school teachers and three preservice teachers. It was reported that while the participants recognized that school librarians had many roles, four of the participants did not know what those roles were. All of the participants indicated that their perceptions of the school librarians had been most heavily influenced by school librarians (Hayden, 2000).

Montiel-Overall and Jones (2011) examined 194 elementary teachers' perceptions of teacher and school librarian collaboration. This study found that teachers who rated low level collaborative activities as occurring frequently were more likely to rate those activities as important to student achievement. Teachers in this study also indicated that activities such as planning objectives, implementing lessons, and evaluating students were also important to student achievement, even though they were less likely to participate in this high level collaborative activities with their school librarian. While teachers routinely rated collaborating with school librarians at a high level of importance, teachers reported not sharing task responsibilities or evaluating students with low ratings. This indicates that much of the collaboration going on between school librarians and teachers are low level, traditional roles for school librarians. (Montiel-Overall & Jones, 2011).

Research conducted by Ragle in 2009 focused on the perceptions high school teachers have in regards to both the importance and practice of school librarians' roles and responsibilities. This study produced results that indicated overall high school

teachers saw the importance of a school librarian roles and responsibilities but did not always see them practiced. Ragle concluded that high school teachers “appear to understand the importance of implementing information literacy into the high school curriculum, collaborating with teachers to enhance student achievement, implementing technology into learning and teaching situations, and managing a library media program that supports a full range of services that supports all members within the learning community” (p. 107). While high school teachers understand the importance of these things, they are not seeing them being practiced. The researcher determined that educators who taught English language arts; career, technical, and agricultural education; and those with a higher level of education believe school librarians practice their roles proficiently. The same study determined that the most important and practiced role of the school librarian to be the use of technology and the least important and practiced to be the role of instructional consultant. (Ragle, 2009).

Summary

Based on the research done to date, effective collaboration between school librarians and classroom teachers can increase student achievement. In today’s society, the importance of a comprehensive STEM curriculum with mathematics as the cornerstone is crucial. Currently, there is little research being conducted on school library and mathematics collaboration. This study is a logical next step in understanding the view of mathematics teachers in relationship to collaborating with school librarians so that school librarians can better assist mathematics teachers and students.

Chapter 3 Methodology

The purpose of this study was to examine factors that influence the extent or willingness of middle school mathematics teachers to collaborate with school librarians. Factors influencing middle school mathematics teachers were measured in the following categories: the school librarian's professional skills, school librarian's instructional/teaching abilities, and school librarian's professional disposition. Middle school mathematics teachers' demographic information was also gathered to determine if there are professional characteristics that influence their level of collaboration. The study asked the participants if they have collaborated with a school librarian or would be willing to collaborate in the future.

Design

This research was designed using a descriptive, nonexperimental, cross-sectional survey methodology. Nonexperimental, cross-sectional survey research uses interviews or questionnaires to gather data from a sample of a target population. This data is used to make generalizations of the target population (Gall, Gall, & Borg, 2003). Surveys are widely used in educational research because of the ability to assess attitudes, opinions, and behaviors that are not directly observable (Creswell, 2015; Gall et al., 2003; Green, Camilli, & Elmore, 2009; Hartas, 2013). Survey research is unlike experimental and quasi-experimental research in that it does not test or give treatments to participants but describes and analyzes relationships and trends in the data. (Creswell, 2015; Hartas, 2013).

Surveys, in general, have many positive attributes, however, there are also some weaknesses that need to be considered. A drawback in surveys comes from one of the strengths, self-reporting. When a participant self-reports, there may actually be differences between their attitudes or opinions and their actions. Low response rates can also plague survey research. Poorly worded questions or survey statements that do not match the research problem or assume that all participants will interpret questions or survey statements in the same way can be problematic (Creswell, 2015; Gall et al., 2003; Green, et al., 2009; Hartas, 2013).

This study used a web-based survey. Web-based surveys have advantages and disadvantages. Chief advantages of using a web-based survey are administration costs are minimal, respondents are usually able to complete the survey in a short amount of time, and the researcher frequently receives the results sooner. Benefits also include the ability to reach a larger audience and a guarantee that participants have given consent. Survey programs can be used to not only protect confidentiality but to allow for an automatic transfer of the data to analysis programs that lead to fewer errors. Additional advantages for the participants are the ability to complete the survey at their own pace and at an opportune time. Technology issues, security problems, and identity fraud are weaknesses that need to be taken into account when using a web-based survey (Creswell, 2015; Gall et al., 2003; Green, et al., 2009; Hartas, 2013).

This research study examined what factors influence middle school mathematics educators' extent of and willingness to collaborate with school librarians. This is best done through the cross-sectional design of survey research because it is intended to "collect data about current attitudes, opinions, or beliefs" (Creswell, 2015, p. 380).

Creswell also states, “Instances where surveys are most suitable are to assess trends or characteristics of a population; learn about individual attitudes, opinions, beliefs, and practices; evaluating the successes or effectiveness of a program; or identify the needs of a community” (2015, p. 406). This research seeks to understand and identify what factors play a part in middle school mathematics educators’ willingness to collaborate with school librarians by utilizing both specific close-ended questions and exploratory, open-ended questions to gain an overall perspective on the current climate of collaboration (Hartas, 2013). A survey format that combines both closed and open-ended questions about knowledge, skills, behaviors, and dispositions allows a larger, more accurate picture to emerge. (Hartas, 2013).

Research Questions

The guiding question for this research was “What factors influence middle school mathematics educators’ extent or willingness to collaborate with the school librarian?” The participants were asked to rate their perceptions of the school librarian and the services offered in three areas: professional library skills, instructional and/or teaching abilities, and professional disposition. Three sub-questions were developed to look at three parts of a school librarian’s job and the middle school mathematics teachers’ demographic information to determine if these factors significantly influence the extent of or the willingness to collaborate on the part of the mathematics teacher.

1. Do the professional library skills of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?

2. Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?
3. Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?

This survey was given to 100 middle school mathematics teachers from one large urban public school district during a required teacher curriculum day meeting. The researcher addressed the teachers at a district mathematics teachers meetings, explained the research purpose, and the survey, instructions, and link for the survey was dispensed through the district email platform. The survey was emailed out to middle school mathematics teacher through the districts research department. The survey remained open for two weeks in order to give all the middle school mathematics teachers from the district an opportunity to participate.

Participants

The target population surveyed in this study was middle school mathematics teachers from a large accredited urban public school district located in the Midwest. The district serves over 50,000 students. Seventy percent of the total student population are minorities. Fifteen percent of the students are enrolled in the English as a Second Language (ESL) program with over 110 different languages being spoken, and over 2,000 student have refugee status. Seventy three percent of the students participate in the district's Free and Reduced-Price Lunch program (Nebraska Department of Education [NDE], 2016a).

Twelve middle schools in the district serve approximately 10,000 students. Seven middle schools serve students in grades six through eight. Three middle schools serve students in grade five through eight and two schools serve students in only the 7th and 8th grades. Middle schools in the district have populations that range in size from approximately 580 to 1350 students. This study surveyed teachers who teach 5th, 6th, 7th, and/or 8th grade mathematics classes. The classes taught included grade level courses Math 5, Math 6, Math 7, and Pre-Algebra (8th grade) to advanced courses including Pre-Algebra, Algebra 1-2, and Geometry 1-2 (NDE, 2015b).

For the district to meet state accreditation requirements, middle school mathematics teachers must have one of several certifications. Teachers certified in middle level education may teach grades 5 through 9 in their endorsement areas. To be certified, teachers must complete their professional education courses and at least 24 semester hours in mathematics. Teachers may meet the state requirements by holding a secondary education certification which permits them to teach grades 6 through 12. In addition to professional education courses, teachers holding this certification have completed a minimum of 36 semester hours in mathematics (NDE, 2016b).

One of the requirements of a school seeking the accreditation by the Nebraska Department of Education is to employ a certified school librarian. Schools with a population greater than 500 students “have at least a full-time educational media specialist or a one-half time educational media specialist and a full-time library media paraprofessional” (NDE, 2015a, p. 24). The school librarian is required to be certified to teach in the state of Nebraska with a school library endorsement or a provisional school library endorsement. All teachers involved in this study work in a building that has a

full-time certified school librarian. The following is a table indicating school-by-school the grades taught, size of the student population, and the number of math teachers.

Table 3

Public Middle School Demographic Data

School	Grades	Student Population	# of Math Teachers
School A	6,7,8	676	7
School B	5,6,7,8	1144	12
School C	7,8	613	6
School D	7,8	825	6
School E	6,7,8	582	8
School F	5,6,7,8	607	7
School G	6, 7,8	826	7
School H	6,7,8	774	6
School I	6,7,8	811	8
School J	6,7,8	748	7
School K	6,7,8	1113	13
School L	5,6,7,8	1355	14
Total			101

Construct Validity

After reviewing the literature, two studies emerged with similar characteristics to the proposed study. Ragle (2009) used McCracken's 2000 survey to measure high school teachers' perceptions of school librarians. Howell (2010) surveyed middle school teachers' perceptions on collaboration with school librarians. This study intended to investigate factors that influence middle school mathematics teachers' extent of or willingness to collaborate with school librarians so the researcher chose to combine and modify the two instruments. The researcher used relevant components of the two surveys and adapted the language to make it specific to middle school mathematics educators.

According to Green, et al., (2009) "construct validity refers to how well a specific measure reflects the theoretical construct it is assumed to measure" (p. 634). To ensure the construct validity of the new survey created for this research, several measures were taken. The survey was first shared with a group of five subject area experts who are all certified school librarians and doctoral candidates in the area of educational leadership. The feedback from this group assisted the researcher in eliminating several survey questions, leaving only the most relevant to the study. This resulted in 22 rating scale questions from McCracken, five frequency and open-ended questions from Howell, seven demographic items and one original open-ended question.

The survey was then reviewed by a survey development specialist from the University of Nebraska at Omaha. Recommendations for adjustments to the McCracken (2000) and Howell (2010) surveys included adding vocabulary to make the items specific to mathematics curriculum, clarifying items to match the research sub questions, and

making adjustments to the subheading. Feedback also included modifying the language of the ordinal scale options that accompany each item. Two mathematics content experts were then consulted, a professor from the University of Nebraska at Omaha who specializes in STEM integration and teacher professional development, and the Secondary Education Mathematics Supervisor for the school district where the research will take place. Independently, both professionals concurred with the language of the survey items and suggested no modifications.

A pilot survey was conducted with a small group of certified mathematics teachers who did not participate in the research survey. The selected certified teachers completed the pilot survey in the spring of 2017. The pilot survey received positive feedback from the respondents. The teachers' comments indicated the questions were easy to understand and the answer choices were appropriate. One respondent suggested a different order to the questions to make the survey more cohesive. Another teacher suggested providing a definition of collaboration with the directions to help clarify the overall survey for the participants. Both changes were implemented in the final version of the survey.

Prior to administering the research survey, approval of the research was given by the district's Research Division Committee. The approval process consisted of submitting a formal request for research that complied with all district guidelines, a consent form containing detailed information regarding the proposed research, and a letter from the sponsoring university. The review committee approved this study in the summer of 2017.

Limitations

This research study was limited to middle school mathematics teachers from one large urban public school district. All research participants are employed by the one large urban school district which may limit the interpretation of the study results and further limit the generalizations of the findings. The researcher of this study is currently a school librarian and a former mathematics teacher with the school district. Surveys that rely on self-reporting may acquire results about attitudes or opinions from participants that are different from their actions.

Data Collection

The delivery of the Qualtrics Research Suite (Qualtrics) survey relied on the use of the district's email platform, Microsoft's Office 365. The researcher opted to use Qualtrics as the method of data collection for two reasons: Qualtrics is a secured, hosted platform that has the ability to export data into multiple formats. Qualtrics gave the researcher the capability to collect, export, and analyze the data quickly and easily. All the data gathered was secured through the University of Nebraska at Omaha's regulated Data File Server. The Regulated Data File Server is a service Information Technology Services provided for the storage of Regulated Data. This server met the technical requirements necessary for the storage of Regulated Data.

Data Analysis

Descriptive statistics were used to simplify, organize, and summarize the data using frequency tables and the percentages. Trends and patterns in the frequencies and

percentages were observed for the variables pertaining to middle school mathematics teachers:

- Extent of collaboration
- Willingness to collaborate
- School librarian's professional skills
- School librarian's instructional and/or teaching abilities.
- School librarian's professional disposition.

Summary

The goal of this research study was to investigate factors that influence middle school mathematics teachers' extent of or willingness to collaborate with school librarians. For this research study, quantitative data was collected from middle school mathematics teachers from one large urban public school district located in the Midwest. Participants answered survey questions about the extent of collaboration that occurs with their school librarian, their willingness to collaborate with the school librarian, the school librarians' professional library skills, instructional/teaching abilities, and professional disposition. The data was analyzed using descriptive statistics.

Chapter 4

The purpose of the research was to examine factors that influence the extent or willingness of middle school mathematics teachers to collaborate with school librarians. Factors influencing middle school mathematics teachers were measured in the following categories: the school librarian's professional skills, school librarian's instructional and/or teaching abilities, and school librarian's professional disposition. Middle school mathematics teachers' demographic information was also gathered to determine if there are professional characteristics that influence their level of collaboration. This chapter addresses the results of the research question "What factors influence middle school mathematics educators' extent or willingness to collaborate with the school librarian?"

Respondents to the Survey

A total of fifty-two middle school mathematics teachers responded to the survey. Fourteen respondents, 27.45%, have been classroom teachers for 0 – 5 years. Eight respondents, 15.69%, have been classroom teachers for 6 – 10 years, while sixteen respondents, 31.31%, have been classroom teachers for 11 – 15 years. Nine respondents, 17.65%, have been classroom teachers for 16 – 20 years and four respondents, 7.84%, have been classroom teachers for 21 or more years (see table 4).

