School Librarians' Perceptions of the Optimal School Library Space

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Insight into school librarians' perceptions and beliefs regarding school library spatial features may facilitate the design of school libraries that better meet the needs of the patrons they serve. This exploratory study used cluster analysis to explore patterns and themes in survey data from n = 190 school librarians. Findings suggested a two-cluster solution for each survey section indicating polarization among school librarians on some issues such as the impact of location, the importance of security, the need for adequate space, and the importance of accessibility. The paper concludes with implications of these findings, limitations, and future research.

Introduction

School libraries continue to evolve to meet the needs of the 21st century learner. Far beyond a repository for books, the school library is embedded within the PK-12 (pre-kindergarten through 12th grade or ages 4 – 17 years) system and has evolved into a necessary resource to meet the needs of students, teachers, and community. Studies suggest a significant relationship between strong school library programs and student academic achievement (Lance & Kachel, 2018); therefore, it is important to understand the variables associated with effective school library programs including the facilities. However, this area of inquiry is limited. Because of the diversity of programs facilitated within the library space, the attributes of the space have a greater likelihood of impacting the outcomes of those programs. Examination of school librarians' perceptions and beliefs regarding the facility spatial design features may contribute to a better understanding of the relationship between the library space and the effectiveness of library programs. This paper argues that school librarians are a valuable source of insight into these relationships and the impact that specific design attributes have on the variety of programs and their libraries. Moreover, this study aims to shed light on these potential relationships and provide insight to inform and potentially improve future school library design processes and outcomes.

Review of Literature

Broadly viewed as a place that supports student learning, the school library can also be used as a testing center, community events venue, a place for holding various school events, or a location for staff professional development activities (Barrett et al., 2017; Cha & Kim, 2015). It is often occupied throughout most of the day, and oftentimes even outside of school hours and in the summer, by multiple different users (Gavigan et al., 2010). It's important to understand how this space influences the occupants since evidence indicates that the physical built environment, regardless of facility type, shapes how humans interact and behave within the space. Studies have shown that there is a connection between student and teacher health, well-being, and success with the building's interior variables (Filardo, 2021). Since the school library space is known as an extension of the classroom, understanding how the physical space could influence the learning experience may be beneficial for school library programs.

The school library is a community space where independent and social learning, formal and informal learning, and student engagement occurs (Willis et al., 2013). According to the American Association of School Librarians (AASL, 2018), the definition of an effective school library program should provide the school with a "personalized learning environment" (AASL, 2018, p. 1), and this environment facilitates "learning for each student's strengths, needs, and interests - including enabling student voice and choice in what, how, when and where they learn" (Patrick et al., 2013, p 4). The classroom teacher has a role in creating a personalized learning environment for the student; however, the school library program has the responsibility to support and sustain this environment.

While the term "environment" is stated within the AASL definition, the term is not defined. This could mean the physical space and spatial attributes or the setting with a more theoretical meaning. Easley (2017) defined personalized learning environments within a case study in Fulton County High School libraries that updated the physical environment to create a supportive physical space for personalized learning. The spatial attributes that supported personalized learning included multiple seating options such as chairs and sofas, flexible furniture with direct access to electrical power, available computer monitor, and creating a Makerspace for Science, Technology, Engineering and Math (STEM) activities.

With library services now incorporating STEM components into the programs, librarians change instructional strategies to include coding and science-based projects plus create a physical space within the library to include makerspaces that support the STEM instruction (Moen, 2022). Makerspace are "informal sites for creative production in art, science, and engineering where people of all ages blend digital and physical technologies to explore ideas, learn technical skills, and create new products" (Sheridan et al., 2014, p. 505). According to Johnston (2021), in order to support STEM school libraries, need to incorporate STEM Centers or stations that include technology such as, "codable robots, circuit kits, video equipment, iPads and apps, coding and gaming apps, and 3D printers" (p. 73) as well as storage to maintain and stock the STEM Centers. The addition of a makerspace into the school library demonstrates how the space is ever evolving and adapting to

new technologies and how there are downstream implications for space, storage, and infrastructure needs.

While multiple studies have examined the academic library design, architecture, and student academic success for those older than 18 years of age (Barrett et al., 2017; Bossaller et al., 2020; Thomas et al., 2015) in addition to community public libraries, technical needs, design, and use (Agosto et al., 2015; Kuhlmann et al., 2014; Lippincott & Duckett, 2013), researchers have only conducted a few studies on the school library physical space for users aged 4 – 17 years old. These studies have examined school library use with a flexible versus a fixed schedule (Gavigan et al., 2010), budgets between academic libraries for those aged 18 and over, community public libraries and K-12 schools aged 5 – 17 years (Regazzi, 2012), and the influence of augmented reality in library instruction (Chen & Tsai, 2012). Little has been documented on the influence of the physical library space in relation to librarian well-being, professional practice, or the school library program.

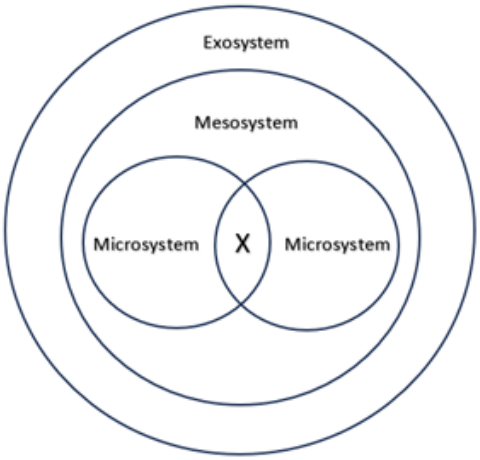
Understanding the librarians' perspectives of the space is important as they have a diverse and multifaceted job within the school system. They work and interact with all students and teachers within the school. They are one of the few people that knows what is being taught in the classroom and what students are learning across all grade levels and content areas (Harland et al., 2021). Their roles and tasks include being leaders, instructional planners, information specialists, teachers, and program administrators (Wine et al., 2023). Additionally, librarians often engage in collaborating and co-teaching with classroom teachers (Koh et al., 2022), which has been shown to increase student academic success, student engagement, and librarian job satisfaction (Kammer et al., 2022).

