"Good Fences Make Good Neighbors": Territorial Dividers Increase User Satisfaction and Efficiency in Library Study Spaces

Çağrı İmamoğlu [a,*], Meltem Ö. Gürel [b]

[a] Bilkent University, Department of Interior Architecture and Environmental Design, Bilkent, Çankaya, Ankara 06800, Turkey
[b] Bilkent University, Department of Architecture, Bilkent, Çankaya, Ankara 06800, Turkey

ABSTRACT

We were consulted to respond to complaints from library users regarding the lack of workspace in a university library hall during busy periods. A behavior mapping study and a survey involving 78 students suggested that the tables in the library hall were used inefficiently, mainly due to a need for territorial markers. Accordingly, we proposed the design and use of new tables that provided dividers (among other improvements), and this design was implemented by the university administration. Follow-up research with 86 students indicated that the design improvements not only led to changes in seating preference trends toward more efficient use of the study hall, but also increased user satisfaction.

© 2015 Elsevier Inc. All rights reserved.

University libraries are hubs of academic life, enriching students' educational experiences. They are important campus learning environments in which students work individually or collaboratively, interacting with each other as members of a learning community. Students visit libraries for a variety of reasons, ranging from checking out books and other forms of media to spending time in the physical space of the library studying individually or in groups. To accommodate these various activities, libraries' physical settings have an important role in effectively meeting patrons' needs and preferences. Accordingly, an important challenge in designing library settings is to provide design options that enhance user satisfaction while enabling efficient use of the available facilities. The research reported in the present paper was undertaken toward meeting that challenge at a university library. Specifically, the challenge involved providing solutions to complaints from library users regarding the lack of workspace in a library study hall during busy periods. Below, we first review some related studies and then provide an overview of the present studies.

RELATED RESEARCH ON THE USE OF LIBRARY SPACES

Many studies have addressed spatial considerations in library design (e.g., library as place: Applegate, 2009; Bennett, 2003; Bennett et al., 2005; Demas & Scherer, 2002; Holder & Lange, 2014; Shill & Tonner, 2003), explored spatial needs to improve services (e.g., Acker & Miller, 2005; Fox & Stuart, 2009; Hunley & Schaller, 2009; Miller, 2008), and pondered the impact of physical space, its furniture, and equipment

on students' behavior and satisfaction when planning campus libraries (e.g., Bennett, 2006; Bennett, 2007; Campbell & Schlechter, 1979; Clee & Maguire, 1993; DeClercq & Cranz, 2014; Foster & Gibbons, 2007; Gayton, 2008; Potthoff, Weis, Montanelli, & Murbach, 2000; Rempel, Hussong-Christian, & Mellinger, 2011; Shill & Tonner, 2004; Webb, Schaller, & Hunley, 2008). Of particular relevance to the present problem are findings that seem to point to a library user's preference for studying in a library (thereby in the presence of others) but having a private study area. In that vein, some authors have concluded that academic libraries provide study spaces answering the needs of a community larger than that of universities alone because people who are not associated with the university also seem to use the library facilities for studying; hence suggesting that they seem to prefer studying with others who are also studying (e.g., Applegate, 2009; Bennett et al., 2005; Brown-Sica, 2012; Cunningham & Tabur, 2012; DeClercq & Cranz, 2014; Gayton, 2008; Montgomery, 2014; O'Connor, 2005; Schneekloth & Keable, 1991; Sommer, 1965; Stewart, 2010; Suarez, 2007; Webb et al., 2008). However, although users may want to study with others (even if they are not directly associated with them), they also seem to avoid being too close to each other when choosing tables to study at, as suggested by environment–behavior researchers examining human spatial behaviors such as privacy, territoriality, and personal space (see Gifford, 2002 for a review).