Table 4

Respondent Data by Years of Classroom Experience

Years As a Classroom Teacher	Answer	Number	Percent
	0 – 5 years	14	27.45
	6 – 10 years	8	15.69
	11 – 15 years	16	31.37
	16 – 20 years	9	17.65
	21 + years	4	7.84
Total		51	100

Twenty-three respondents, 44.23%, received their initial teaching certificate in elementary education. Fifteen respondents, 28.85% received their initial teaching certificate in middle school education and fourteen respondents, 26.92%, received their initial teaching certificate in secondary education (see table 5).

Table 5

Respondent Data by Initial Teaching Certificate

Initial Teaching Certificate	Answer	Number	Percent
	Elementary	23	44.23
	Middle School	15	28.85
	Secondary	14	26.92
Total		52	100

Out of fifty-two respondents, twenty had received formal training in collaboration during their preservice education in one or more settings. Formal training in collaboration occurred most often during methods classes. Twenty eight respondents, 31.82%, indicated that they received formal training in collaboration during their education methods courses. Seventeen respondents, 19.32%, received formal training in collaboration during classroom visits and twenty four respondents, 27.27%, received formal training in collaboration during student teaching. Nineteen respondents, 21.59%, did not receive formal training in collaboration during their preservice education (see table 6).

Table 6

Respondent Data by Formal Training in Collaboration During Preservice Education

Formal Training in Collaboration During Preservice Education	Answer	Number	Percent
	Yes – During Methods Classes	28	31.28
	Yes – During Classroom Visits	17	19.32
	Yes – During Student Teaching	24	27.27
	No	19	21.59
Total		88	100

As shown in table 7, nineteen respondents had received professional development on collaboration since graduation in one or more settings. Professional development on collaboration occurred most often through the respondents' school building or district. Thirty seven respondents, 47.44%, indicated that they received professional development on collaboration through their school building or district offerings. Eighteen respondents, 23.08%, received professional development in collaboration through a professional conference and fourteen respondents, 17.95%, conducted their own research to gain professional development on collaboration. Nine respondents, 11.54%, have not experienced any professional development in collaboration.

Table 7

Respondent Data by Professional Development on Collaboration

Received Professional Development on Collaboration Since Graduation	Answer	Number	Percent
	Yes – Through a Professional Conference	18	23.08
	Yes – Through My Building and/or District	37	47.44
	Yes – Through My Own Research	14	17.95
	No	9	11.54
Total		78	100

Out of fifty-two respondents, seven currently teach more than one grade level. Six respondents, 10.17%, teach fifth grade. Sixteen respondents, 27.12%, teach sixth grade. Nineteen respondents, 32.20%, teach seventh grade and eighteen respondents, 30.51%, teach eighth grade (see table 8).

Table 8

Respondent Data by Grade Level Assignment

Grade Level	Answer	Number	Percent
	5 th	6	10.17
	6 th	16	27.12
	7 th	19	32.20
	8 th	18	30.51
Total		59	100

Thirty eight respondents teach more than one mathematics course. In fifth grade, six respondents, 5.66%, teach Math 5; two respondents, 1.89%, teach Math 5 Honors; and one respondent, 0.94%, teaches Math 5 with a special education co-teacher. In sixth grade, twelve respondents, 11.32%, teach Math 6; six respondents, 5.66%, teach Math 6 Honors; and eight respondents, 7.55%, teach Math 6 with a special education co-teacher. Sixteen respondents, 15.09%, teach Math 7, while six respondents, 5.66%, teach Math 7 with a special education co-teacher. Sixteen respondents, 15.09%, teach Pre-Algebra and six respondents, 5.66%, teach Pre-Algebra Honors. Seven respondents, 6.60%, teach Pre-Algebra with a special education co-teacher. Sixteen respondents, 15.09%, teach Algebra 1 – 2, while four respondents, 3.77%, teach Geometry 1 – 2. Algebra 1 – 2 and Geometry 1 – 2 are equivalent to the course taught at the high school level (see table 9).

Table 9

Respondent Data by Course Taught

Course Taught	Answer	Number	Percent
	Math 5	6	5.66
	Math 5 Honors	2	1.89
	Math 5 Co-teach	1	0.94
	Math 6	12	11.32
	Math 6 Honors	6	5.66
	Math 6 Co-teach	8	7.55
	Math 7	16	15.09
	Math 7 Co-teach	6	5.66
	Pre-Algebra	16	15.09
	Pre-Algebra Honors	6	5.66
	Pre-Algebra Co-teach	7	6.60
	Algebra 1 – 2	16	15.09
	Geometry	4	3.77
Total		106	100

Information literacy skills include the ability to access, evaluate, and use information from a variety of sources. As shown in table 10, ten respondents, 19.23%, believe the content of the mathematics classes they teach require information literacy skills “a lot” of the time. Seventeen respondents, 32.69%, believe the content of the mathematics classes they teach require information literacy skills “a moderate amount” of the time. Seventeen respondents, 32.69%, believe the content of the mathematics classes they teach require information literacy skills “a little” of the time. Seven respondents, 13.46%, believe the content of the mathematics classes they teach never require information literacy skills and one respondent, 1.92%, did not know if information literacy skills were needed for the classes they teach. Forty-four respondents, 84.61%, believe that information literacy skills are need to some extent in the classes they teach ranging from “a little” to “a lot.”

Table 10

Respondent Data by Belief in the Need for Information Literacy Skills

Content of Class(es) Require Information Literacy Skills	Answer	Number	Percent
	A lot	10	19.23
	A Moderate Amount	17	32.69
	A little	17	32.69
	None at all	7	13.46
	I don't know	1	1.92
Total		52	100

Of the fifty-one respondents who answered this survey question, twelve respondents, 23.53%, were male. Thirty six, 70.59%, of the respondents were female. Three respondents, 5.88%, preferred not to indicate a gender (see table 11).

Table 11

Respondent Data by Gender

Gender	Answer	Number	Percent
	Male	12	23.53
	Female	36	70.59
	Prefer not to say	3	5.88
Total		51	100

Willingness To and/or Extent of Collaboration

Collaboration is commonly defined as the work between two educators in order to improve instruction (Maharaj, 2015). Collaborative works span a continuum from coordination, in which colleagues work together to make their individual endeavors run smoothly to integrated curriculum. According to Montiel-Overall (2005), low level collaboration often occurs when coworkers come together to coordinate activities, share space and resources, or eliminate duplicated pursuits. High level collaboration involves teachers and school librarians merging their curriculums and working in partnership to create learning experiences for students that are superior to what they would have made alone.

As shown in table 12, twenty one respondents, 39.62%, reports never utilizing the basic service of the school librarian, such as gathering resources or access technology, in a school year. Nine respondents, 16.98%, report utilizing the service of the school librarian once a year. Ten respondents, 18.87%, report utilizing the services of the school librarian twice a year. Nine respondents, 16.98%, utilize the services of the school librarian three to five times a year and four respondents reported using the school librarians services more than six times a year.

Table 12

Approximate Number of Times Respondents Utilize School Library Basic Services

Times Basic Services of the School Librarian Are Used in a School Year	Answer	Number	Percent
	0	21	39.62
	Once	9	16.98
	Twice	10	18.87
	3 – 5 times	9	16.98
	6 or more	4	7.55
Total		53	100

Thirty nine respondents, 75.00%, report never collaborating with the school librarian for instructional purposes. Seven respondents, 13.46%, report collaborating with the school librarian for instructional purposes once a year. Three respondents, 5.77%, report collaborating with the school librarian twice a year for instructional purposes and three respondents, 5.77%, reported collaborating three to five times a year. No middle school mathematics teachers reported collaborating for instructional purposes six or more times a year with their school librarian (see table 13).

Table 13

Number of Times Respondents Collaborated with School Librarian for Instructional Purposes

Times Collaborated with School Librarian for Instructional Purposes	Answer	Number	Percent
	0	39	75.00
	Once	7	13.46
	Twice	3	5.77
	3 – 5 times	3	5.77
	6 or more	0	0.00
Total		52	100

Of the fifty-one respondents, eight respondents, 15.69%, would never consider collaborating with the school librarian in the future. Two respondents, 3.92%, would consider collaborating with the school librarian once a year in the future. Nineteen respondents, 37.25%, would consider collaborating with the school librarian twice a year, while twelve respondents, 23.53%, would consider collaborating three to five times a year in the future. Ten respondents, 19.61%, would consider collaborating with the school librarian six or more time a school year in the future (see table 14). Overall, 84.31% of middle school mathematics teachers surveyed would consider collaborating with the school librarian in the future.

Table 14

<i>Number of Times Respondents Would Consider Collaborating with the School Librarian in the Future</i>			
Times Collaboration Would be Considered in the Future	Answer	Number	Percent
	0	8	15.69
	Once	2	3.92
	Twice	19	37.25
	3 – 5 times	12	23.53
	6 or more	10	19.61
Total		51	100

Summary of the Results for Survey Items Related to the Middle School

Mathematics Teachers' Extent or Willingness to Collaborate with the School

Librarian

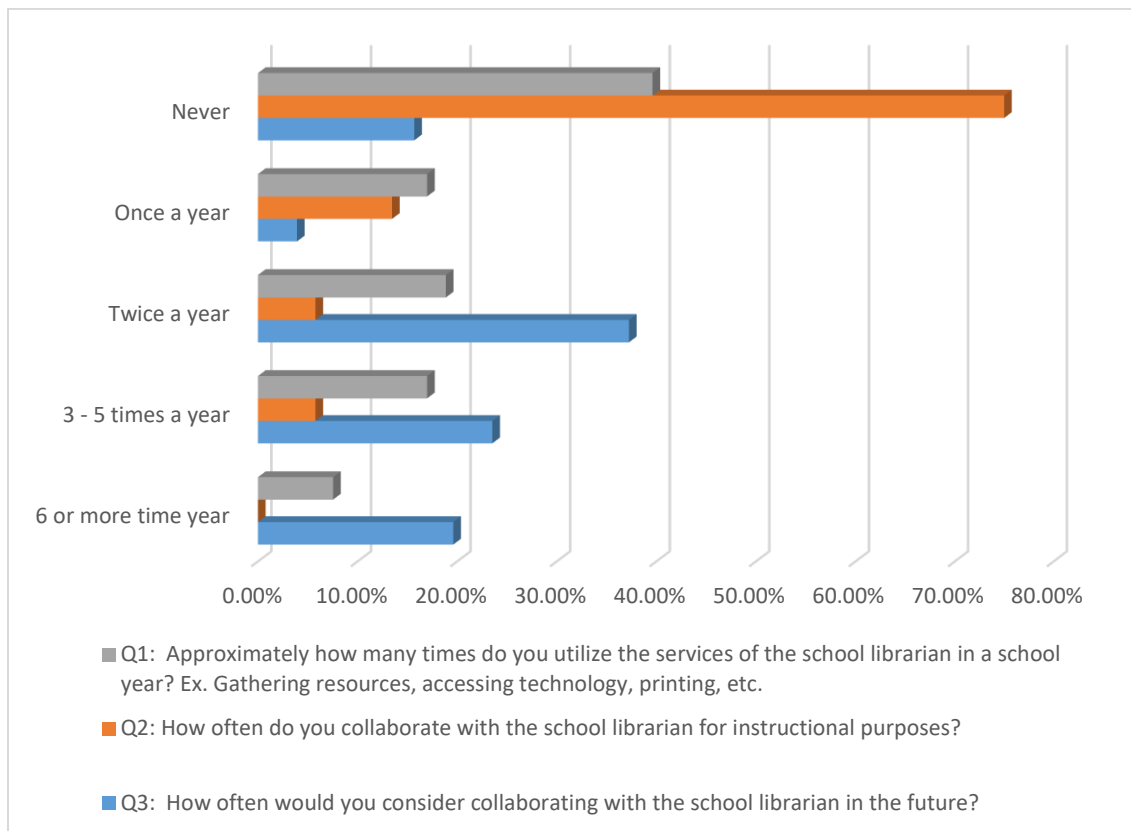


Figure 5. Results for Survey Items 1, 2, & 3

Results for Survey Items Related to Research Sub-Question 1

Do the professional library skills of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?

Survey respondents were asked five questions regarding their perceptions of school librarians' professional library skills.

Of the fifty-one survey respondents, no respondents strongly agreed that their school library program maintains a collection of resources that meet the goals and objectives of the mathematics curriculum. Seven respondents, 13.73%, agreed with the statement and fifteen respondents, 29.41%, had a neutral opinion of the statement. Six respondents, 11.76%, disagreed and two respondents, 3.92%, strongly disagreed with the statement. The majority of respondents, twenty-one or 41.18%, did not know if the school library program maintains a collection of resources that meet the goals and objectives of the mathematics curriculum (see table 15).

Table 15

Mathematics Teachers' Perceptions of the School Library Program's Collection of Resources that Meet the Goals/Objectives of the Mathematics Curriculum

Answer	Number	Percent
Strongly Agree	0	0.00
Agree	7	13.73
Neutral	15	29.41
Disagree	6	11.76
Strongly Disagree	2	3.92
I Don't Know	21	41.18
Total	51	100

As shown in table 16, three respondents, 5.77%, strongly agreed with the statement, “As a math teacher, I believe the school librarian assists students and staff in identifying appropriate information resources for mathematics.” Ten respondents, 19.23%, agreed with the statement while ten respondents, 19.23%, were neutral about the statement. Sixteen respondents, 30.77%, disagreed with the statement and one respondents, 1.92%, strongly disagreed with the statement. Twelve respondents, 23.08%, selected “I don’t know” for the statement “As a math teacher, I believe the school librarian assists students and staff in identifying appropriate information resources for mathematics.”