With the limited number of studies performed in public PK-12 school libraries for those ages 4 – 17 in the United States, only one of which gathering librarian feedback on the spatial attributes in learning commons (McCunn, 2016), most of the literature for this study on library architecture focused on the planning of community public libraries or academic library buildings for those 18 years and older. Design guidelines for PK-12 libraries (ages 4 – 17) are referenced in a publication from the American Association of School Librarians (Sullivan, 2013). However, the audiences for the document are librarians and administrators who are planning the library space and not intended for the architects or designers creating the space. Therefore, most PK-12 library spatial designs for 4 – 17 year olds are at the discretion of the architect working on the project. Oftentimes, the design team consults with the school administrators and not the end user, such as the librarian which results in omitting contextual factors related to the library programming which should inform the implementation of design guidelines. Studies suggest that some school administrators and principals do not fully understand the contributions of librarians to the school's academic program or culture (Harland et al., 2021) and therefore the library space might not function or be sufficient for the librarian and school library program needs related to layout, infrastructure, and storage needs. Hughes et al. (2015) found that higher levels of collaboration between the designers and school stakeholders yielded more positive outcomes. Thus, it's important to understand PK-12 (ages 4 – 17 years) library space design features from the librarian's perspective to ensure that it supports their success and promotes the school library program to aid in student academic success.

Theoretical Framework

This study was framed around the Ecological Systems Theory (Jaeger, 2016; Neal & Neal, 2013) which posits that the school environment is interconnected within itself and the community forming a mesosystem. Within this ecological system, the curriculum, teachers, administrators, counselors, librarians, and staff are all connected and overlapping similar to a "set of Russian dolls" (Bronfenbrenner, 1994, p. 3). The classroom space and the library space are each considered microsystems within the mesosystem, which is the larger whole school system and consists of other microsystems. Bronfenbrenner (1994) defines the setting or space as "a place where people can readily engage in face-to-face interaction" (p. 22). Students spend most of their time in the classroom microsystem but also interact with other students, teachers or staff in the other microsystems, such as the library space, indicating a nesting social system within the mesosystem of the school (Wine et al., 2023). This crossover of microsystems provides opportunities for the librarians to interact directly with students which has an influence on student academic success.

Figure 1: *Adapted Ecological Systems Theory Framework from Wine et al. (2023)*



Continuing with the school as an interconnected mesosystem, and the classroom environment being a microsystem, there are also crossovers in empirical studies indicating that the interior variables within the spatial environment also influence student learning. Evidence suggests that school occupants, both teachers (Pulay & Tripp, 2022) and students, are influenced by multiple variables within the building. These variables include the configuration of spaces (Evans, 2006; Knez & Kers, 2000; Pulay et al., 2016; Pulay& Williamson, 2017); the size, flexibility, and fit of furniture (Asino & Pulay, 2018; Cheryan et al., 2014; Uline et al. 2008); and personal choice or preference (Jindal-Snape et al., 2013). The multifaceted nature of the school library for those ages 4 – 18 years

makes it both an extension of the classroom learning environment and a learning environment in its own right. Therefore, these interior environment variables influence occupants, both students and teachers, in a classroom setting, then the same interior environment variables should also have a similar influence on the occupants in a library setting.

While multiple studies have examined the school building and student or user opinions of the interior factors, limited studies have investigated school librarians' perceptions of school library design and how it might influence their professional practice and the effectiveness of their programs. This study utilizes the Ecological Systems Theory in an exploration of how school librarians perceive and prioritize PK-12 school library spatial features in terms of their potential to benefit or hinder the effectiveness of school library programs for 4 – 17 year olds. Based upon the literature review, the following research questions were developed for this study.

RQ1: Which features of the school library space are most important for the effectiveness of a school library program according to school librarians?

RQ2: Which issues related to the school library space are most likely to negatively affect a school library program according to school librarians?

RQ3: Which features of the school library space do school librarians prioritize?

RQ4: What meaningful relationships exist among school librarians' programs, professional practices, and school attributes and their preferences and beliefs regarding the school library space?

Methodology

This exploratory study used an anonymous self-report survey instrument designed according to the principles of Ecological Systems Theory. The study investigated school librarians' library design preferences and beliefs as well as the relationships among these variables and the librarians' programs, professional practices, and school attributes.

Population and Recruitment

The population of this study is school librarians currently employed at PK-12 schools (aged 4 – 17 years) in the United States. Most participants reported being fully certified as school librarians with the exception of $n = 17$ participants who reported not being fully certified. $N = 7$ participants reported being employed as school library assistants rather than school librarians. We included these participants as the data from this small group did not vary significantly from the participants who reported being school librarians. Table 1 presents additional participant demographics. These data indicate a well distributed representation in terms of school level and size. In terms of school level, high school refers to schools serving 10th through 12th grade (ages 15 – 17 years) or 9th through 12thgrade (ages 14 – 17 years), middles school/junior high refers to schools serving 6th through 8th

grade (ages 11 - 13 years) or 7th through 9th grade (ages 12 – 14 years), and elementary refers to schools serving pre-kindergarten (age 4 years) through 5th grade (age 10 years) or pre-kindergarten through 6th grade (ages 4 – 11 years).

Table 1. Participant Demographics

Response	*n*	%
	Library Position	
Full-time librarian	179	94.211
Part-time librarian	4	2.105
Full-time assistant	7	3.684
	School Level	
High school	58	30.625
Middle school/junior high	45	23.684
Elementary	55	28.947
PK-8	7	3.684
PK-12	16	8.421
Other	8	4.211
	Student Enrollment	
500 or fewer	59	31.053
501 to 1000	68	35.789
1001 to 1500	27	14.211
1501 to 2000	12	6.316
2001 to 2500	11	5.789
2501 to 3000	7	3.684
More than 3000	5	2.632

[a]The ages of students served by each of the school levels are approximately as follows: high school – 14 to 17 years, middle school/junior high – 11 to 14 years, elementary – 4 to 11 years, PK-8 – 4 to 14 years, PK-12 – 4 to 17 years.