A broad theoretical discussion of the dynamics of such psychological tendencies is beyond the scope of the present paper. Therefore, in line with the current purposes, we simply conclude that this tendency may be likely to result in inefficient use of library spaces. For example, earlier studies involving seating preferences in academic libraries have suggested that students seem to prefer to sit by themselves at tables,

* Corresponding author.
E-mail address: icagri@bilkent.edu.tr (Ç. İmamoğlu).

even when the tables are large enough to accommodate others and multiple seats at the tables are available (e.g., Sommer, 1965). If all the tables had at least one student sitting at them, an arriving student would choose to sit diagonally in relation to the other student (Eastman & Harper, 1971; Gal, Benedict, & Supinski, 1986; Sommer, 1965). These findings were supported by more recent research which found that library users would choose not to sit at a table when its usage is close to 50% full (e.g., Applegate, 2009; DeClercq & Cranz, 2014; Foster & Gibbons, 2007; Xia, 2005).

Thus, users seem to have needs for both togetherness and separateness. As Cowan (2012) and Fournier, Lane, and Lyle (2010) have stated, students like to have others working with them, but want space to spread out materials. Carrels (personal study units with high partitions) may appear to satisfy both of those needs; however, findings involving carrels seem to be somewhat conflicting. For example, Gal et al. (1986) have found that students only sit next to others at a table when the tables have high partitions; otherwise they prefer to take only the diagonal seats. Other studies have suggested that students seem to prefer to sit at tables as opposed to carrels (Bennett et al., 2005; Eastman & Harper, 1971; Loder, 2000; Webb et al., 2008; Young, 2003; Xia, 2005), which were described by one student as "They box you in" (Bennett et al., 2005, p. 17). Still, in other studies, carrels and/or carrel areas have been found to be popular (Vaska, Chan, & Powelson, 2009), but less so when alternatives are provided (Applegate, 2009), and seem to be preferred under certain conditions, for example, being near a window, in a well-lit area or having low partitions (Applegate, 2009; Kilic & Hasirci, 2011; Loder, 2000; Shill & Tonner, 2004; Vaska et al., 2009; Young, 1993). Thus, we can conclude that rather than carrels, students in library study areas seem to prefer working at tables that provide visual privacy for their work but are in proximity to others. For example, the study furniture rated highest for quiet study by students in one study was a Y-shaped divided table (Holder & Lange, 2014); students drawing their ideal library group study areas in another study drew "…conference tables, and partitions or other structures to provide some level of privacy…" (Foster & Gibbons, 2007, p. 22). In line with our conclusion, Schneekloth and Keable (1991) have observed that students often use territorial markers on tables such as books, magazines, and backpacks. Overall, the above findings seem to suggest a preference to study together, but also a need for some boundaries.

Furthermore, in recent years, libraries' physical properties and spatial requirements have been changing with the emergence of new technologies, such as portable computers and electronic devices, which influence patron needs, preferences, and behavior (Brown, 2004; Cowan, 2012; Fournier et al., 2010; Mohanty, 2002). In fact, Bennett (2003) found that this change in student study space needs was the second highest reason for library renovations (after growth of the collections). For example, internet access and availability of alternative study spaces have had a great impact in changing study habits and use of library spaces, widely drawing students to study outside the library (Mohanty, 2002). A survey (Fournier et al., 2010) with 1894 students has shown that electrical outlets for laptops was the number one necessary feature cited by students in a study area, above comfortable furniture, quiet spaces, and large tables/surfaces. Brudvig et al. (2009) have found that students want wireless internet connectivity throughout a library. Thus, in recent years, students seem to need not only surfaces on which to place materials, but also electrical outlets through which to charge electronic devices (Brown-Sica, 2012; Foster & Gibbons, 2007; Halling & Carrigan, 2012; Holder & Lange, 2014; Montgomery, 2014; Norton, Butson, Tennant, & Botero, 2013; Vaska et al., 2009; Xia, 2005).