Table 16

Mathematics Teachers' Perceptions of the School Librarian's Ability to Assist Students and Staff in Identifying Appropriate Resources for Mathematics

Answer	Number	Percent
Strongly Agree	3	5.77
Agree	10	19.23
Neutral	10	19.23
Disagree	16	30.77
Strongly Disagree	1	1.92
I Don't Know	12	23.08
Total	52	100

Out of the fifty-one survey respondents, one respondents, 1.96%, strongly agreed with the statement “The school library program promotes competency in information literacy across the mathematics curriculum.” Seven respondents, 13.73%, agreed with the statement and sixteen respondents, 31.37%, were neutral about the statement. Nine respondents, 17.65%, disagreed and one respondent, 1.96%, strongly disagreed with the statement. Seventeen respondents, 33.33%, replied “I don’t know” to the statement “The school library program promotes competency in information literacy across the mathematics curriculum” (see table 17).

Table 17

Mathematics Teachers' Perceptions of the School Library Program's Promotion of Competency in Information Literacy Across the Mathematics Curriculum

Answer	Number	Percent
Strongly Agree	1	1.96
Agree	7	13.73
Neutral	16	31.37
Disagree	9	17.65
Strongly Disagree	1	1.96
I Don't Know	17	33.33
Total	51	100

As shown in table 18, three respondents, 5.77%, strongly agreed with the statement “As a math teacher, I believe the school librarian guides and assists teachers in evaluating and selecting appropriate informational and instructional resources for mathematics.” Eight respondents, 15.38%, agreed while eight respondents, 15.38%, also were neutral towards the statement. The majority of respondents, twenty or 38.46%, disagreed with the statement “As a math teacher, I believe the school librarian guides and assists teachers in evaluating and selecting appropriate informational and instructional resources for mathematics.” Two respondents, 3.85%, strongly disagreed with the statement and eleven respondents, 21.15%, selected the “I don’t know” response.

Table 18

Mathematics Teachers' Perceptions of the School Librarian Guiding and Assisting Teachers in Evaluating and Selecting Resources for Mathematics

Answer	Number	Percent
Strongly Agree	3	5.77
Agree	8	15.38
Neutral	8	15.38
Disagree	20	38.46
Strongly Disagree	2	3.85
I Don't Know	11	21.15
Total	52	100

Of the fifty-two survey respondents, eight respondents, 15.38%, strongly agreed with the statement, “The school librarian is given the opportunity to present information literacy skills to teachers as essential to learning in all subject areas.” Fourteen respondents, 26.92%, agreed with the statement while ten respondents, 19.23%, were neutral. Eleven respondents, 21.15%, disagreed with the statement and two respondents, 3.58%, strongly disagreed with the statement. Seven respondents, 13.46%, responded “I don’t know” to the statement, “The school librarian is given the opportunity to present information literacy skills to teachers as essential to learning in all subject areas” (see table 19).

Table 19

Mathematics Teachers' Perceptions of the School Librarian's Opportunity to Present Information Literacy Skills to Teachers as Essential Learning in All Subjects

Answer	Number	Percent
Strongly Agree	8	15.38
Agree	14	26.92
Neutral	10	19.23
Disagree	11	21.15
Strongly Disagree	2	3.85
I Don't Know	7	13.46
Total	52	100

Summary of the Results for Survey Items Related to Research Sub-Question 1: Do the professional library skills of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?

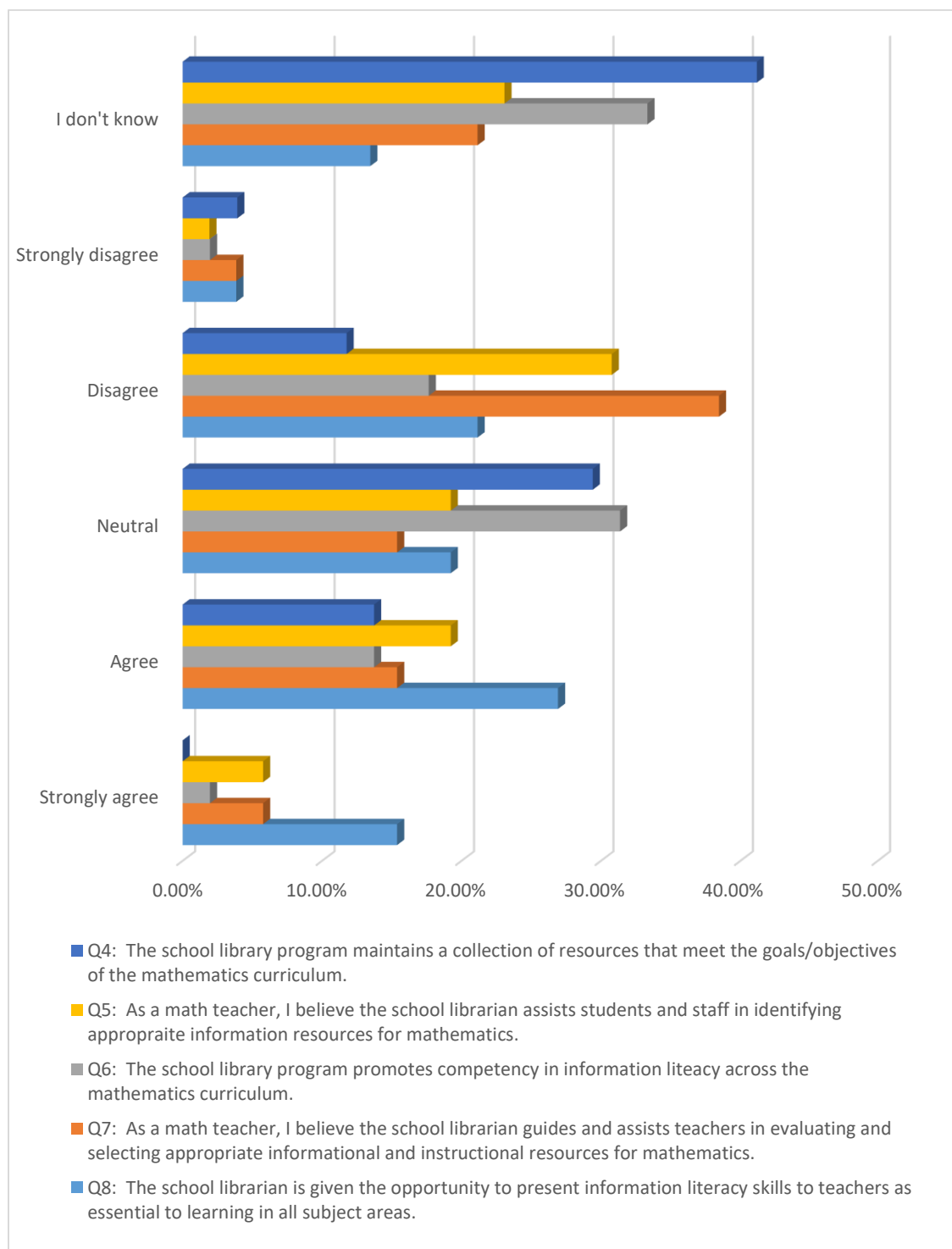


Figure 6. Results for Survey Items 4, 5, 6, 7, & 8

Results for Survey Items Related to Research Sub-Question 2

Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?

Survey respondents were asked nine questions regarding their perceptions of school librarians' instructional and/or teaching abilities.

As shown in table 20, three respondents, 5.88%, strongly agree with the statement, "The school library program models the use of the appropriate assessments used in evaluating student work, especially when learning objectives include various types of media." Eleven respondents, 21.57%, agreed with the statement while eleven respondents, 21.57%, also were neutral towards the statement. Five respondents, 9.80%, disagreed with the statement and two respondents, 3.92%, strongly disagreed with the statement. The majority of the respondents, nineteen or 37.25%, responded "I don't know" to the statement, "The school library program models the use of the appropriate assessments used in evaluating student work, especially when learning objectives include various types of media."

Table 20

Mathematics Teachers' Perceptions of the School Library Program's Modeling of the Use of Appropriate Assessments When Evaluating Student Work, Especially When Learning Objectives included Various Types of Media

Answer	Number	Percent
Strongly Agree	3	5.88
Agree	11	21.57
Neutral	11	21.57
Disagree	5	9.80
Strongly Disagree	2	3.92
I Don't Know	19	37.25
Total	51	100

Of the fifty-one respondents, five respondents, 9.80%, strongly agreed with the statement, “The school library program is able to adapt and modify learning activities based on feedback gained from observations and interactions with students.” The majority of respondents, twenty-one or 41.18%, agreed with the statement. Ten respondents, 19.61%, were neutral towards the statement and one respondent, 1.96%, disagreed with the statement. One respondent, 1.96%, strongly disagreed with the statement while thirteen respondents, 25.49%, responded “I don’t know” to the statement, “The school library program is able to adapt and modify learning activities based on feedback gained from observations and interactions with students” (see table 21).

Table 21

Mathematics Teachers' Perceptions of the School Library Program's Ability to Adapt and Modify Learning Activities Based on Feedback

	Answer	Number	Percent
	Strongly Agree	5	9.80
	Agree	21	41.18
	Neutral	10	19.61
	Disagree	1	1.96
	Strongly Disagree	1	1.96
	I Don't Know	13	25.49
Total		51	100

As shown in table 22, fourteen respondents, 27.45%, strongly agreed with the statement, “The school library program models and promotes the effective uses of technology for teaching and learning.” Twenty-three respondents, 45.10%, agreed with the statement and nine respondents, 17.65%, were neutral towards the statement. One respondent, 1.96%, disagreed with the statement and no respondents strongly disagreed. Four respondents, 7.84%, answered “I don’t know” to the statement, “The school library program models and promotes the effective uses of technology for teaching and learning.”

Table 22

Mathematics Teachers' Perceptions of the School Library Program's Promotion and Effective Use of Technology for Teaching and Learning

Answer	Number	Percent
Strongly Agree	14	27.45
Agree	23	45.10
Neutral	9	17.65
Disagree	1	1.96
Strongly Disagree	0	0
I Don't Know	4	7.84
Total	51	100

Of fifty respondents, seven respondents, 14.00%, strongly agreed with the statement, “The school library program works closely with teachers in designing authentic learning tasks.” The majority of respondents, sixteen or 32.00%, agreed with the statement. Seven respondents, 14.00%, were neutral to the statement. Nine respondents, 18.00%, disagreed with the statement while two respondents, 4.00%, strongly disagreed. Nine respondents, 18.00%, replied “I don’t know” to the statement, “The school library program works closely with teachers in designing authentic learning tasks” (see table 23).

Table 23

Mathematics Teachers' Perceptions of the School Library Program's Practice of Working Closely with Teachers in Designing Authentic Learning Tasks

Answer	Number	Percent
Strongly Agree	7	14.00
Agree	16	32.00
Neutral	7	14.00
Disagree	9	18.00
Strongly Disagree	2	4.00
I Don't Know	9	18.00
Total	50	100

As shown in table 24, ten respondents, 19.61%, strongly agreed with the statement, “The school library program models collaboration by working with other teachers.” The majority of respondents, thirty or 58.52%, agreed with the statement. Five respondents, 9.80%, were neutral to the statement, while three respondents, 5.88%, disagreed with the statement. No respondents felt strongly about the statement. Three respondents, 5.88%, replied “I don’t know” to the statement, “The school library program models collaboration by working with other teachers.”

Table 24

Mathematics Teachers' Perceptions of the School Library Programs Practice of Modeling Collaboration by Working with Other Teachers

Answer	Number	Percent
Strongly Agree	10	19.61
Agree	30	58.82
Neutral	5	9.80
Disagree	3	5.88
Strongly Disagree	0	0.00
I Don't Know	3	5.88
Total	51	100

Out of fifty-two survey respondents, six respondents, 11.54%, strongly agreed and twenty respondents, 38.46%, agreed with the statement, “The school library program provides the opportunity to create independent teaching and learning activities that reflect the best in current research and practice.” Ten respondents, 19.23%, were neutral towards the statement. Four respondents, 7.69%, disagreed and no respondents strongly disagreed with the statement. Twelve respondents, 23.08%, answered “I don’t know” to the statement, “The school library program provides the opportunity to create independent teaching and learning activities that reflect the best in current research and practice” (see table 25).

Table 25

Mathematics Teachers' Perceptions of the School Library Program Ability to Create Independent Teaching and Learning Activities Reflective of Best Practice

Answer	Number	Percent
Strongly Agree	6	11.54
Agree	20	38.46
Neutral	10	19.23
Disagree	4	7.69
Strongly Disagree	0	0.00
I Don't Know	12	23.08
Total	52	100

Seven respondents, 14.00%, strongly agreed with the statement, “The school library program exhibits collaboration by working with teachers to design and implement teaching and learning activities that reflect the best in current research and practice.” The majority of respondents, twenty-one or 42.00%, agreed with the statement. Eight respondents, 16.00%, were neutral towards the statement while five respondents, 10.00%, disagreed. No respondents strongly disagreed with the statement. Nine respondents, 18.00%, replied “I don’t know” to the statement, “The school library program exhibits collaboration by working with teachers to design and implement teaching and learning activities that reflect the best in current research and practice” (see table 26).

Table 26

Mathematics Teachers' Perceptions of the School Library Program Exhibiting Collaboration by Working with Teachers to Design and Implement Activities that Reflect Best Practice

	Answer	Number	Percent
	Strongly Agree	7	14.00
	Agree	21	42.00
	Neutral	8	16.00
	Disagree	5	10.00
	Strongly Disagree	0	0.00
	I Don't Know	9	18.00
Total		50	100

As shown in table 27, nine respondents, 18.00%, strongly agreed and twenty-two respondents, 44.00%, agreed with the statement, “The school library program promotes collaborating with teachers to ensure students develop higher level thinking skills for the organization, evaluation, and use of information and ideas.” Nine respondents, 18.00%, were neutral to the statement and two respondents, 4.00%, disagreed with the statement. No respondents strongly disagreed with the statement. Eight respondents, 16.00%, answered “I don’t know” to the statement, “The school library program promotes collaborating with teachers to ensure students develop higher level thinking skills for the organization, evaluation, and use of information and ideas.”