Recruitment proceeded through a snowball method that utilized professional contacts associated with the American Library Association (ALA) and/or the Association of American School Librarians (AASL). We provided an IRB-approved (Institutional Review Board) email script containing a Qualtrics survey link to individuals within these organizations who are permitted to email communications to ALA and/or AASL members. After receiving an email invitation and accessing the survey, participants communicated informed consent in the introductory section of the survey before proceeding to the survey instrument itself.

Data Collection

Participants completed an anonymous online survey using Qualtrics. The survey collected non-identifiable information from $n = 190$ school librarians about the schools where they are employed, their school libraries, and their perspectives of school library design. The survey collected quantitative data through select-response items and Likert-type items.

The survey collected extensive data on characteristics of the school, school library program, the school library space, and how these domains intersect. These data facilitate understanding of the school library's position within the school mesosystem and how this position relates to school librarian perspectives and beliefs regarding the school library space. We designed the survey instrument in collaboration with an advisory board consisting of school librarians, members of an architectural firm that specializes in the design of PK-12 schools (ages 4 – 18), school librarian preparation program faculty, a faculty member in a university educational technology program, and a faculty member in a university architectural design program. Based on feedback from school librarians on the advisory board, the survey focused on school library spatial features related to functionality as opposed to aesthetic features. This feedback aligns with findings from the case study by Hughes et al. (2015) which suggested school librarians were primarily concerned with the functional attributes of the school library space. The advisory board verified content validity. We first collected pilot data among a group of $n = 9$ school librarians to obtain feedback and additional content validity assurance. Participants in the pilot study verified that they understood the survey items, that the format of the survey posed no difficulties, and that the survey items were relevant to the school library field. Cronbach's alpha provided an indicator for the reliability of survey items. Data from each section of the survey with continuous variable items demonstrated a Cronbach's alpha greater than 0.800 which suggests a satisfactory level of internal consistency (Gliem & Gliem, 2003). Response validation was built into the survey to ensure participants only encountered survey items applicable to their positions and school libraries. Incomplete surveys were omitted from the study.

Data Analysis

We used cluster analysis because we were interested in exploring possible relationships among actors related to schools, school libraries and their programs, and library space features. Cluster analysis is a nonparametric statistical analysis that identifies homogeneous groups in a study's sample based on a given set of traits (Huberty et al., 2005). Within the context of this study, we used cluster analysis to identify groups of school librarians who were alike in terms of their beliefs and preferences related to the school library space. This analytical approach allowed us to investigate response patterns among participants through first assigning participants to cluster memberships based on their responses to Likert-type and ranked survey items and then examining between-cluster differences in participant demographics. As Clatworthy et al. (2010) advised, cluster analysis can be a useful method for organizing multivariate data to facilitate interpretation. Using SPSS (Statistical Package for Social Sciences), we conducted multiple forms of cluster analysis on each survey section that employed a Likert-type scale or ranking system. No clear sample size recommendations or stipulations for cluster analysis are available (Huberty et al., 2005); however, to maintain a participant-to-variable ratio of at least 10:1, we analyzed each survey section separately. Prior to conducting analysis on each section, participants with missing data were removed from the dataset.

We first conducted hierarchical cluster analysis with an algorithm using squared Euclidean distances and Ward's clustering method to determine a plausible number of clusters that emerged in the data through examination of the dendrogram. Ward's clustering method (Ward & Hook, 1963) was chosen to facilitate interpretation due to the more parsimonious results the method yields. Standardization of variables was unnecessary as survey items within each section used the same scale. K-means cluster analysis then provided validation of the cluster number determination and assignment of participant cluster membership. Finally, we conducted 2-step cluster analysis which in SPSS provides a graphical rendering of the quality of the data for the given cluster solution based on homogeneity within the clusters and between-cluster discrimination. Conducting multiple forms of cluster analysis on a dataset is a method for providing evidence of the stability of a cluster solution (Clatworthy et al., 2010; Huberty et al., 2005; Milligan, 1980). To determine potential patterns in participants' responses that may be related to attributes of their schools and/or school libraries, we examined between-cluster demographics frequencies. We focused on frequencies that indicated significant between-cluster differences, and they tested the significance of these differences using Chi-square tests of independence. These data analysis methods served to consolidate the data, facilitating our interpretation of school librarians' perspectives of school library space features' importance to library program effectiveness (RQ1), potentially negative school library space issues (RQ2), and the prioritizing of school library space features (RQ3). Further, cluster analysis allowed us to identify possible relationships among these variables and variables related to school attributes (RQ4), offering insight into how the school library fits within the mesosystem of the school.

Results

Descriptive Statistics

This section presents frequencies, percentages, means, and other pertinent descriptive statistics for survey items pertaining to participants' preferences and priorities related to school library design. The survey asked participants to rate the importance of different design features for the effectiveness of a school library on a scale of 1 (not important) to 5 (highly important). Table 2 reports the frequencies and percentages of participants who selected each rating for each design feature as well as the mean rating for each design feature. The table presents the rating for each feature selected by the largest percentage of participants in bold text. The data suggests participants in general considered each design feature somewhat important to highly important for effective school libraries, but ratings for some features indicated a divided response.