OVERVIEW OF OUR STUDIES

As noted above, the present research was undertaken after the authors were consulted as members of an interior architecture department to respond to complaints from library users regarding a lack of workspace in a university library hall during busy periods. The present paper reports the results of an exploratory study involving observations (behavior mapping) and two studies involving before–after assessments in a university library study hall. Our aim in the initial observations and in the first study was to analyze the problem of inefficient use of the tables in the hall and to generate possible design solutions to increase user satisfaction and the number of people using the tables.

Our initial behavior mapping and survey results suggested that the tables in the library hall were used inefficiently: four-person tables being used by only one student due mainly to a need for territoriality/ privacy. Accordingly, we proposed the design and use of new tables that provided low dividers together with other improvements, and this design was implemented by the university administration.

Our aim in the second study, which was conducted after our design suggestions were implemented, was to obtain assessment measures from the users and make comparisons with the earlier measures, in line with the research suggesting data gathering before and after remodeling library spaces (Campbell & Schlechter, 1979; Foster & Gibbons, 2007; Montgomery, 2014; Norton et al., 2013). Thus, the second study can be considered a field experiment, enabling us to compare the measures obtained after the changes with those obtained as part of the initial survey. Both parts of our research are explained in detail below.

PILOT STUDY

THE SETTING

The setting for the study was one of the major reading halls, with an area of 655 m^2, at the main library of a large university in Ankara, Turkey. The hall is utilized as a quiet study area, as areas for louder group study are provided elsewhere in the library building. In the original configuration, the hall housed approximately 80 study tables (mostly for four students: 120 by 80 cm) with 280 chairs, as well as book stacks.

EXPLORATORY OBSERVATIONS: BEHAVIOR MAPPING

Behavior mapping is a type of direct observation of behavior, which provides quantifiable information about the use of a space (May, 2011). In this method, people's locations, activities, and movements within a setting are tracked and noted systematically to understand behavior and how it relates to the physical setting; that is, their use of space. Behavior mapping helps record people's actual behaviors, as opposed to those that are only reported. Thus, combining behavior mapping with self-reporting, as we did in the present study, may help get a better picture of people's behaviors in a setting.

Accordingly, in the present study, in line with Ittelson, Proshansky, Rivlin, and Winkel's (1974) description, we identified observational categories and created keys for noting different behaviors. The study hall to be observed was divided into four equal areas, the plans of which were distributed to four groups of nine graduate students from the interior architecture department, who conducted the observations under the supervision of the authors. The students were responsible for preparing a schedule of observation that would cover high-density periods in the observed section of the library. Each student was asked to check his/her observations with those of his/her teammate(s) to obtain interobserver reliability. The students observed their areas every 15 min for a period of 2 h during the times when the hall had the highest density. Using a predetermined checklist and coding system, they noted gender, location, activity (walking, sitting, conversing, reading, writing and/or working with a computer), and marked these observations on the plans.

Because the main purpose of this pilot study was to obtain a better understanding of the problem to be tackled in further studies, we were basically interested in the general trends suggested by those observations. Therefore, rather than providing detailed information here,

we summarize the main trends observed: (a) students generally chose not to use an occupied table (for four) even if there were multiple seats available, in line with past studies (e.g., Applegate, 2009; DeClercq & Cranz, 2014; Foster & Gibbons, 2007; Xia, 2005); (b) students generally chose to sit diagonally across from other students instead of sitting next to them or directly across, in line with past studies (Eastman & Harper, 1971; Gal et al., 1986; Sommer, 1965); (c) students generally preferred seats next to windows, in congruence with earlier findings (e.g., Applegate, 2009; Kilic & Hasirci, 2011); (d) a typical student covered more space than would be allotted to one person; (e) many students (about one-third of all students in the hall) used computers, and needed plugs and internet access; some students listened to music with earphones; (f) students rarely used books from the book stacks; and (g) when a table was occupied by a group of students, conversation often took place among them.