Table 27

Mathematics Teachers' Perceptions of the School Library Programs Promotion of Collaborating with Teachers to Ensure Students Develop Higher Level Thinking Skills for the Organization, Evaluation, and Use of Information and Ideas

Answer	Number	Percent
Strongly Agree	9	18.00
Agree	22	44.00
Neutral	9	18.00
Disagree	2	4.00
Strongly Disagree	0	0.00
I Don't Know	8	16.00
Total	50	100

Ten respondents, 19.61%, out of fifty-one total respondents, strongly agreed with the statement, “As a math teacher, I believe the school librarian is familiar with mathematics curriculum and standards.” Six respondents, 11.76%, agreed with the statement while two respondents, 3.92%, were neutral to the statement. The majority of the respondents, twenty-one or 41.18%, disagreed with the statement. Three respondents, 5.88%, strongly disagreed while nine respondents, 17.65%, replied “I don’t know” to the statement, “As a math teacher, I believe the school librarian is familiar with mathematics curriculum and standards” (see table 28).

Table 28

*Mathematics Teachers' Perceptions of the School Librarian's Knowledge of
Mathematics Curriculum and Standards*

Answer	Number	Percent
Strongly Agree	10	19.61
Agree	6	11.76
Neutral	2	3.92
Disagree	21	41.18
Strongly Disagree	3	5.88
I Don't Know	9	17.65
Total	51	100

Summary of the Results for Survey Items Related to Research Sub-Question 2: Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate? Part A

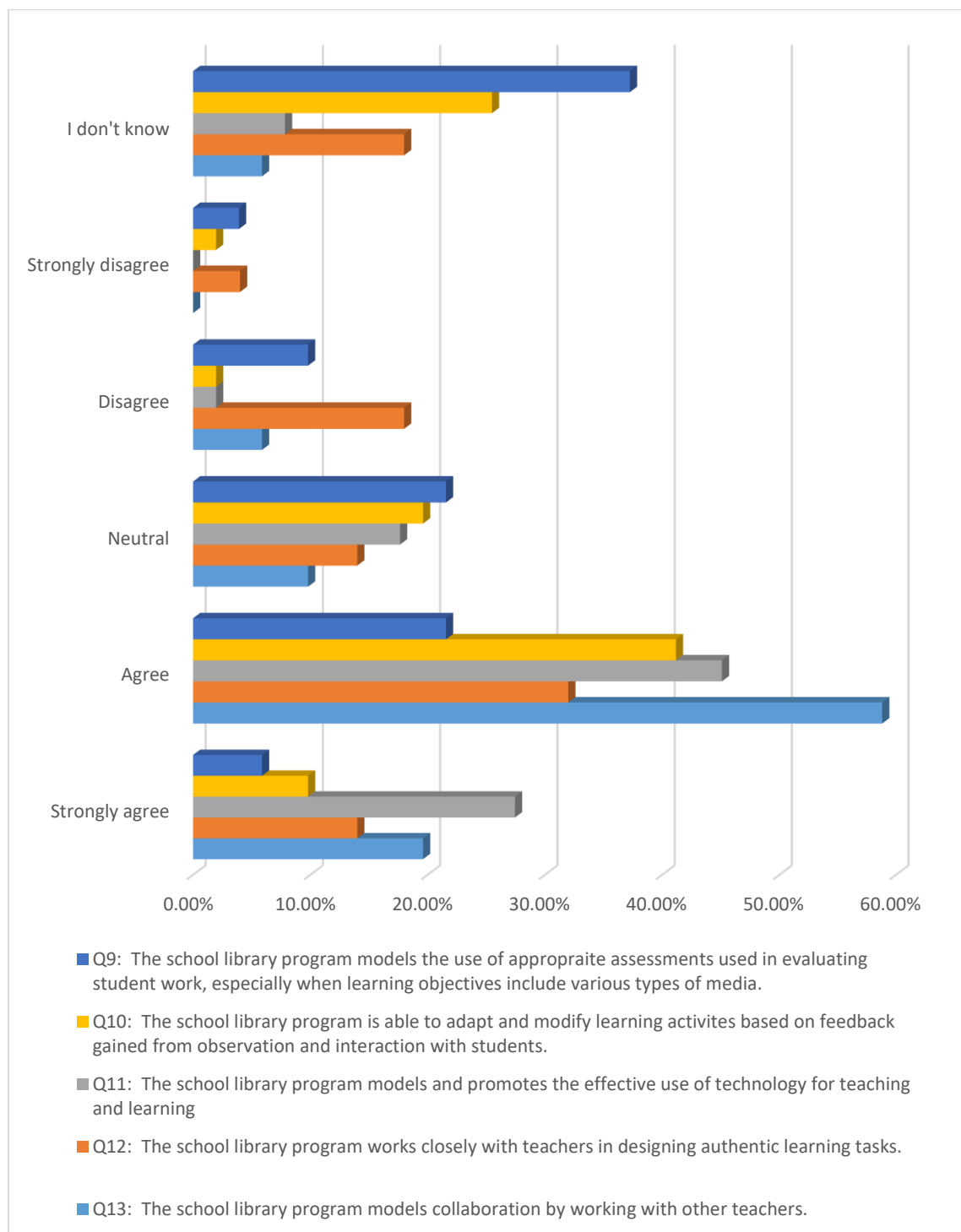


Figure 7. Results for Survey Items 9, 10, 11, 12, & 13

Summary of the Results for Survey Items Related to Research Sub-Question 2: Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate? Part B

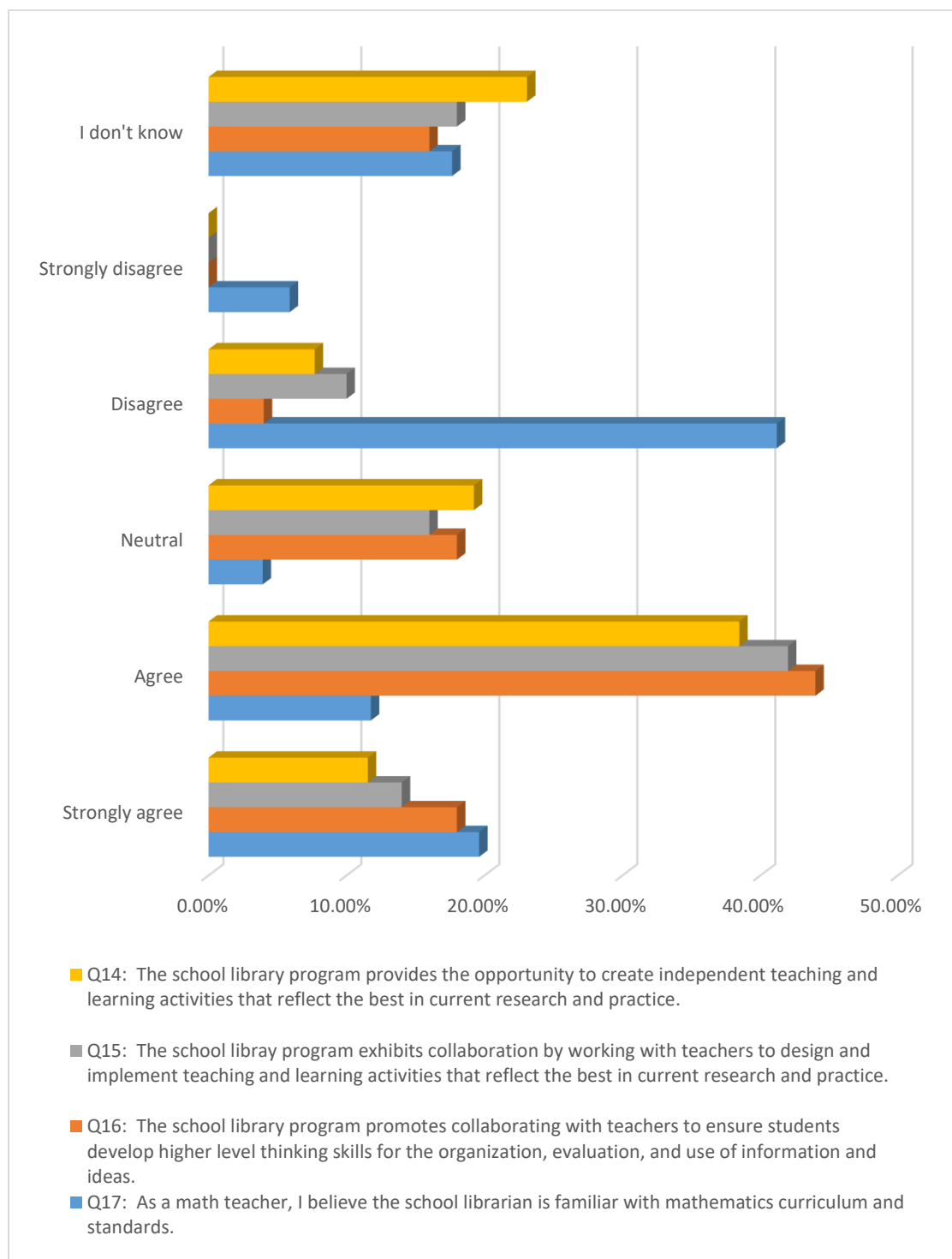


Figure 8. Results for Survey Items 14, 15, 16, & 17

Results for Survey Items Related to Research Sub-Question 3

Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?

Survey respondents were asked seven questions regarding their perceptions of school librarians' professional dispositions.

One respondent, 1.96%, out of fifty-one total survey respondents, strongly agreed with the statement, "The school library program effectively communicates about available resources related to the math curriculum." Eight respondents, 15.69%, agreed with and eight respondents, 15.69%, were neutral towards the statement. The majority of respondents, twenty-two or 43.14%, disagreed with the statement while five respondents, 9.80%, strongly disagreed. Seven respondents, 13.73%, answered "I don't know" to the statement, "The school library program effectively communicates about available resources related to the math curriculum" (see table 29).

Table 29

Mathematics Teachers' Perceptions of the School Library Program's Ability to effectively Communicate About Available Resources Related to the Math Curriculum

Answer	Number	Percent
Strongly Agree	1	1.96
Agree	8	15.69
Neutral	8	15.69
Disagree	22	43.14
Strongly Disagree	5	9.80
I Don't Know	7	13.73
Total	51	100

As shown in table 30, five respondents, 9.80%, strongly agreed with the statement, “As a math teacher, I believe the school librarian has approached me about collaborating on a lesson or unit.” Seven respondents, 13.73%, agreed with the statement while one respondent, 1.96%, was neutral towards the statement. The majority of the respondents, twenty-seven or 52.94%, disagreed with the statement and eleven respondents, 21.57%, strongly disagreed. No respondents replied “I don’t know” to the statement, “As a math teacher, I believe the school librarian has approached me about collaborating on a lesson or unit.”

Table 30

Mathematics Teachers' Perceptions of the Outreach of School Librarian in Regards to Collaboration on a Lesson or Unit

	Answer	Number	Percent
	Strongly Agree	5	9.80
	Agree	7	13.73
	Neutral	1	1.96
	Disagree	27	52.94
	Strongly Disagree	11	21.57
	I Don't Know	0	0.00
Total		51	100

Of fifty-one respondents, four respondents, 7.84%, strongly agreed with the statement, “As a math teacher, I have met with the school librarian individually about my subject area.” Eight respondents, 15.69%, agreed with the statement and one respondent, 1.96%, was neutral towards the statement. Twenty-eight respondents, 54.90%, disagreed with the statement and nine respondents, 17.65%, strongly disagreed. One respondent, 1.96%, replied “I don’t know” to the statement, “As a math teacher, I have met with the school librarian individually about my subject area” (see table 31).

Table 31

*Mathematics Teachers' Perceptions of Communication with the School Librarian
About the Subject Area of Mathematics*

	Answer	Number	Percent
	Strongly Agree	4	7.84
	Agree	8	15.69
	Neutral	1	1.96
	Disagree	28	54.90
	Strongly Disagree	9	17.65
	I Don't Know	1	1.96
Total		51	100

Ten respondents, 19.61%, strongly agreed with the statement, “As a math teacher, I believe the school librarian is willing to team-teach a lesson with me.” The majority of respondents, twenty or 39.22%, agreed with the statement. Eight respondents, 15.69%, were neutral towards the statement. Five respondents, 9.80%, disagreed and one respondent, 1.96%, strongly disagreed with the statement. Seven respondents, replied “I don’t know” to the statement, “As a math teacher, I believe the school librarian is willing to team-teach a lesson with me” (see table 32).

Table 32

Mathematics Teachers' Perceptions of the School Librarians' Willingness to Team-Teach a Mathematics Lesson

	Answer	Number	Percent
	Strongly Agree	10	19.61
	Agree	20	39.22
	Neutral	8	15.69
	Disagree	5	9.80
	Strongly Disagree	1	1.96
	I Don't Know	7	13.73
Total		51	100

As shown in table 33, six respondents, 11.76%, strongly agreed and twenty-three respondents, 45.10%, agreed with the statement, “The flexibility of the school library program’s schedule allows me to have my class in the library for a lesson.’ Five respondents, 9.80%, were neutral towards the statement. Seven respondents, 13.73%, disagreed and one respondent, 1.96%, strongly disagreed with the statement. Nine respondents, 17.65%, answered “I don’t know” to the statement, “The flexibility of the school library program’s schedule allows me to have my class in the library for a lesson.”

Table 33

Mathematics Teachers' Perceptions of the School Library Program's Schedule Flexibility

Answer	Number	Percent
Strongly Agree	6	11.76
Agree	23	45.10
Neutral	5	9.80
Disagree	7	13.73
Strongly Disagree	1	1.96
I Don't Know	9	17.65
Total	51	100

The majority of the fifty-one respondents, twenty-nine or 56.86%, strongly agreed with the statement, “The school library is a welcoming environment.” Twenty respondents, 39.22%, agreed with the statement and two respondents, 3.92%, were neutral towards the statement. No respondents disagreed, strongly disagreed, or replied “I don’t know” to the statement, “The school library is a welcoming environment” (see table 34).