Table 2. Importance of School Library Design Features

Design Feature	1 (Not Important)	2	3	4	5 (Highly Important)	
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	Mean
Electric outlet availability	2 (1.053)	0 (0.000)	13 (6.842)	33 (17.368)	**125 (65.789)**	4.61
Network drop availability	21 (11.052)	15 (7.895)	35 (18.421)	34 (17.895)	**66 (34.737)**	3.64
WiFi quality	0 (0.000)	0 (0.000)	1 (0.526)	11 (5.789)	**162 (85.263)**	4.92
WiFi access	0 (0.000)	0 (0.000)	1 (0.526)	12 (6.316)	**160 (84.211)**	4.92
Charge stations	18 (9.474)	17(8.947)	44 (23.158)	**50 (26.318)**	44 (23.158)	3.49
Teaching spaces	0 (0.000)	4 (2.105)	11 (5.789)	32 (16.842)	**126 (66.316)**	4.62
Independent study/reading spaces	2 (1.053)	5 (2.632)	30 (15.789)	45 (23.684)	**91 (47.895)**	4.26
Spaces for book displays	0 (0.000)	2 (1.053)	14 (7.368)	47 (24.737)	**110 (57.895)**	4.53
Large-group spaces	5 (2.632)	22 (11.579)	41 (21.579)	48 (25.263)	**57 (30.000)**	3.75
Traffic flow space	0 (0.000)	2 (1.053)	10 (5.263)	53 (27.895)	**108 (56.842)**	4.54

Storage space	1 (0.526)	2 (1.053)	16 (8.421)	42 (22.105)	**112 (58.947)**	4.51
Number of bookshelves	0 (0.000)	0 (0.000)	4 (2.105)	26 (13.684)	**141 (74.211)**	4.80
Bookshelf height	0 (0.000)	1 (0.526)	16 (8.421)	48 (25.263)	**108 (56.842)**	4.52
Collection display options	2 (1.053)	16 (8.421)	47 (24.737)	47 (24.737)	**50 (26.316)**	3.80
Window availability	5 (2.632)	7 (3.684)	32 (16.842)	57 (30.000)	**72 (37.895)**	4.06
Accessibility	0 (0.000)	1 (0.526)	8 (4.211)	44 (23.158)	**120 (63.158)**	4.64

Participants also rated security features that could be available in a school library according to the same scale of importance. Table 3 reports these findings, including the rating for each feature selected by the largest percentage of participants in bold text. While data for each security feature indicated a majority of participants considered them important, a few security features received a more mixed response, including inventory control, traffic control, storm shelters or safe rooms, and panic buttons. Each of these security features received mean ratings of less than 4.00.

Table 3. Importance of Security Features

Security Feature	1	2	3	4	5	
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	Mean
Visibility	0 (0.000)	1 (0.526)	13 (6.842)	38 (20.000)	**120 (63.158)**	4.61
Entry/exit points	0 (0.000)	3 (1.579)	13 (6.842)	43 (22.632)	**113 (59.474)**	4.55
Inventory control	12 (6.316)	23 (12.105)	45 (23.684)	44 (23.158)	**48 (25.263)**	3.54
Traffic control	2 (1.053)	11 (5.789)	37 (19.475)	**66 (34.737)**	54 (28.421)	3.94
Secure lockdown locations	3 (1.579)	7 (3.684)	10 (5.263)	29 (15.263)	**123 (64.737)**	4.52
Storm shelters/safe rooms	7 (3.684)	17 (8.947)	30 (15.789)	50 (26.316)	**68 (35.789)**	3.90
External emergency exit	9 (4.737)	8 (4.211)	21 (11.053)	47 (24.737)	**87 (45.789)**	4.13
Panic button	23 (12.105)	16 (8.421)	37 (19.474)	38 (20.000)	**58 (30.526)**	3.53

In the next survey section, which presented participants with examples of six different potentially negative issues related to school library design, participants ranked the issues in order according to the potential negative effects the issues might have on a school library program. The higher the ranking reflected the greater potential for negative effects according to the perspective of the participants. Table 4 presents the frequencies and percentages associated with each ranking for each issue along with the mean absolute value of the rank for each issue. Each frequency reflects the number of participants who assigned the given rank to that issue. For interpretation of each mean rank, the means increase as the average perceived potential for negative effects on a school library decrease. According to the Table 4 data, most participants expressed that issues related to inadequate space (for patrons and for the collection) had the greater potential for negatively affecting a school library program and that lack of security features had the lesser potential for negative effects.

Table 4. Ranking of School Library Design Issues According to Their Potential Negative Effects

Design Issue	1st	2nd	3rd	4th	5th	6th	
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	Mean Rank
Inadequate space for patrons	49 (25.789)	50 (26.316)	34 (17.895)	17 (8.947)	10 (5.263)	2 (1.053)	2.35
Inadequate collection space	22 (11.579)	47 (24.737)	40 (21.053)	35 (18.421)	11 (5.789)	7 (3.684)	2.92
Lack of security features	10 (5.263)	10 (5.263)	14 (7.368)	23 (12.105)	42 (22.105)	63 (33.158)	4.64
Lack of accessibility	12 (6.316)	18 (9.474)	32 (16.842)	39 (20.526)	41 (21.579)	20 (10.526)	3.86
Poor library location	47 (24.737)	11 (5.789)	13 (6.842)	10 (5.263)	29 (15.263)	52 (27.368)	3.73
Inadequate technology infrastructure	22 (11.579)	26 (13.684)	29 (15.263)	38 (20.000)	29 (15.263)	18 (9.475)	3.49

Participants then ranked design features in order of their perceived importance for the success of a school library program. Table 5 presents these findings. Note that for these variables, the means decrease as the average perceived importance increases. The data in Table 5 suggest participants

generally prioritized the importance of square footage, library location, and technology infrastructure over storage space and security with most participants ranking the former items in first through third place.