STUDY 1: LIBRARY USER PREFERENCES AND EVALUATIONS

As noted, in the first study we tried to further analyze the problem of the inefficient table use in the study hall, with the final aim of coming up with design suggestions that would increase user satisfaction and the number of people using the tables. Toward achieving this aim, we first collected some descriptive self-reported data involving students' reasons for using the library, their seating preferences (e.g., a table or carrel, studying alone or with others, and some variables considered important in choosing a seat), and their assessments of the existing study conditions (e.g., privacy provided and the sufficiency of available conditions). Second, we tested the hypothesis that students would make more favorable evaluations of workspaces that provided more privacy. To do so, we developed computer-generated workspace drawings that manipulated the level of privacy provided by tables and asked students to rate the options, as explained below.

METHOD

RESPONDENTS

Respondents were 78 university students (40 women, 38 men) contacted in the noted study hall, who agreed to participate in the study. The mean age of the respondents (consisting of 68 undergraduate and 10 graduate students) was 21.83 years (ranging from 18 to 34 years).

MATERIALS AND PROCEDURE

The survey was administered by graduate students in the library study hall described above. Participation in the study was voluntary. After briefly explaining the study, the graduate students asked the respondents to fill out the questionnaires. The table drawings in the last section of the questionnaire were presented to the respondents randomly to prevent possible order effects.

The questionnaire consisted of five parts: personal information, reasons for using the library/study preferences, seating preferences, sufficiency ratings of the study area, and assessment of table drawings varying in territoriality/privacy. The personal information section involved questions concerning gender and age, department and/or occupation, and whether the respondents were undergraduate or graduate students. The other parts of the questionnaire are explained below.

REASONS FOR USING THE LIBRARY AND STUDY PREFERENCES. This part of the survey involved two questions. The first question inquired about the reason(s) for coming to the library; the item options for this question were (a) to study; (b) to do research; (c) to read books; (d) to work with a portable computer; and (e) other (explanation requested). The second question asked the respondents to specify whether they would prefer to study (a) alone, (b) silently with friends, (c) talk/discuss with a group of friends, or (d) other (explanation requested). In both questions the respondents could choose more than one option.

SEATING PREFERENCES. Of the three questions in this part, one inquired about studying preferences for three different seating arrangements: (a) chair–table arrangement; (b) armchair–coffee table arrangement; and (c) personal study unit (study carrel). Respondents were asked to indicate their preferences for each arrangement using a 5-point scale (1 = *not at all suitable*; 5 = *very suitable*).

Again using a 5-point scale (1 = *not at all important*; 5 = *very important*), another set of questions asked the respondents to rate the importance of certain variables regarding choosing a table to study at. The variables considered were: (a) being near a window; (b) providing privacy; (c) the distance to others; (d) the presence of others using the table; (e) silence; (f) the availability of an electrical outlet and internet access; and (g) other (explanation requested).

Finally, a multiple-choice question inquired where the respondents would sit with respect to another person if that person was studying at a table for four. The choices were: (a) next to; (b) across from; (c) diagonally across from the other person; (d) would decide not to sit; and (e) other (explanation requested).

SUFFICIENCY RATINGS OF THE STUDY AREA. Respondents were asked to rate the sufficiency of (a) the number of tables in the hall; (b) the study area of the table when all the seats were occupied by others; and (c) the sufficiency of the tables to study at without being disturbed by others when all the seats were occupied. Judgments were indicated on a 5-point scale (1 = *not at all sufficient*; 5 = *very sufficient*).

ASSESSMENT OF TABLE DRAWINGS VARYING IN TERRITORIALITY/PRIVACY. The respondents were presented with four computer-generated drawings, three of which represented three seating arrangements that varied in territoriality/privacy (representing minimum, intermediate and maximum levels), with the fourth seating arrangement involving an armchair–coffee table combination, used as a buffer (see Fig. 1). Respondents were asked to rate each of the computer-generated drawings using a 7-point semantic differential scale that consisted of *not useful–useful*; *ugly–beautiful*; *uncomfortable–comfortable*; *provides no privacy–provides privacy*; *cramped–spacious*; *insufficient area for study–sufficient area for study*; and *did not like it–liked it.*

RESULTS AND DISCUSSION

REASONS FOR USING THE LIBRARY AND STUDY PREFERENCES

In response to the question involving reasons, all participants indicated that they used the library to study. While doing research and working with a portable computer were rated highly (39% and 30%, respectively), only four of the respondents (5%) indicated that they used the library to read books. Those who marked "other" (9%), stated that they were there to watch movies, hang out with friends or sleep.