Table 34

<i>Mathematics Teachers' Perceptions of a Welcoming School Library Environment</i>		
Answer	Number	Percent
Strongly Agree	29	56.86
Agree	20	39.22
Neutral	2	3.92
Disagree	0	0.00
Strongly Disagree	0	0.00
I Don't Know	0	0.00
Total	51	100

Fourteen respondents, 27.45%, strongly agreed with the statement, “The school library program encourages life-long learning by cultivating curiosity in students.” The majority of respondents, twenty-six or 50.98%, agreed with the statement. Four respondents, 7.84%, were neutral towards the statement and seven respondents, 13.73%, replied “I don’t know” to the statement. No respondents disagreed or strongly disagreed with the statement, “The school library program encourages life-long learning by cultivating curiosity in students” (see table 35).

Table 35

Mathematics Teachers' Perceptions of the School Library Program's Ability to Encourage Life-Long Learning by Cultivating Curiosity in Students

Answer	Number	Percent
Strongly Agree	14	27.45
Agree	26	50.98
Neutral	4	7.84
Disagree	0	0.00
Strongly Disagree	0	0.00
I Don't Know	7	13.73
Total	51	100

Summary of the Results for Survey Items Related to Research Sub-Question 3: Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate? Part A

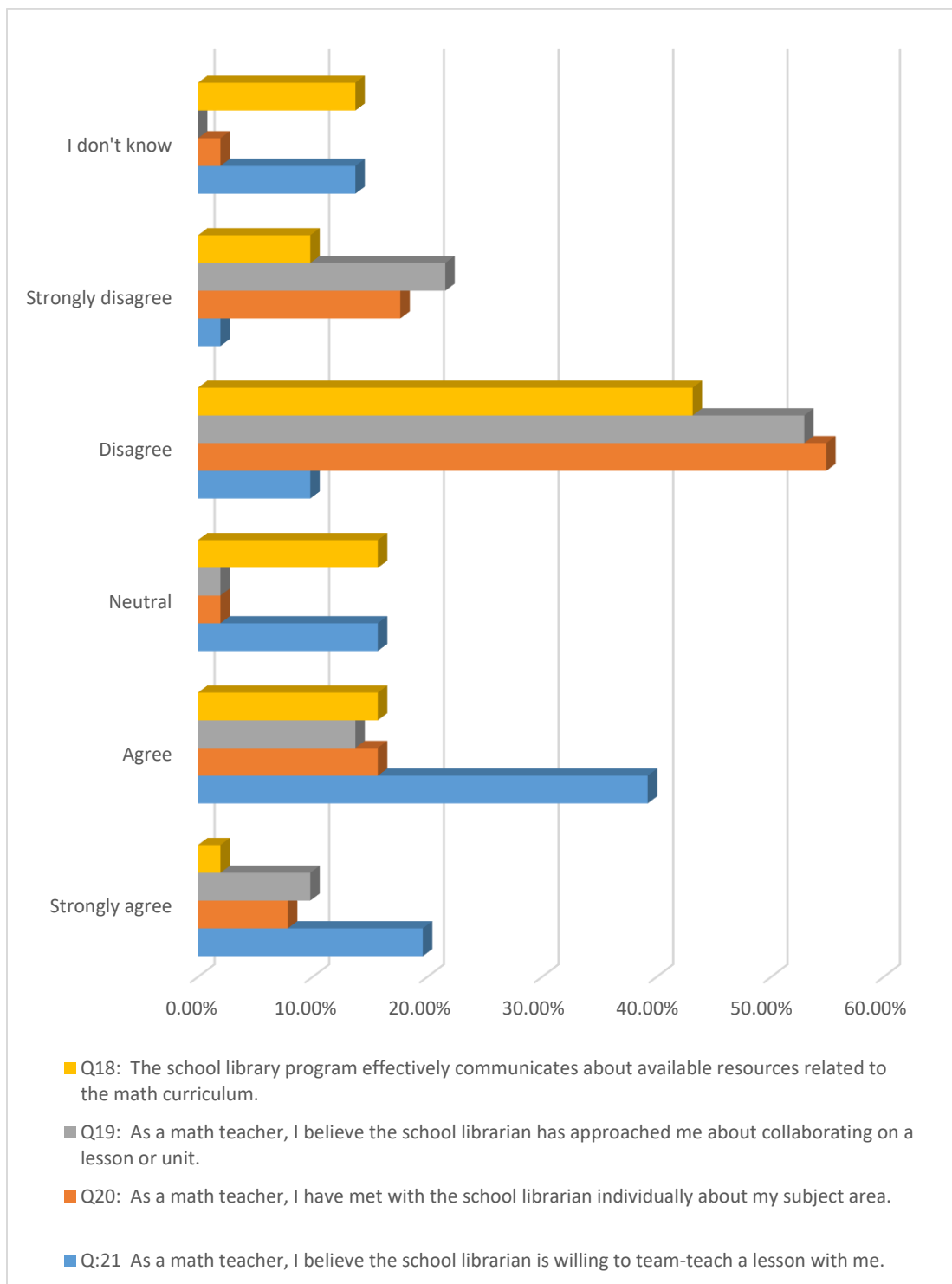


Figure 9. Results for Survey Items 18, 19, 20, & 21

Summary of the Results for Survey Items Related to Research Sub-Question 3: Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate? Part B

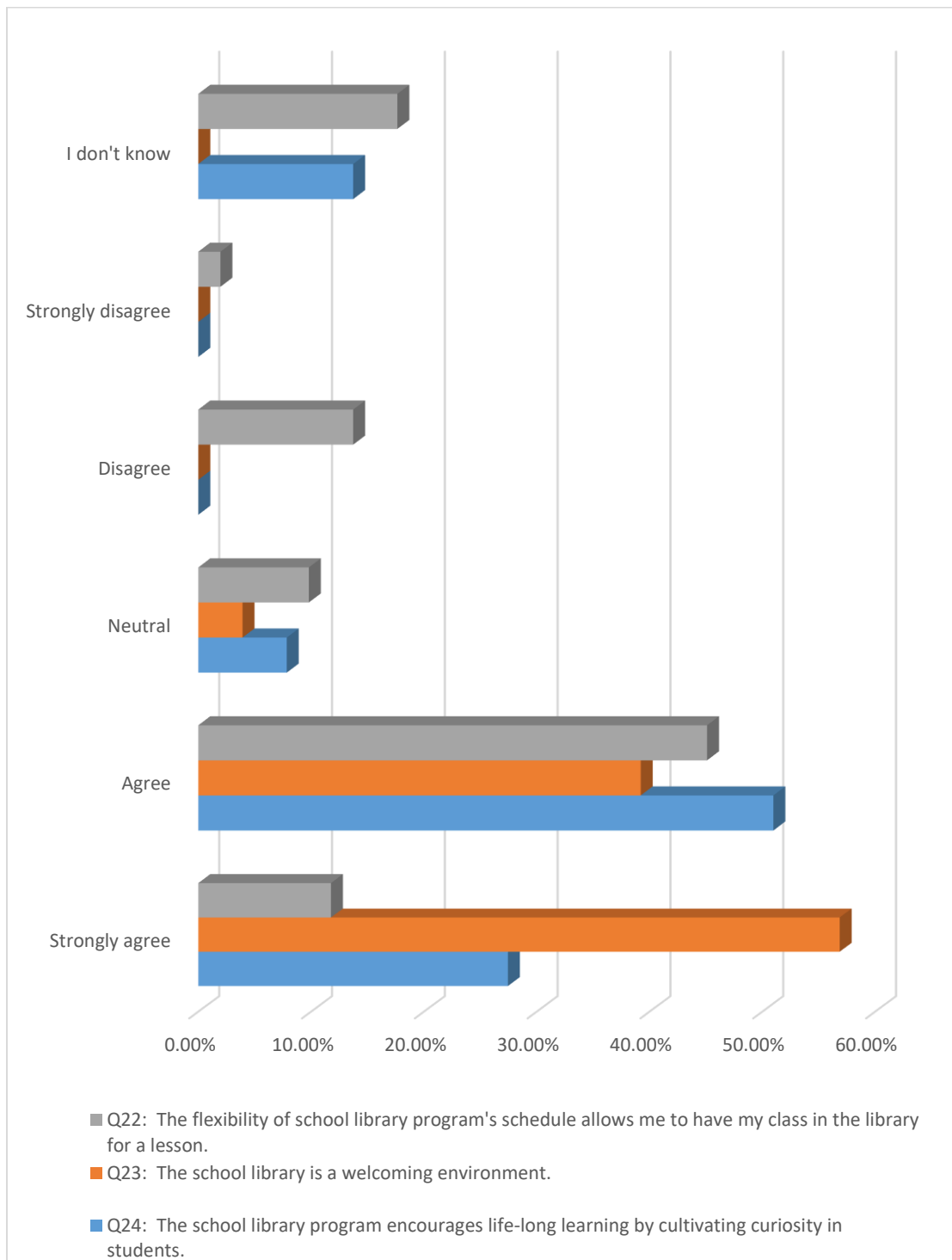


Figure 10. Results for Survey Items 22, 23, &24

Implications: Research Sub-Question 1

Sub-question 1 asks “Do the professional library skills of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?” Professional library skills are closely aligned with the day-to-day management of the school library program. These skills include, but are not limited to, creating and maintaining a relevant and useful collection for all library stakeholders; gathering and recommending resources and materials to assist staff and students; promoting and aiding in the development of information literacy skills; and providing access to technology and training. The following survey items addressed research sub-question 1:

- 4) The school library program maintains a collection of resources that meet the goals/objectives of the mathematics curriculum.
- 5) As a math teacher, I believe the school librarian assists students and staff in identifying appropriate information resources for mathematics.
- 6) The school library program promotes competency in information literacy across the mathematics curriculum.
- 7) As a math teacher, I believe the school librarian guides and assists teachers in evaluating and selecting appropriate informational and instructional resources for mathematics.
- 8) The school librarian is given the opportunity to present information literacy skills to teachers as essential to learning in all subject areas.

Responses to this set of survey items indicated a lack of understanding by the mathematics teachers of the roles and responsibilities of the school librarian.

Respondents indicated “I didn’t know” if the school library program maintains a collection of resources for the mathematics curriculum (item 4, 41.18%) or if the school library promotes information literacy in the mathematics curriculum (item 6, 33.33%). More than half of the participants disagreed (30.77%) or didn’t know (23.08%) if the school librarian would be able to assist staff or students in identifying appropriate information resources for mathematics. Question 8 provided the strongest area of agreement with 42.30% of the participants either agreeing or strongly agreeing that school librarians were given opportunities to promote information literacy skills as essential to all curriculum areas. The data suggests the mathematics teachers’ perceptions of the school librarian’s professional skills appears to relate to 75% of mathematics teachers not collaborating with school librarians in instruction.

Implications Sub-question 2

Sub-question 2 asks, “Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?” Central to the school librarians’ roles and responsibilities are teaching and collaboration. School librarians help teachers and students bridge the gap between formal and informal learning. School librarians collaborate with classroom teachers to use differentiation and a variety of best practices to reach all learner. The following survey items address research sub-question 2:

- 9) The school library program models the use of appropriate assessments used in evaluating student work, especially when learning objectives include various types of media.
- 10) The school library program is able to adapt and modify learning activities based on feedback gained from observation and interaction with students.
- 11) The school library program models and promotes the effective use of technology for teaching and learning.
- 12) The school library program works closely with teachers in designing authentic learning tasks.
- 13) The school library program models collaboration by working with other teachers.
- 14) The school library program provides the opportunity to create independent teaching and learning activities that reflect the best in current research and practice.
- 15) The school library program exhibits collaboration by working with teachers to design and implement teaching and learning activities that reflect the best in current research and practice.
- 16) The school library program promotes collaborating with teachers to ensure students develop higher level thinking skills for the organization, evaluation, and use of information and ideas.

17) As a math teacher, I believe the school librarian is familiar with mathematics curriculum and standards.

This set of survey items revealed strong agreement of the middle school mathematics teachers' perceptions of the school librarians' teaching and instructional abilities. The majority of respondents replied either strongly agree or agree to seven items in the section. Respondents either strongly agreed or agreed that the school library program created activities and learning opportunities that reflect best practices (item 14, 50.00%); is able to modify those activities based on observations and interaction with students (item 10, 50.98%); and models effective use of technology for teaching and learning (item 11, 72.55%). The majority of participants also strongly agreed or agreed with the school library program's collaboration efforts towards working with other teachers and ensuring students develop higher level thinking skills (item 12, 46.00%; item 13, 78.43%; item 15, 56.00%; item 16, 62.00%). Of the mathematics teachers who participated in this survey, 64.71% have the perception that the school librarian is not familiar with mathematics curriculum and standards or the participants don't know if the school librarian is familiar (item 17). Item 9 revealed 37.25% of mathematics teachers don't know if the school library uses appropriate assessments, especially when using various types of media, to evaluate students' work. The data suggests that overall, mathematics teachers may have a positive perception of school librarians teaching and instructional abilities. These positive perceptions seem to relate to 84.31% of middle school mathematics teachers indicating they would consider collaborating with school librarians in the future (item 3).

Implications Sub-question 3

Sub-question 3 asks, “Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?” The goal of all school library programs is to help students acquire the capability to understand and use information and become life-long learners. Professional dispositions of the school librarian are the habits and behaviors that support student learning. Professional dispositions are the mindset the librarian brings to the job and influences how the school librarian’s roles and responsibilities are executed in the school setting. The following survey items address research sub-question 3:

- 18) The school library program effectively communicates about available resources related to the math curriculum.
- 19) As a math teacher, I believe the school librarian has approached me about collaborating on a lesson or unit.
- 20) As a math teacher, I have met with the school librarian individually about my subject area.
- 21) As a math teacher, I believe the school librarian is willing to team-teach a lesson with me.
- 22) The flexibility of the school library program’s schedule allows me to have my class in the library for a lesson.
- 23) The school library is a welcoming environment.