Table 5. Ranking of School Library Design Features According to Perceived Importance

Design Feature	1st	2nd	3rd	4th	5th	6th	
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	Mean Rank
Square footage	33 (17.368)	43 (22.632)	30 (15.789)	30 (15.789)	18 (9.474)	14 (7.368)	2.99
Storage space	6 (3.158)	13 (6.842)	27 (14.211)	37 (19.474)	53 (27.895)	32 (16.842)	4.27
Library Location	72 (37.895)	21 (11.053)	18 (9.474)	18 (9.474)	13 (6.842)	26 (13.684)	2.74
Technology infrastructure	24 (12.632)	49 (25.789)	43 (22.632)	24 (12.632)	22 (11.579)	6 (3.158)	2.93
Security	16 (8.421)	10 (5.263)	17 (8.947)	27 (14.211)	33 (17.368)	65 (34.211)	4.46
Accessibility	17 (8.947)	32 (16.842)	33 (17.368)	32 (16.842)	29 (15.263)	25 (13.158)	3.59

Cluster Analysis

Results of hierarchical cluster analysis using Ward's clustering method supported a two-cluster solution for each survey section analyzed. The k-means cluster analysis and 2-step cluster analysis corroborated the two-cluster solutions. Figures 2 through 5 present the final cluster centers yielded by k-means cluster analysis for each survey section analyzed. The figures also include the ANOVA results for the distances between centroids which provide indication of variables that may have been more or less influential in the forming of the clusters.