With regards to the question about study preferences, more than half of the respondents (58%) indicated that they preferred to study alone, whereas almost half (46%) preferred to study silently with a couple of friends. The percentage of those preferring to study by talking/discussing with a group of friends was much lower (15%), probably because study halls in which talking is allowed are available elsewhere in the library.

SEATING PREFERENCES

Regarding their preferences for different seating arrangements, respondents rated the chair–table arrangement as being more suitable for studying (M = 3.55, SD = .94) than the study carrel alternative, which was considered "*neither suitable nor unsuitable*" (M = 3.00, SD = 1.21; t(77) = 3.30, p < .001). That the chair–table arrangement was preferred to the study carrel arrangement is in congruence with the findings referred to earlier (e.g., Bennett et al., 2005; Eastman & Harper, 1971; Loder, 2000; Webb et al., 2008;; Xia, 2005; Young, 2003). The armchair–coffee table arrangement, which was used as a
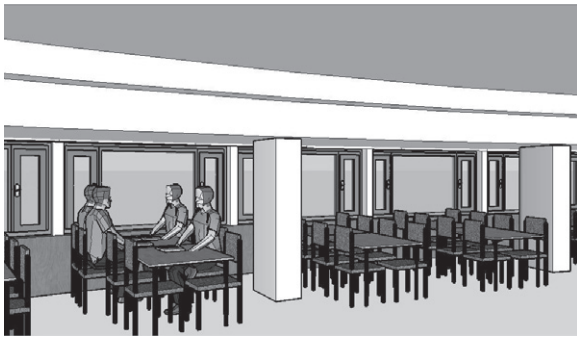
(a)

(b)

(c)

(d)

Fig. 1. The table configurations, showing (a) minimum (similar to the original layout); (b) intermediate; (c) maximum levels of territorial privacy; and (d) the armchair–coffee table combination, used as a buffer.

buffer in the table drawings was rated as "*somewhat unsuitable*" ($M = 2.79$, $SD = 1.13$).

As noted above, respondents were also asked to rate the importance of a list of variables when choosing a table to study at. As shown in Table 1, all the variables considered were rated as important, with the most important ones being availability of an electrical outlet and internet access, silence, and being near a window. These features were followed by the presence of others using the table, providing privacy, and distance to others. We will consider these variables again later in the paper in relation to the results of the second study.

Finally, respondents' seating preferences were examined in relation to someone already seated at a table for four persons. As can be seen in Table 2, just over half of the respondents (51%) indicated that they would prefer to look for another table. A smaller group of respondents (42%) indicated that they would choose to sit diagonally across from the other student. As shown in Table 2, those who would choose to sit next to or directly across from the other person were negligible. These findings seem to be in line with previous research (e.g., Eastman & Harper, 1971), and point to an efficiency problem with shared tables in academic libraries, as referred to earlier in the paper.

SUFFICIENCY RATINGS OF THE STUDY AREA

The means obtained for the sufficiency of the study area in terms of the degree of privacy provided, the number of tables, and the study area available on the tables are shown in Table 3. As evident, the study hall was evaluated as being average or below average on those dimensions.

ASSESSMENT OF TABLE DRAWINGS VARYING IN TERRITORIALITY/PRIVACY

As noted above, respondents rated three computer-generated table drawings representing a gradation in territoriality/privacy using a 7-point semantic differential scale. Before conducting the main analysis, we undertook two pre-analyses; the first, to verify the validity of the manipulation, and the second, to explore the basic dimensions underlying the variables considered, as explained below.