24) The school library program encourages life-long learning by cultivating curiosity in students.

This set of survey items provided two distinct patterns about the middle school mathematics teachers' perceptions of the school librarian's professional disposition. The majority respondents strongly agreed or agreed with four items and disagreed or strongly disagreed with three items. Middle school mathematics teachers who participated in the survey agreed or strongly agreed that overall the school librarian was willing to team-teach (item 21, 58.83%); maintained a flexible schedule (item 22, 56.86%); created a welcoming environment (item 23, 96.08%); and encouraged life-long learning in students (item 24, 78.43%). In contrast, when the survey items were specific to the math teacher or curriculum, the majority of respondents disagreed or strongly disagreed. 52.94% of participants disagreed or strongly disagreed with the school library program effectively communicating about resource related to the math curriculum (item 18). The bulk of participants disagreed or strongly disagreed that the school librarian had ever approached them about collaborating (item 19, 74.51%) or spoke with them individually about their subject area (item 20, 72.55%). The results of survey items 18, 19, and 20 indicate the professional dispositions of the school librarian maybe influencing the 75% of respondents who do not currently collaborate with the school librarian. Items 21, 22, 23, and 24 indicate the perceptions middle school mathematics teachers have of the school librarian's professional disposition, as a whole, may have influence 84.31% of the respondents who would consider collaborating in the future.

Demographic Analysis

Additional statistical tests were run on the middle school mathematics teachers' demographic information. A chi-squared test for independence indicated no significant relationships between the respondents' demographic information and the answers to survey items 1, 2, and 3 which were used to determine the extent or willingness of the middle school mathematics teacher's willingness to or extent of collaboration with the school librarian.

Trends and Patterns for Factors Influencing Levels of Collaboration

After a thorough review of the data, several trends and patterns became apparent. Data from the survey items was condensed into four categories. Responses marked strongly agree or agree were combined into the positive category, as these answers were considered positive perceptions the middle school mathematics teachers had of the school librarian. Responses marked neutral were not combined with other any other category and were considered an impartial perception. Responses marked disagree or strongly disagree were combined to create the category of negative, as these responses were considered negative perceptions of the school librarians skills, abilities, or dispositions. Responses marked "I don't know" remained separate as they indicated a lack of knowledge on the topic by the participant.

Indicators Positively Influencing Collaboration

Twelve of the twenty-one survey items that were directly related to the school librarian's skills, abilities, and disposition were recorded with a majority of the participants agreeing or strongly agreeing to the statements. These twelve items

originated from all the sub groups: professional library skills, teaching and instructional abilities, and professional dispositions. The teaching and instructional abilities sub-group accounted for the most positive replies, seven. The items with the highest percentage of middle school mathematics teachers agreeing or strongly agreeing with the statements were item 23, 96.08%, the school library is a welcoming environment; item 24, 78.43%, the school librarian encourages life-long learning; and item 11, 78.43%, the school library program promotes the effective uses of technology for teaching and learning. The high level of agreement for over half of the survey items related to the school librarian's skills, abilities, and disposition could indicate that middle school mathematics teachers' perceptions are positive of their school librarians. This data seems to be related to the 84.31% of respondents who indicated they would be willing to collaborate with the school librarian in the future.

Summary of the Results for Indicators Positively Influencing Collaboration

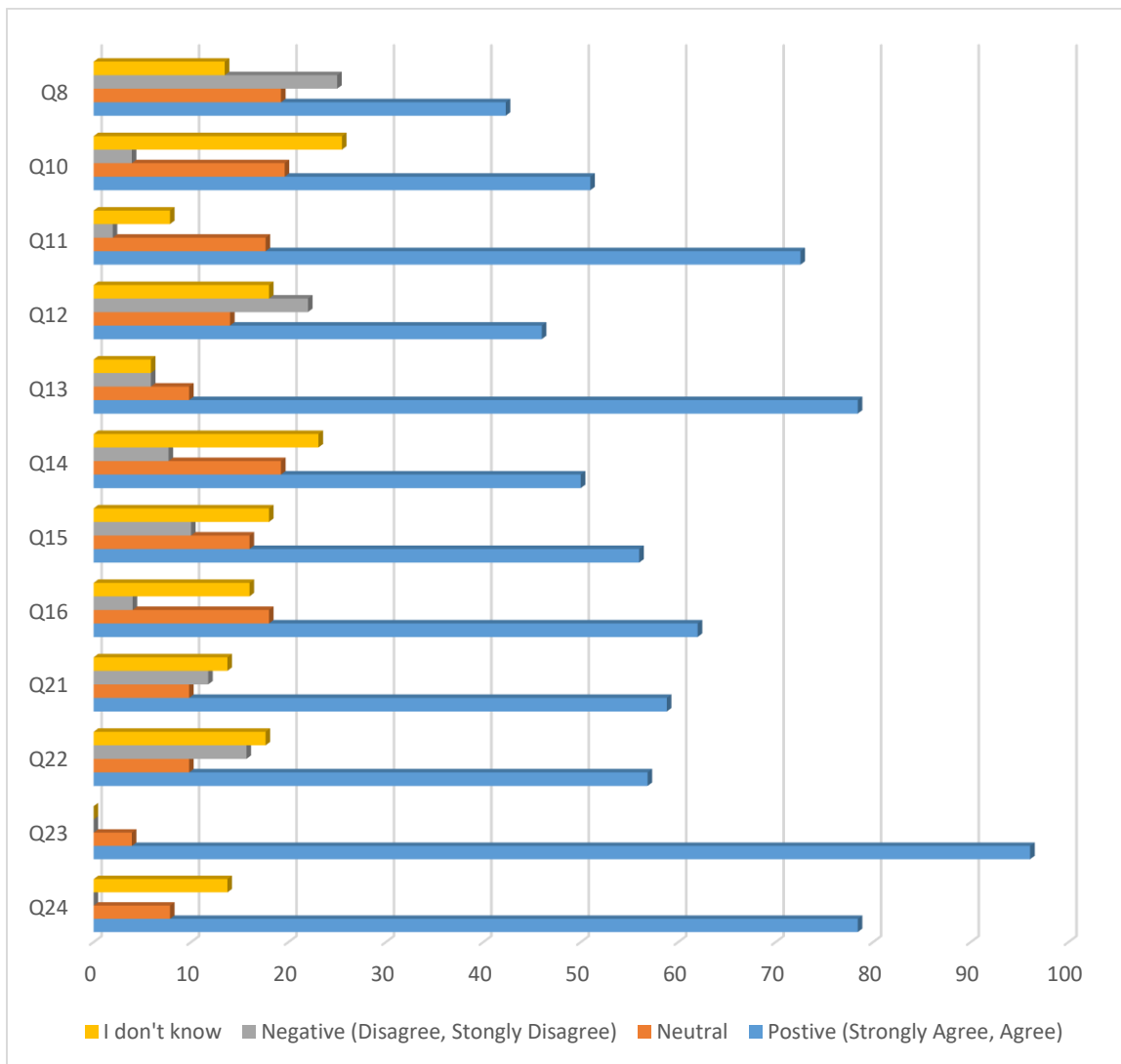


Figure 11. Results for Survey Items 8, 10, 11, 12, 13, 14, 15, 16, 21, 22, 23, & 24

Indicators Negatively Influencing Collaboration

Five of the twenty-one survey items that were directly related to the school librarian's skills, abilities, and disposition were recorded with a majority of the participants disagreeing or strongly disagreeing to the statements. These five items originated from all the sub groups: professional library skills, teaching and instructional abilities, and professional dispositions. The subgroup of professional dispositions had the most negative responses, items 18, 19, and 20. These items also had the highest percent of negative answers. Middle school mathematics teachers responded negatively, at a rate of 52.94%, to the statement "The school library program effectively communicates about available resources related to the math curriculum." The majority of respondents, 74.51%, also disagreed or strongly disagreed with item 19, stating that the school librarian had approached them about collaborating. Item 20, stating that mathematics teachers have met with the school librarian about their subject area, had a disagreement percentage of 72.55%. The finding may be an indication of why 75% of mathematics teacher do not currently collaborate with the school librarian and 39.62% never use any service provided by the school library.

Summary of the Results for Indicators Negatively Influencing Collaboration.

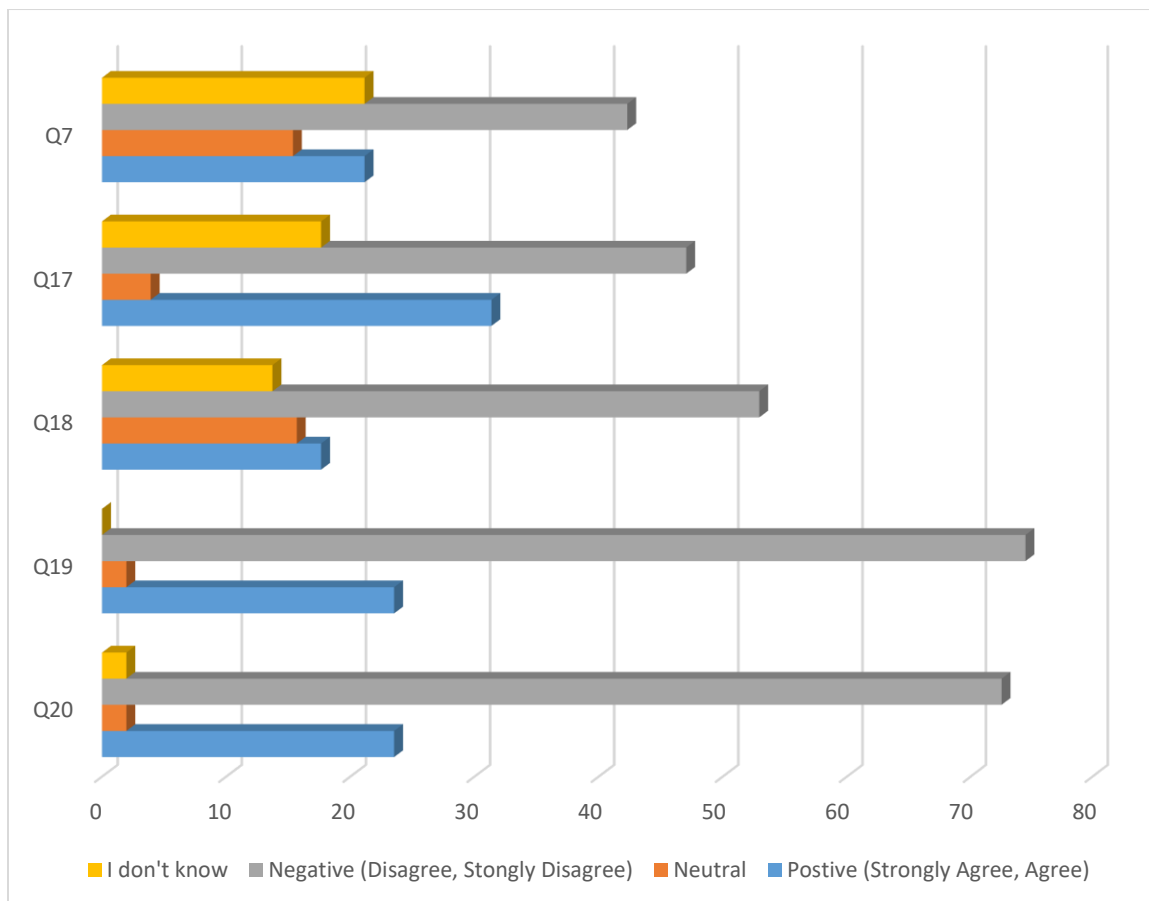


Figure 12. Results for Survey Items 7, 17, 18, 19, & 20

Survey Items Indicating “I don’t know”

Three of the twenty-one survey items that were directly related to the school librarian’s skills, abilities, and disposition were recorded with a majority of the participants replying “I don’t know” to the statements. These three items originated from two of the sub groups: professional library skills, and teaching and instructional abilities. Participants indicated a lack of understanding about if the school library collection maintained materials related to the mathematics curriculum (item 4); if the school library

promoted competency in information literacy in the mathematics curriculum (item 6); and if the school library uses appropriate assessments to evaluate student when various types of media are involved (item 9). The data might suggest that the absence of awareness of these services could be related to the 75% of mathematics teachers indicating they do not current collaborate with the school librarian and 39.62% never using any service provided by the school library.

Summary of the Results for Survey Items Indicating “I don’t know” Responses.