Figure 2. *Cluster Centers: Importance of Library Features*

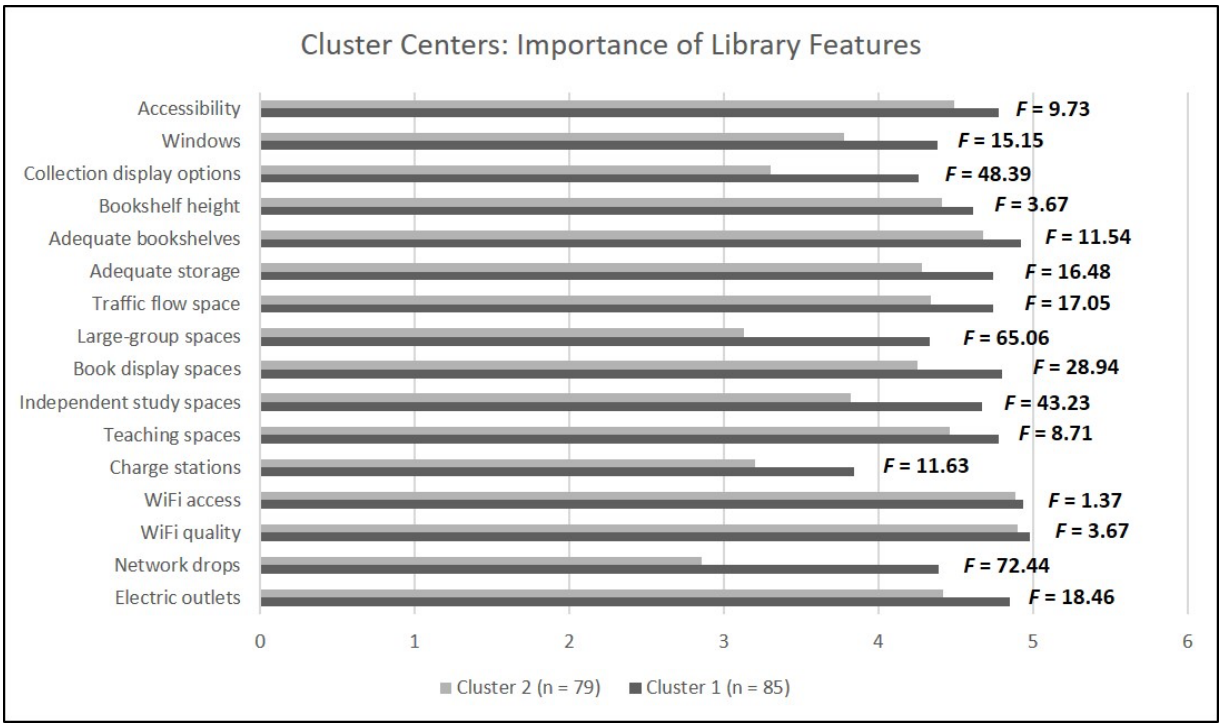


Figure 3. *Cluster Centers: Importance of Security Features*

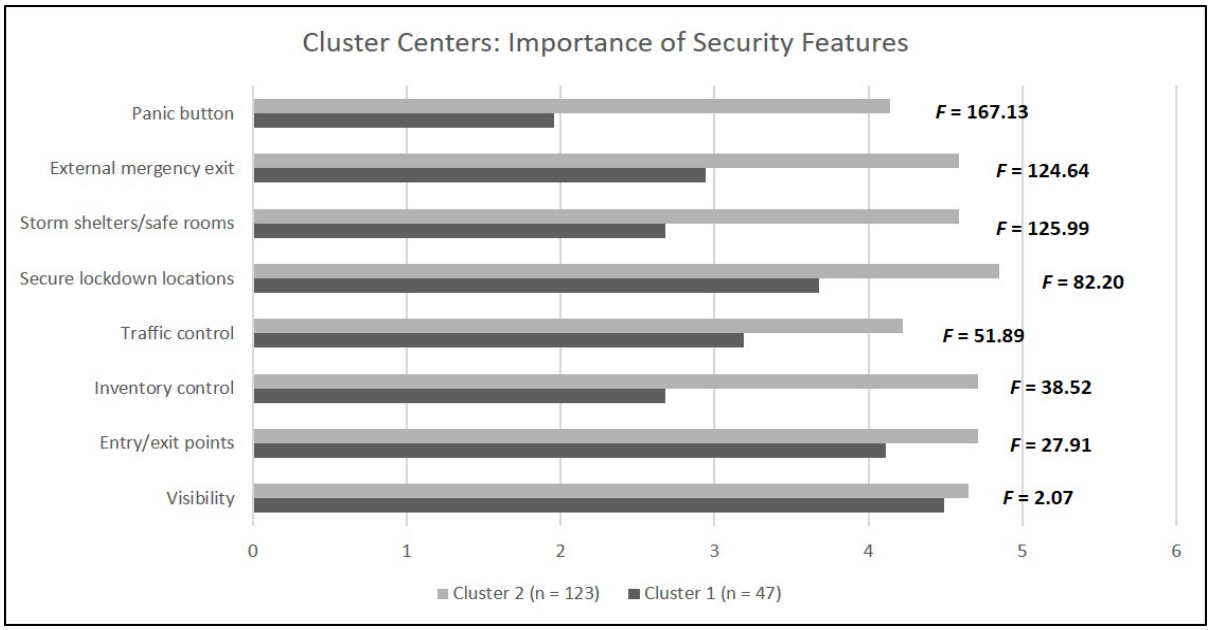
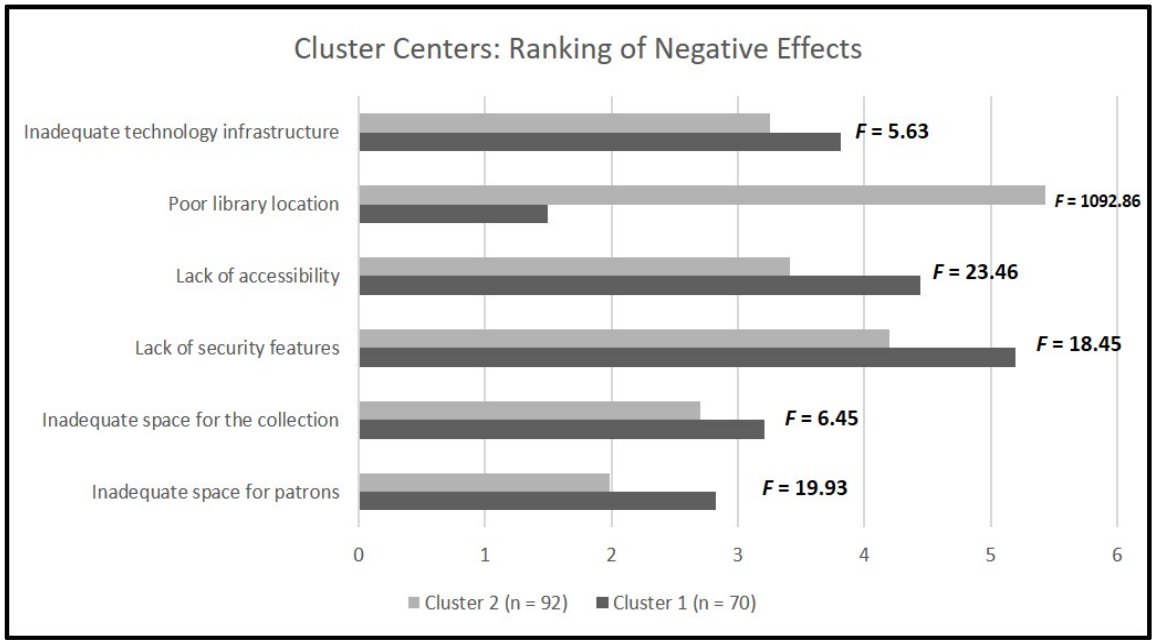
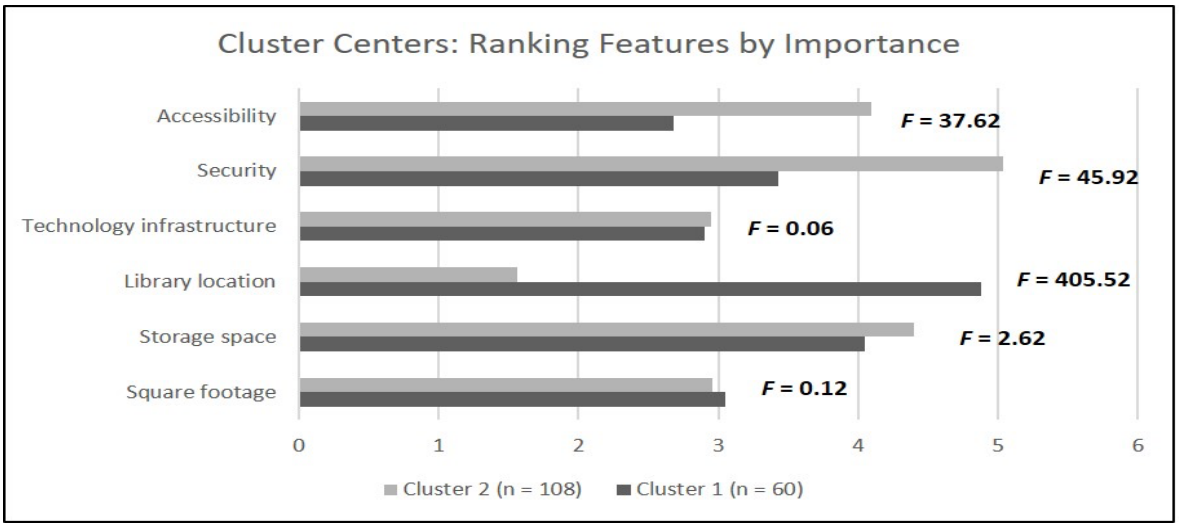


Figure 4. *Cluster Centers: Ranking of Negative Effects*



Note. The lower the value of the cluster center, the higher that cluster members ranked the issue according to its negative effects.

Figure 5. *Cluster Centers: Ranking Features of Importance*



Note. The lower the value of the cluster center, the higher that cluster members ranked the feature according to its importance.