To explore whether the three drawings representing different levels of territoriality/privacy were perceived as intended, we conducted a within-subjects design one-way analysis of variance (ANOVA) on the privacy data (i.e., ratings of the semantic differential pair *provides no privacy–provides privacy*) obtained for the three table types. According to the privacy level main effect, the mean perceived privacy values increased as a function of the drawings' manipulated privacy levels: $F(2, 154) = 87.98$, $MSE = 2.13$, $p < .001$, partial eta$^2 = .53$. According to the follow-up comparison results (with a Bonferroni adjustment), the table drawings representing minimum ($M = 2.91$, $SD = 1.57$), intermediate ($M = 4.65$, $SD = 1.74$), and maximum ($M = 6.00$, $SD = 1.50$) levels of privacy differed significantly from each other ($p < .001$). Thus, it can be concluded that the drawings were perceived in accordance with the privacy manipulation.

Next, to explore the dimensions of the ratings on the semantic differential scales considered, we subjected data consisting of the overall means of the ratings for the three table types to a varimax rotated factor analysis. According to the "eigenvalue greater than one" criterion, one overall factor, named the Evaluation factor emerged with an eigenvalue of 4.58, which accounted for 65.46% of the variance. Cronbach's alpha for this Evaluation factor consisting of seven items was found to be .91.

This general Evaluation factor was used in the main analysis carried out to test the significance of the differences between the three table drawings representing minimum, intermediate, and maximum levels of territorial privacy. The results of that within-subject design one-way ANOVA indicated that the Evaluation main effect was significant: $F(2, 154) = 97.24$, $MSE = 1.52$, $p < .001$, partial eta$^2 = .56$. According to follow-up comparison results (with a Bonferroni adjustment), the table drawing representing the minimum territoriality/privacy level ($M = 3.13$, $SD = 1.34$) was evaluated less positively than those representing the maximum ($M = 5.68$, $SD = 1.26$) and intermediate ($M = 5.30$, $SD = 1.25$) levels ($p < .001$). There was also a nonsignificant

trend for the drawing representing the intermediate level to be evaluated less positively than the one representing the maximum level ($p < .11$). Thus, our hypothesis stating that students would make more positive evaluations of workspaces that provided more privacy was supported.

On the basis of the results obtained in the first study, we concluded that the degree of territoriality/privacy provided to users seems to play an important role in evaluating study halls; and the present study hall was rated as below average in this important dimension. Accordingly, we suggested to the administration that improving the territoriality/privacy (as well as satisfying current needs for electrical facilities) through using different tables may increase the satisfaction and number of people using the tables in the library hall.

It should be noted that in all the analyses reported, data were collapsed over gender because the preliminary analyses indicated that gender was not a significant variable, in line with the fact that we had no hypotheses involving gender. At this point, the reader may wonder (as did an anonymous reviewer) why we have included gender as a variable since we did not have any gender-related hypotheses. A discussion of this issue is beyond the scope of the present paper, but we can briefly note that whether (or how) gender differences should be studied or disregarded altogether in research has become quite a controversial issue among some psychologists (see Hyde & Mezulis, 2001, for a review). We seem to side by those who think that gender should be routinely included so that any nonsignificant results could be noted. Accordingly, our nonsignificant gender results seem to be congruent with the gender similarities hypothesis of Hyde (2005).

STUDY 2: IMPACT OF NEW TABLES WITH PHYSICAL PARTITIONS ON USER SATISFACTION AND EFFICIENT USE OF THE STUDY HALL

Based on our propositions derived from the results of the first study, a table prototype was constructed with support from the university administration to replace the existing tables in the study hall (see Fig. 2). The proposed table arrangement seated four students, and had clear territoriality markers in the form of dividers. Using the feedback from the first survey results, we designed the tables with narrow shelves to place items on, two outlets with which to charge electronic devices, and task lighting for the study area. The dimensions of the table space (in centimeters) per student were 90 (width) by 50 (depth) with a height of 75 for the study area (105 for the shelf/side divider, and 115 for the top of the longitudinal divider).