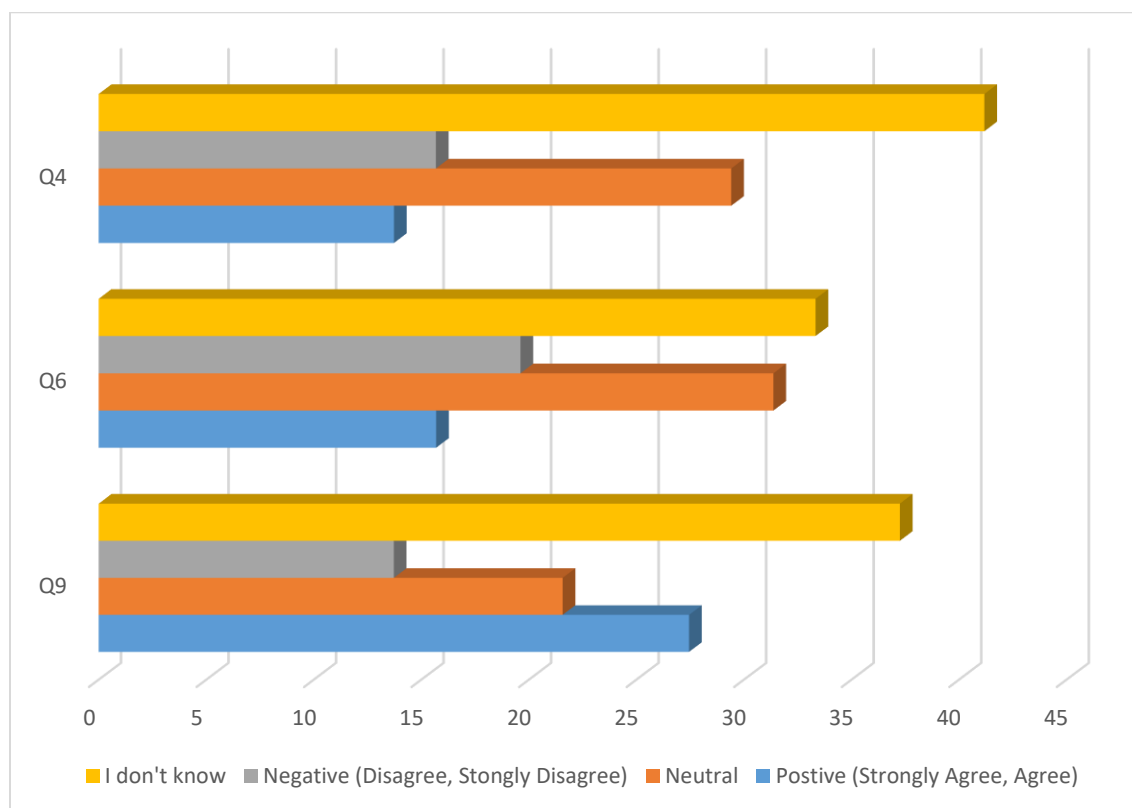


Figure 13. Results for Survey Items 4, 6, & 9

Impact of Mathematics Resources on Willingness to Collaborate

Four survey items related to mathematics resources. Participants replied “I don’t know” or a negative response the majority of the time for the items related to mathematics resources. Middle school mathematics teachers who participated in the survey were unaware if the school library had resource that met the goals and objectives of the mathematics curriculum at a rate of 41.18% (item 4). The participants disagreed or strongly disagreed that school librarians could assist in helping staff and students identify appropriate resource for math (item 5, 32.69%); could assist teacher in evaluating and selecting resources for math (item 7, 42.31%); and effectively communicate about what mathematics resources are available (item 18, 52.94%).). The research results may imply that the negative responses and lack of understanding about mathematics resources available through the school library and the ability to identify appropriate mathematics resources by the school librarian could be a contributing factor to why 75% of mathematics teacher do not currently collaborate with the school librarian and 39.62% never use any service provided by the school library.

Summary of the Results for Survey Items Relating to Mathematics Resources

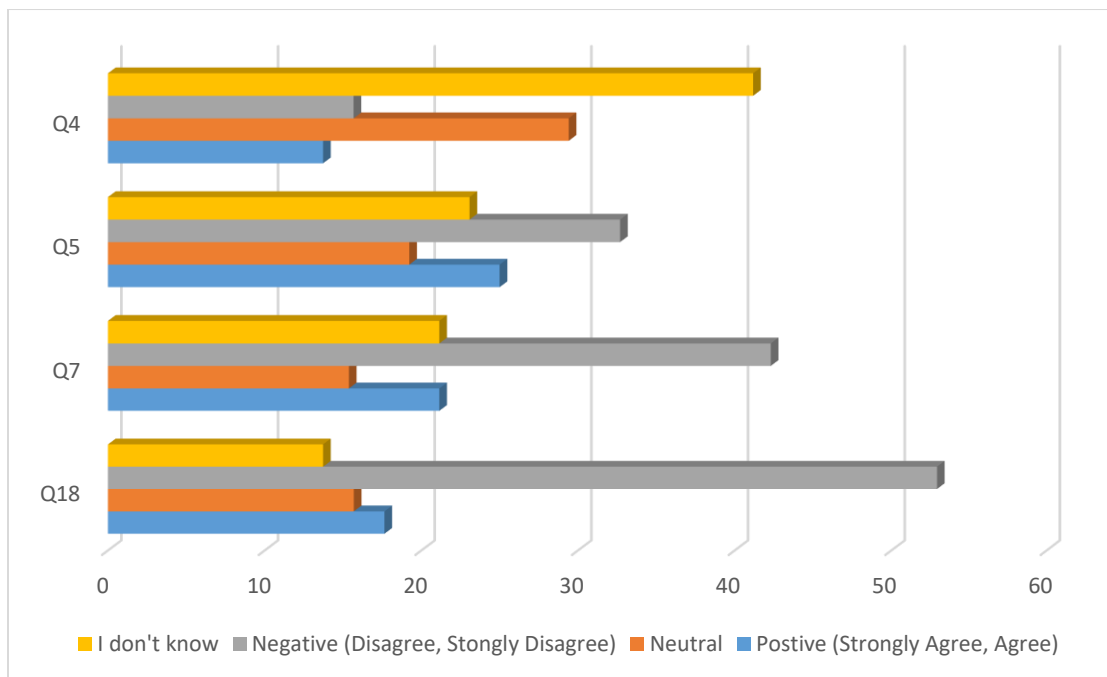


Figure 14. Results for Survey Items 4, 5, 7, & 18

Impact of Information Literacy instruction on Willingness to Collaborate

The majority of respondents, 84.61%, to this survey indicated that the mathematics classes they taught required informational literacy skills at least “a little bit” (item 31, table 10). Over half of the respondents, 51.92%, felt their classes required “a moderate amount” to “a lot” of information literacy skills. Information literacy skills involve the students’ ability to access, evaluate, and use information from a variety of sources. Three survey items were directly related to information literacy. Middle school mathematics teachers help positive perceptions of the school librarian’s promotion of information literacy skills (item 8, 42.3%; and item 16 62%) but were unsure of the school library program’s promotion of these skills in the mathematic curriculum. The

majority of participants replied “I don’t know” (33.33%) and neutral (31.37%). This data could indicate that the lack of awareness or the impartial responses toward the school library program’s role in promoting information literacy in the mathematics curriculum are related to a lack of current collaboration between the school librarian and middle school mathematics teachers.

Summary of the Results for Survey Items Relating to Information Literacy

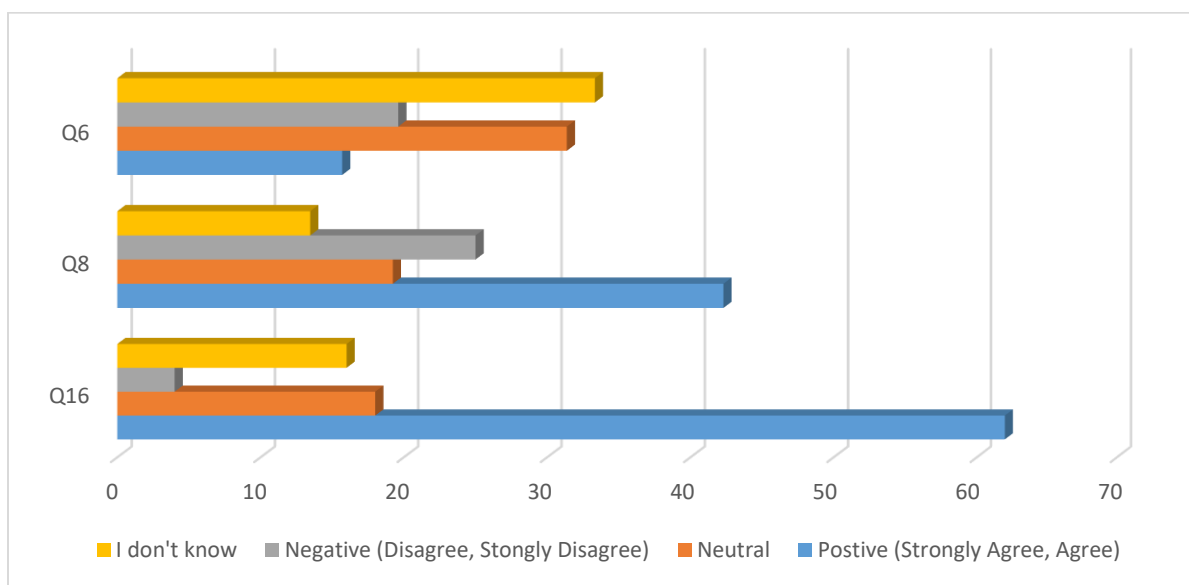


Figure 15. Results for Survey Items 6, 8, & 16

Impact of Technology on Willingness to Collaborate

Two survey questions directly related to technology and the use of different media in teaching and learning. There was strong positive perception that the school library program modeled and promoted the use of technology with 72.55% of the respondents agreeing or strongly agreeing to the statement. But paradoxically, item 9 had 37.25% of respondents replying “I don’t know” to the statement that the school library program

modeled the use of appropriate assessments in evaluating student work, especially when various types of media were involved.

Summary of the Results for Survey Items Relating to Technology

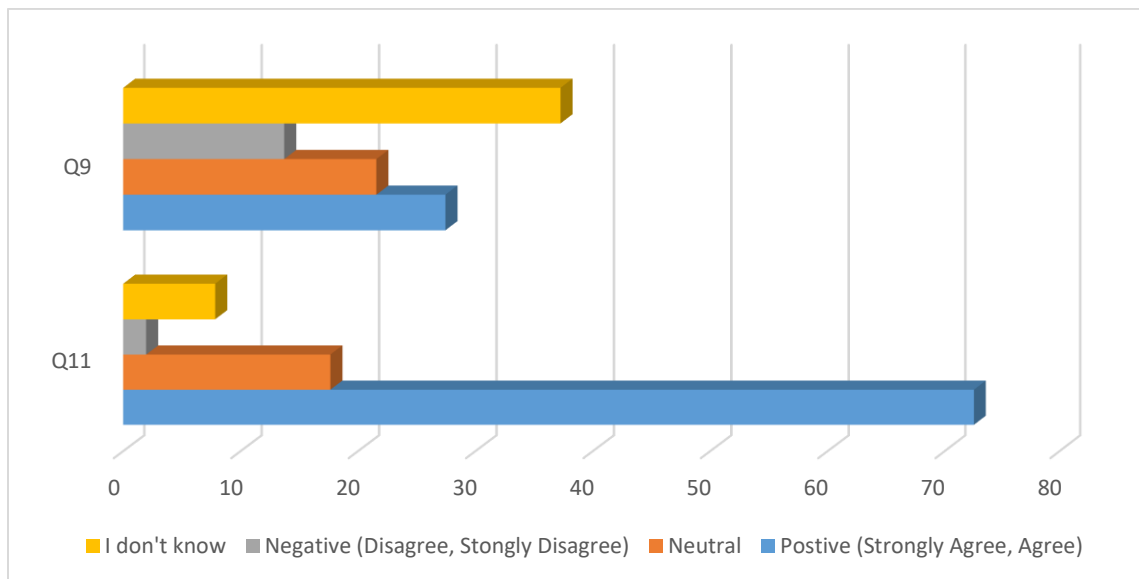


Figure 16. Results for Survey Items 9 & 11

Summary

The guiding question for this research was “What factors influence middle school mathematics educators’ extent or willingness to collaborate with the school librarian?” The participants were asked to rate their perceptions of the school librarian and the services offered in three areas: professional library skills, instructional and teaching abilities, and professional disposition. The data leads this researcher to conclude that factors that influence middle school mathematics teachers’ willingness to collaborate include the school librarian’s instructional and teaching abilities and their professional dispositions. The school librarian’s abilities to collaborate and team teach with other

teachers; develop authentic learning activities that meet the students' needs; integration of technology; having a flexible schedule; and the welcoming environment of the library may all influence 84.31% of the respondents to consider collaborating with the school librarian in the future. A lack of understanding and disagreement about the availability of mathematics resources and the school librarian's understanding of a mathematics curriculum may influence 75% of respondents to not currently collaborate with the school librarian.

Chapter 5

The goal of this research study was to investigate factors that influence middle school mathematics teachers' extent of or willingness to collaborate with school librarians. The theoretical framework for this study was social constructivism. Social constructivism stresses that learning is not an individual activity but relies on social interaction and asserts that knowledge is constructed and reconstructed through "discourse communities" (Green & Gredler, 2002). Discourse communities are beneficial to both teacher development and student learning. Twenty-first century school library programs incorporate the central ideas of social constructivism, inquiry, questioning, and social interaction, by collaborating with classroom teachers to create authentic learning experiences. Professional organizations that represent both school librarians and mathematics teachers, the American Association of School Librarians and the National Council of Teachers of Mathematics, call for students to have real-life learning experiences.

This study examined the factors that influence middle school mathematics teachers' extent of or willingness to collaborate in one large urban Midwestern school district. For the purpose of this study, a survey was designed to measure middle school mathematics teachers' perceptions of the school librarian's professional library skills, instructional and/or teaching abilities, and professional disposition. The instrument also measured participants' current use of school library services, current collaboration, and if the participants would be willing to collaborate in the future. The survey was distributed to 100 middle school mathematics teachers and data was obtained from 52 completed surveys.

Discussion of Results

The data collected from the middle school mathematics teachers who responded to the survey indicated there is currently a general absence of collaboration between school librarians and middle school mathematics teachers. These same teachers indicated a strong interest in potential future collaboration between the two departments. The majority of respondents also indicated that they had received collaboration training in both pre-service education and through professional development which leads to the discussion of what factors can influence increased collaboration between school librarians and middle school mathematics teachers.

The research question for this study was “What factors influence middle school mathematics educators’ extent or willingness to collaborate with the school librarian?” Three sub-questions were used to highlight which specific school librarian roles influenced the middle school mathematics teachers’ extent or willingness to collaborate with the school librarian.

1. Do the professional library skills of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?
2. Do the instructional and/or teaching abilities of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?
3. Do the professional dispositions of school librarians influence the extent or willingness of middle school mathematics teachers to collaborate?