The cluster centers resulting from each application of cluster analysis suggest areas in which participants may have been more or less polarized in their perspectives. Examining the cluster centers for the importance of school library features, members of Cluster 1 generally rated each feature as being more important than did the members of Cluster 2. Cluster formation appeared to be most influenced by participant responses related to availability of network drops, space for independent studying or reading, space for large group presentations, spaces for book displays, and display options for subcollections or special collections. In other areas of this survey section, participants between clusters appeared to be more in agreement. Cluster centers for the survey section addressing the importance of security features suggest a significant polarization of opinion across most features with participants in Cluster 2 generally rating security features as more important than participants of Cluster 1. The security features whose cluster centers had the greatest distances were panic buttons ($F = 167.13$), storm shelters/ safe rooms ($F = 125.99$), external emergency exits ($F = 124.64$), and secure lockdown locations ($F = 82.20$). Visibility of school spaces was the only security feature on which librarians appeared to have a more uniform opinion, as the cluster centers were much closer together than was evident across the other security features with $F = 2.07$.

A significant polarization of opinion was evident across certain areas in the survey sections asking participants to rank items according to potential negative effects and based on priority of importance, respectively. Analysis of participant rankings of issues according to their potential negative effects on a school library program indicated rankings of poor library location were most influential on cluster formation with the F value for the distance between centroids being 1092.86, a vastly higher value than any other variable in this section. Library location also appeared to have the most significant influence on cluster formation for the survey section in which participants ranked school library features in order according to their priority of importance, having an F value of 405.52 for the between-cluster centroid distance.

To better understand the membership within each cluster and identify potential factors that may have influenced participants' responses, we examined the between-cluster descriptive statistics for each survey section. A Chi-square test of independence determined whether between-cluster differences in frequencies were significant, and Table 6 reports the areas in which cluster frequency differences were significant with $p > 0.001$. Each percentage represents the percentage of participants within the given cluster.

Table 6. Between-Cluster Frequencies Tested with Chi-square Tests of Independence

Variable	Cluster 1	Cluster 2	*F*	*p*
	Importance of School Library Features ($n_{\text{Cluster 1}} = 85$, $n_{\text{Cluster 2}} = 79$)			
Electric outlet	4.85	4.42	18.46	< 0.001

availability				
Network drops availability	4.39	2.86	72.44	< 0.001
WiFi quality	4.98	4.90	4.38	0.038
WiFi connection access	4.94	4.89	1.37	0.243
Charge stations	3.84	3.20	11.63	< 0.001
Teaching spaces	4.78	4.46	8.711	0.004
Independent study/reading spaces	4.67	3.82	43.23	< 0.001
Book display spaces	4.80	4.25	28.94	< 0.001
Large-group spaces	4.33	3.13	65.06	< 0.001
Traffic flow space	4.74	4.34	17.05	< 0.001
Adequate storage space	4.74	4.28	16.48	< 0.001
Adequate bookshelves	4.92	4.68	11.54	< 0.001
Bookshelf height	4.61	4.41	3.67	0.057
Collection display options	4.26	3.30	48.39	< 0.001
Window availability	4.38	3.78	15.15	< 0.001
Accessibility	4.78	4.49	9.73	0.002
Importance of Security Features ($n_{\text{Cluster 1}} = 47$, $n_{\text{Cluster 2}} = 123$)				
Visibility	4.49	4.65	2.07	0.152
Entry/exit points	4.11	4.71	27.91	< 0.001
Inventory control	2.68	4.71	38.52	< 0.001

Traffic control	3.19	4.22	51.89	< 0.001
Secure lockdown locations	3.68	4.85	82.20	< 0.001
Storm shelters/safe rooms	2.68	4.37	125.99	< 0.001
External emergency exit	2.94	4.59	124.64	< 0.001
Panic button	1.96	4.14	167.13	< 0.001
Ranking of Negative Effects ($n_{\text{Cluster 1}} = 70$, $n_{\text{Cluster 2}} = 92$)				
Inadequate space for patrons	2.83	1.99	19.93	< 0.001
Inadequate space for the collection	3.21	2.70	6.45	0.012
Lack of security features	5.20	4.20	18.45	< 0.001
Lack of accessibility	4.44	3.41	23.46	< 0.001
Poor library location	1.50	5.43	1092.86	< 0.001
Inadequate technology infrastructure	3.81	3.25	5.36	0.022
Ranking of Importance ($n_{\text{Cluster 1}} = 60$, $n_{\text{Cluster 2}} = 108$)				
Square footage	3.05	2.96	0.12	0.729
Storage space	4.05	4.40	2.62	0.108
Library location	4.88	1.56	405.52	< 0.001
Technology infrastructure	2.90	2.95	0.06	0.808
Security	3.43	5.04	45.92	< 0.001

Accessibility	2.68	4.09	37.62	< 0.001

Discussion

This exploratory study sought insight into the following: school librarians' perspectives on the importance of school library spatial features (RQ1); issues with the school library space that could negatively affect a school library program (RQ2); features of school library design prioritized by school librarians (RQ3); and the meaningful patterns or relationships that may exist among school librarians' programs, professional practices, and school attributes and their perspectives regarding the school library space (RQ4).

Our findings are significant in that they contribute to our knowledge of school librarians' perspectives and beliefs about the school library space on a wider scale than has been accomplished in prior research. Prior research on school library spaces has tended to focus on issues in more specific, local contexts. For instance, Maxwell and French (2016) examined student perspectives of the learning commons concept adopted by two elementary schools. Stewart (2018) collected data from a high school's principal, librarian, and students on their newly designed library. Hughes et al. (2015) conducted a case study contrasting the design processes among a sample of school libraries that were being remodeled. Harper & Deskins (2015) discussed a librarian's use of action research to redesign her school library space. This study has given voice to 190 school librarians across multiple US states on issues related to the school library space to provide a broader overview.

To facilitate interpretation of the data we collected from the n = 190 school librarians who participated in our study, we employed cluster analysis in order to examine whether meaningful patterns emerged among participant responses and then juxtaposed the results of this analysis with analysis of descriptive statistics taken from the demographic data collected. These processes helped us investigate patterns among participants based on their perspectives and then identify potential factors that may influence their perspectives. Cluster analysis results for each survey section indicated a two-cluster solution. Analysis of results across survey sections suggests librarians are in unity in their opinions on some school library space issues while demonstrating a wider range of positions on many others. The following sections offer interpretation of these results in terms of each research question.