At this point it may be useful to define a carrel, and specify how the new tables with dividers differed from traditional study carrels. A study carrel can be defined as a small table that has a front block usually with two side blocks (Xia, 2005). One recommendation for the carrel has provided its dimensions (in centimeters) as 120 (width) by 75 (depth) with 150 cm high front and side blocks (Cohen & Cohen, 1979). Thus, our new tables provided a smaller study area per student than a typical carrel, but had a 35 cm lower front block, and 45 cm lower separators on the sides, which were both translucent, and 10 cm shorter than the total depth of the table, compared to the side blocks of carrels. This design aimed to provide territorial markers for privacy, while preserving the feeling of working together at a table with good natural light.

As will be remembered, the hall originally housed approximately 80 study tables without any partitions (and 280 chairs). Although each table was supposed to be used by four students, the actual use patterns (based on our observations, findings of Study 1 and the related research noted above) indicated that they were mostly being used by one student. Hence in practice each student occupied a table (of 120 by 80 cm.), which theoretically was designed for four students. After the renovation, even though the number of tables (for four) were reduced to 42 (with 168 chairs), we expected (due to more efficient use) that they would be evaluated as more sufficient. As noted by Shill and Tonner (2004), a large number of seats (or increasing gate counts;

Stewart, 2011) may not be sufficient to increase the use of library facilities.

As explained in detail below, a follow-up survey was administered in the same library hall after the tables with territorial markers were installed. Respondents' evaluations involving the new tables (with low partitions) were compared to those obtained in the previous study involving the original tables (without partitions). As noted, we expected that design changes that increased privacy and territoriality (and considered users' increasing electronic needs) would have a positive effect on user perception of the study areas and hence would increase the percentage of tables occupied.

Specifically, we hypothesized that relative to the previous layout, the new study condition would be evaluated more positively in terms of sufficiency of the number of tables, the study area available, and the degree of privacy provided. We also expected that the new layout would be evaluated favorably for all the variables considered important by the users in the first study. Finally, we expected that students' seating preferences would likely reflect trends toward more efficient use of the study hall compared to the findings obtained in Study 1.

METHOD

RESPONDENTS

The respondents were 86 students (43 women, 43 men) who agreed to participate in the study. They were contacted in the same library hall involved in the previous study. The mean age of the respondents (consisting of 73 undergraduate and nine graduate students) was 21.17 years (ranging from 18 to 33 years).

MATERIALS AND PROCEDURE

A graduate student administered the questionnaire for the second study in the noted hall, under the supervision of the authors. After briefly introducing the study, the graduate student asked the respondents to fill out the questionnaires.

The questionnaire consisted of two parts. The first part involved the same questions from the first study, that is, about the respondents' background and demographics. The second part consisted of items that measured students' evaluations of the new layout and seating preferences, as explained below.

SUFFICIENCY RATINGS OF THE STUDY AREA. Similar to the first study, three questions inquired about the sufficiency of the (new) tables in the hall for studying: (a) the number of tables; (b) the study area on the table when all seats were occupied by others; and (c) the sufficiency of the tables to study at without being disturbed when all other seats were occupied. Again, preferences were indicated on a 5-point scale (1 = *not at all sufficient*, 5 = *very sufficient*).

EVALUATION OF THE STUDY HALL IN TERMS OF VARIABLES CONSIDERED IMPORTANT. The respondents were asked to rate the sufficiency of the new tables in terms of the variables found to be important in the first study regarding choosing a table to study at. Respondents indicated their thoughts using a 5-point scale (1 = *not at all sufficient*, 5 = *very sufficient*). As in the first study, the variables considered were: being near a window, providing privacy, distance to others, presence of others using the table, silence, and availability of an electrical outlet and internet access. Added to the above variables were two new questions; one regarding the sufficiency of the study area and the other about the task light built into the tables.