The descriptive data for the first research sub-question suggests that the middle school mathematics teachers’ understanding of the school librarian’s abilities to identify

appropriate mathematics resources, maintain a relevant collection of mathematics resources, and effectively promote information literacy skills as essential to mathematics leads to a negative effect on current collaboration. The data shows 75% of middle school mathematics teachers are not currently collaborating with school librarians. One factor may be the perception that the school librarians do not provide these professional services for the specific content area of mathematics. The descriptive data reveals, middle school mathematics teachers' willingness to collaborate is high. This willingness to collaborate is supported by comments to open-ended questions from the respondents affirming that middle school mathematics teachers would access the professional skills of the school librarian. When asked in what ways they would like to collaborate with the school librarian, comments included: "implement technology in my curriculum;" "learning about new resources to use;" "books to incorporate into math lessons;" "have some math text that were on the students reading level;" and "collaborate on more math websites and resources available outside the math classroom."

Descriptive data results for research sub-question two indicate that middle school mathematics teachers believe school librarians have strong instructional and teaching abilities. These beliefs are exemplified in the areas of creating authentic learning opportunities, effectively using technology in lessons, using best practices, and collaborating with other teachers to help ensure students develop higher level thinking skills. Middle school mathematics teachers' believe these statements to be true for other areas of the curriculum, but not mathematics. The majority of respondents perceive the school librarian as not being familiar with or knowing about the mathematics standards and curriculum. This negative perception could be a factor as to why middle school

mathematics teachers are not currently collaborating with school librarians. The positive perceptions of the school librarian's instructional and teaching abilities overall could be a factor in this willingness to collaborate in the future indicated by 84.31% of the respondents.

Results gathered for research sub-question three reveal overall middle school mathematics teachers have a positive perception of the school librarian's professional disposition, yet indicate a lack of communication about mathematics resources and potential collaboration. The majority of respondents have not been approached about co-teaching a lesson or been communicated with about mathematics resources. These factors most likely contribute to the lack of collaboration occurring between school librarians and middle school mathematics teachers. Professional disposition factors that potentially influence the large number of respondents to consider collaborating in the future are the welcoming library environment, the flexible scheduling, the school librarians willingness to team-teach, and encouragement of students to become life-long learners. The descriptive data is also supported by comments middle school mathematics teachers made to open ended questions. Comments included, "past and present librarians at my school are exceptional professionals;" "works hard to connect with teachers and create collaboration lessons;" "is always willing to help with lessons and is always welcoming when we come in!"

Social Constructivism

Fulton (2003) asserted that social constructivism supports collaboration which can result in new learning opportunities for students and educators. A tenet of social

constructivism is co-creating knowledge. The data from this research confirms that the majority of middle school mathematics teachers are willing to collaborate in order to co-create authentic learning experiences for their students. The respondents also agreed that school librarians promote and model collaboration with other teachers, design authentic learning experiences, use best practices, and are willing to team teach. These characteristics and skills are essential to develop a new collaborative relationship in a social constructivist environment.

School Librarian Role as Teacher. Effective school librarians are teachers who use their knowledge of best practices in instruction and collaborates with other educators in planning and delivering content. Helping teachers reach all students, including students of varying ability levels and cultural backgrounds, by differentiating instruction is an asset that school librarians bring to the collaborative experience (Lamb, 2011). Middle school mathematics teachers consistently rated school librarians' instructional and teaching abilities positively. A teacher comment, "I would like to collaborate to find ways to better help students with IEP math goals," is an example of the confidence middle school mathematics teachers expressed in the ability of the school librarian to meet the needs of all learners.

Collaboration. Collaboration is beneficial to professional educators by improving professional growth, student engagement and achievement, and learning environments. AASL (2016a) specifically defines collaboration as "working with a member of a teaching team to plan, implement, and evaluate a specialized instructional plan" (p. 2). The respondents to this survey routinely agreed or strongly agreed with questions related to collaboration. Middle school mathematics teachers believe that

school librarians model collaboration, use best practices when collaborating, and design authentic learning tasks with other teachers. The majority of respondents agree that school librarians collaborate with other teacher to help develop higher level thinking skills in students. These perceptions of the middle school mathematics teachers could be related to over 84% of the respondents indicating they would be willing to collaborate with the school librarian in the future.

Mathematics and School Library Collaboration. This research aligns with the work by Subramaniam and Edwards (2014) that reported that there is little collaboration between mathematics teachers and school librarians. In the study conducted by Subramaniam and Edwards, school librarians reported a minimal level of collaboration by providing space, resources, and infusing mathematics standards into other content area projects. This research found middle school mathematics teachers also reported a low level of collaboration, only 25% currently collaborate with the school librarian. The data shows that 60.38% of middle school mathematics do use the basic services of the library, such as gathering resources or accessing technology, at least once a year. The middle school mathematics teachers reported working with the school librarian mainly through the use of library resources such as books, websites, and DVD's. However, eight respondents did comment in the open-ended question section that they had taught lessons with the school librarian covering topics such as tessellations, measures of central tendency, decimals, statistical research, Pi day, and using fractions, decimals, and percent.

Significance of the Study

Previous research has found that professional collaboration has been shown to be an effective tool to improve student achievement (AASL & AECT, 1998; NCTM, 2000; Wilson & Blednick, 2011). This research found that middle school mathematics teachers are willing to collaborate but currently there is little collaboration occurring between middle school mathematics teachers and school librarians. Lack of communication appears to be driving the gap between current collaboration levels and willingness to collaborate. The majority of respondents asserted they “didn’t know” if the school library had resources that supported the mathematics curriculum or if the school librarian promoted information literacy in the area of mathematics. Middle school mathematics teachers who responded to this survey also overwhelmingly believed that their school librarian was not familiar with the mathematics curriculum. The data also indicated that school librarians were not communicating with the middle school mathematics teachers about collaborating, information about the content area, or what resources the library has for mathematics. Responses to the open-ended questions further support the idea that middle school mathematics teachers are unaware of any opportunities for them in the library. Comments included “I’m just not sure how we could collaborate;” “I don’t even know what that looks like;” “I really don’t know anything about it;” and “I wish I knew more about how I can collaborate with the librarian.”

According to the American Association of School Librarians, school librarians recognize their important role as instructional partners in every curriculum area to create authentic, meaningful learning experiences for all students (ALA & AASL, 2010, & AASL & AECT, 1999). This research shows that is not the case when investigating

collaboration between school libraries and middle school mathematics. It is the belief of this researcher that the lack of collaboration between these two departments falls on the shoulders of the school librarian and the lack of communication about resources and potential collaborative endeavors. One professional standard set forth by the AASL is advocacy, or communication, with all stakeholders about the programs, resources, and service available. The lack of communication places the burden of increasing collaboration on school librarians and school librarian training and development. It is the belief of the researcher that school librarians need specific preservice training and professional development to target mathematics curriculum, to bring awareness to the library resources, and potential collaboration opportunities within mathematics.

The training for pre-service librarians and practicing professionals needs to begin with an understanding of the National Council of Teachers of Mathematics standards to develop familiarity with mathematics curriculum. Areas of focus should be promoting information literacy as an essential skill in mathematics, supporting the NCTM standard of communication and meaningful and authentic integration of technology into the mathematics curriculum. Training in these areas can help increase the confidence of the school librarian and encourage outreach to promote the services and resources available to the mathematics department through the school library program.

Future Research

This study found that there is great potential for future collaboration between school librarians and middle school mathematics teachers. Previous research established that collaboration and co-teaching improve student engagement and student achievement

(Achterman & Loertscher, 2008; Branchard & Quinnwilliams, 2012; Cramer & Nevin, 2006; Lance, et al., 2010; & Maharaj, 2015). Additional research is needed to bridge the gap between the current extent of collaboration between middle school mathematics teachers and school librarians and the willingness to collaborate. One area of important investigation is determining the school librarians' knowledge and understanding of the mathematics curriculum. This investigation should also seek to determine the comfort level of school librarians with collaborating with mathematics content. The current study only focused on the mathematics teachers' view. This additional work would provide the librarians' perspective.

A second area of research should concentrate on those middle school mathematics teachers and school librarians who are currently collaborating. This research should explore how the collaboration began, what mathematics and library topics are currently being co-taught, and if there are additional standards that can be taught collaboratively between the two departments. This would extend the current study to investigate the specifics of current collaborative situations between the school librarian and mathematics teacher.

The implementation of professional development focused on training school librarian to better communicate services and resources to mathematics teachers is critical to the discussion of improving collaboration between school librarians and mathematics teachers. This area of study should include the participation of school librarians in strategically designed professional development that emphasizes collaboration with mathematics teachers. A pre- and post-test design that analyzes the mathematics

teachers' perception of collaboration with the school library program could be used in order to determine the effectiveness of the professional development program.

Conclusion

After analyzing the middle school mathematics teachers' perceptions of the school library program and collaboration it is clear that work needs to be done in order to create more collaborative experiences between the two groups. The current research establishes a baseline of information regarding school library and middle school mathematics collaboration. The results of this study provide support for the development of best practices and improved collaboration between school library programs and the mathematics curriculum. This research is valuable to school librarians, school library preparation programs, and school administration personnel.

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Appendix A: Survey

Middle School Mathematics Teacher Survey

Collaboration can occur at a variety of levels. Collaboration is commonly defined as the work between two educators in order to improve instruction (Maharaj, 2015). The school librarian leads and directs the school library program and has many responsibilities including instruction, resource management, literacy promotion, and library administration. This survey is voluntary and you may skip any questions you do not want to answer. When responding to the survey statements, keep in mind that you are expressing your perceptions and views, there are no “right” or “wrong” answers. To help you as you complete this survey, the following are descriptions of the selection choices.

“A lot” – often; substantial; numerous examples

“A moderate amount” – some discussion; average interaction

“A little” – rarely; few examples

“None at all” - never

Mathematics Teachers' Collaboration Experiences

Q1 Approximately how many times do you utilize the services of the school librarian in a school year? Ex. gathering resources, accessing technology, printing, etc.

Never

Once a year

Twice a year

3 - 5 times a year

6 or more times a year

Q2 How often do you collaborate with the school librarian for instructional purposes?

Never

Once a year

Twice a year

3 - 5 times a year

6 or more times a year

Q3 How often would you consider collaborating with the school librarian in the future?

Never

Once a year

Twice a year

3 - 5 times a year

6 or more times a year

Professional Library Skills

Q4 The school library program maintains a collection of resources that meet the goals/objectives of the mathematics curriculum.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q5 As a math teacher, I believe the school librarian assists students and staff in identifying appropriate information resources for mathematics.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q6 The school library program promotes competency in information literacy across the mathematics curriculum.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q7 As a math teacher, I believe the school librarian guides and assists teachers in evaluating and selecting appropriate informational and instructional resources for mathematics.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q8 The school librarian is given the opportunity to present information literacy skills to teachers as essential to learning in all subject areas.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Instructional and/or Teaching Abilities

Q9 The school library program models the use of appropriate assessments used in evaluating student work, especially when learning objectives include various types of media.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q10 The school library program is able to adapt and modify learning activities based on feedback gained from observation and interaction with students.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q11 The school library program models and promotes the effective uses of technology for teaching and learning.

Strongly Agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q12 The school library program works closely with teachers in designing authentic learning tasks.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q13 The school library program models collaboration by working with other teachers.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q14 The school library program provides the opportunity to create independent teaching and learning activities that reflect the best in current research and practice.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q15 The school library program exhibits collaboration by working with teachers to design and implement teaching and learning activities that reflect the best in current research and practice.

Strongly Agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q16 The school library program promotes collaborating with teachers to ensure students develop higher level thinking skills for the organization, evaluation, and use of information and ideas.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q17 As a math teacher, I believe the school librarian is familiar with mathematics curriculum and standards.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Professional Disposition

Q18 The school library program effectively communicates about available resources related to the math curriculum.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q19 As a math teacher, I believe the school librarian has approached me about collaborating on a lesson or unit.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q20 As a math teacher, I have met with the school librarian individually about my subject area.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q21 As a math teacher, I believe the school librarian is willing to team-teach a lesson with me.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q22 The flexibility of school library program's schedule allows me to have my class in the library for a lesson.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q23 The school library is a welcoming environment.

Strongly agree
Agree
Neutral
Disagree
Strongly disagree
I don't know

Q24 The school library program encourages life-long learning by cultivating curiosity in students.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree
- I don't know

Mathematics Teachers' Professional Experiences

Q25 How many years of experience do you have as a classroom teacher?

- 0 - 5 years
- 6 - 10 years
- 11 - 15 years
- 16 - 20 years
- 21 + years

Q26 What is your initial teaching certificate in?

- Elementary
- Middle school
- Secondary

Q27 Did you receive any formal training in collaboration during your preservice education? (Mark all that apply)

- Yes - during methods classes
- Yes - during classroom visits
- Yes - during student teaching
- No

Q28 Have you received any professional development on collaboration since graduation? (Mark all that apply)

- Yes - through a professional conference
- Yes - through my building and/or district
- Yes - through my own research
- No

Q29 What grades do you currently teach? (Mark all that apply)

- 5th
- 6th
- 7th
- 8th

Q30 What courses do you currently teach? (Mark all that apply)

Math 5
 Math 5 Honors
 Math 5 Co-teach
 Math 6
 Math 6 Honors
 Math 6 Co-teach
 Math 7

Math 7 Honors
 Math 7 Co-teach
 Pre-Algebra
 Pre-Algebra Honors
 Pre-Algebra Co-teach
 Algebra 1 – 2
 Geometry 1 – 2

Q31 How much does the content of your class(es) require information literacy skills, that is, the ability of the students to access, evaluate, and use information from a variety of sources?

A lot
 A moderate amount
 A little
 None at all
 I don't know

Q32 In what ways (if any) have you collaborated with the school librarian?

Q33 In what ways would you like to collaborate with the school librarian?

Q34 Are there any other comments you would like to make regarding your school library program and/or collaboration?

Demographics

Q35 Gender
 Male
 Female
 Prefer not to say