RQ1

Participants rated different school library space features according to their importance for the effectiveness of a school library program, and cluster analysis results on these survey items indicate Cluster 1 members generally rated the importance of each feature higher than the members of Cluster 2. Members of either cluster tended to consider each of the features of moderate to high importance as there was only one cluster center less than 3.00, in the area of network drop availability. Network drop availability along with space for large-group presentations, space for

independent study/reading, and spaces for book displays were areas in which the clusters were further apart. Librarians in Cluster 1 tended to find these features much more important than the librarians in Cluster 2. Between-cluster demographic frequency analysis revealed Cluster 1 had a higher concentration of secondary librarians (librarians employed at a middle school (ages 10 – 11 years), junior high (ages 12 – 13 years), or high school (ages 14 – 17 years) than Cluster 2. Cluster 1 librarians were more likely to have flexible schedules and smaller daily student checkout numbers (≤ 100). Interestingly, librarians in Cluster 2 were much more likely to have library hours that extended beyond the school day.

Analyzing participant responses in the survey section focused on security features, the clusters formed through much more marked differences of opinion than was observed in the previous survey section on school library space features. Cluster 2 librarians tended to consider all security features to be important, while Cluster 1 librarians did not seem to place as much importance on security features other than visibility and entry-exit point locations. Examination of differences in demographics sheds some light on the polarization in opinions on security features. Cluster 2 librarians are more likely to have open student checkout at all times as well as to maintain a library schedule that is always open to students visiting outside of class. Cluster 2 librarians are also more likely to have enclosed spaces in the library that may affect visibility and make monitoring students difficult. These spaces include classrooms, study areas, and office spaces. Contrary to what one might expect though, Cluster 1 had a slightly higher concentration of librarians whose libraries were larger (> 4000 sq. ft.).

RQ2

When participants were asked to rank various potentially problematic issues in order according to their negative effects on a school library program, Cluster 1 librarians were most likely to rank poor library location the highest in terms of negative effects while Cluster 2 librarians tended to assign the highest rank to inadequate space for patrons. For other issues presented in this section, the clusters appeared to be more in agreement but with Cluster 2 librarians more likely to rank these issues higher than Cluster 1. Cluster 1 librarians were more likely to have library hours outside the school day than Cluster 2 librarians. In other areas, the demographics of between-cluster membership were not notably different.

RQ3

The survey asked participants to rank school library space features in order based on their importance for the effectiveness of a school library program. Library location proved once again to be a polarizing topic with Cluster 2 librarians ranking this feature much higher than Cluster 1 librarians. The importance of library location to many librarians resonates with Stewart's (2018) findings that placing the school library intentionally to promote use and access positively affects student engagement in and perception of the library. Other influential features that contributed significantly to cluster formation were security and accessibility/ADA compliance with Cluster 1 librarians much more likely to rank these features higher in terms of importance. One of the more

significant differences in cluster demographics involved library staffing, and these differences may help to explain the divide in opinions on the importance of accessibility and ADA compliance. Cluster 1 librarians are much more likely to house the speech language pathology and school counseling programs in their libraries. In fact, 80% of librarians who reported that a speech language pathologist was housed in the library belonged to Cluster 1 in this survey section. Proximity to these programs whose specialists are typically well versed in ADA and accessibility issues may influence the librarians' perspectives, especially considering those specialists more than likely provide services to their students within the school library space.

RQ4

Examination of the between-cluster demographics for each cluster analysis solution allowed us to identify potential relationships among the variables and shed light on how librarians' perspectives might be influenced by school-level or school library-level factors. The apparent relationships that emerged resonated with Ecological Systems Theory in that they illustrated the interconnectedness of school librarians' perspectives of the school library space within the microsystem of the school library program and throughout the mesosystem of the school. School level appeared to be influential on school librarians' perspectives regarding the importance of the availability of spaces and technological infrastructure with secondary librarians tending to rate these issues of greater importance. These findings align with findings from prior studies on specific cases of library space redesigns which included spaces for teens and/or secondary students (Harper & Deskins, 2015; Hughes et al. 2015). Library program attributes such as library scheduling are possibly predictive of school librarian perspectives. Librarians who maintain library hours beyond the school day appeared more likely to consider the location of the library likely to affect a program's effectiveness, and schedules that are more open to students throughout the school day tended to be associated with the importance of security features. Proximity to non-library-related programs and staff may have an influence on how librarians prioritize school library design features. Proximity to programs such as speech language pathology and school counseling appeared to be associated with prioritizing accessibility and ADA compliance as well as security features. These associations are related to small numbers in the data and would benefit from additional research to substantiate the relationships, but collectively the associations illustrate how librarians' perspective may shift in response to attributes of the larger school mesosystem and the needs of the stakeholders who abide within that system.

Limitations

This study has the following limitations. Self-report surveys depend on the perceptions and knowledge of the respondents and data collected using such surveys are subject to a margin of error. However, a sufficiently large sample size mitigates the potential for error. Our methodology included cluster analysis, a nonparametric analysis method which yields results that are not generalizable beyond a study's sample. Though lacking in generalizability, the findings from the

cluster analyses yield valuable insight into the perspectives of the school librarians who participated in this study regarding school library spaces and some of the factors that may influence their perspectives.

Future Research

This research would benefit from continued data collection from new samples to determine whether the cluster solutions and additional findings hold constant. Through this work, we will seek to develop a theoretical framework that encapsulates the dynamics of the school library space in relation to school library programs and the stakeholders they serve.

The findings from this study will provide helpful information on how school libraries may be designed to best support school library programs and the students and other stakeholders. Further, this study's findings will be made available to architectural firms who are interested in following a research-based approach to school library design.

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