STUDENTS' SEATING PREFERENCES WITH RESPECT TO ANOTHER STUDENT. As in the first study, students were asked to respond to a multiple-choice question to indicate where they would sit with respect to another person if that person was already studying at a table for four persons. Parallel to the first study, the choices were: next to, across from,

diagonally across from, would decide not to sit, and other (changes according to circumstance − explanation requested).

RESULTS AND DISCUSSION

As explained above, we obtained data sets parallel to those of the first study in the follow-up study regarding students' evaluations and seating preferences. In the analyses reported below, we compared those two data sets to see how the users assessed the new tables, and hence, to understand their impact on user satisfaction and efficient use of the tables. Again, the data were collapsed over gender in all analyses for the reasons noted for Study 1.

SUFFICIENCY RATINGS OF THE STUDY AREA

As shown in Table 3, the results of paired sample t-tests indicated that the new tables (in Study 2) were evaluated more positively than the original ones (in Study 1) in terms of sufficiency of the number of tables, study area available and degree of privacy provided (i.e., the degree to which one could study without being disturbed by others at the table). All differences were significant at the .001 level.

Thus, our hypothesis stating that, relative to the previous layout, the new study condition would be evaluated more positively in terms of the available number of tables, study area, and degree of privacy was supported. In this regard, it is important to note that respondents not only perceived the number of tables as more sufficient compared to the previous condition, but also perceived the study area as more satisfactory, in spite of the reduction both in the actual number of tables provided (from 80 to 42), as well as the area actually occupied by each student (reduced to less than half in area; i.e., from 9600 to 4500 cm^2) in the new set-up (compared to the original). Furthermore, the fact that the respondents felt less disturbed by others during their studies suggests that the territorial markers in the form of dividers on the new tables were useful.

EVALUATION OF THE STUDY HALL IN TERMS OF VARIABLES CONSIDERED IMPORTANT

As can be seen in Table 1, all the mean evaluations of the new layout were above the neutral point '3' (on the 5-point scale used), suggesting that the new layout was generally perceived as sufficient in terms of the variables users considered important. The highest evaluations were made for the availability of an electrical outlet and internet access ($M = 4.60$), silence ($M = 4.23$) and being near a window ($M = 4.12$), suggesting that the study hall was perceived as quite satisfactory in terms of those variables.

On the other hand, in terms of variables related to privacy/territoriality, the hall was rated relatively lower than the above three variables but still satisfactory; respective means being 3.80, 3.59, and 3.40 for privacy, being able to study without being disturbed by others and distance to others. As would be expected, students' sufficiency ratings involving the latter three variables were significantly correlated with each other, i.e., privacy ratings correlated with ratings for distance to others ($r = .60$, $p < .001$) and studying without being disturbed by others ($r = .52$, $p < .001$), while the ratings for distance to others

were strongly associated with the ratings for studying without being disturbed by others ($r = .73$, $p < .001$). Furthermore, students' degrees of satisfaction involving those three variables were also positively and significantly associated with their satisfaction involving silence and being near a window, variables rated as quite important in the first study (the respective correlation coefficients involving satisfaction with silence and being near a window were .26 and .34 for privacy; .33 and .28 for distance to others; and .52 and .25 for studying without being disturbed by others, all significant at least at the .02 level).

The responses to the two questions in Study 2 that were not included in Study 1 also indicated that the new layout was rated positively in terms of the sufficiency of the study area ($M = 3.98$, $SD = .95$) and the task lighting ($M = 4.47$, $SD = .88$). Thus, the study hall's new layout was perceived as consistently satisfactory both in terms of the variables considered important in the first study as well as the extra two from the second study.

STUDENTS' SEATING PREFERENCES WITH RESPECT TO ANOTHER STUDENT

As shown in Table 2, after the implementation of the new design there was a significant drop in the percentage of respondents who stated that they would not sit at a table if someone else was already seated there (from 51.3% to 22.1%). Among those who stated they would not leave, in the second study (relative to the first) significantly more students stated they would sit next to or directly across from an already seated student (see Table 2). On the other hand, although proportionately fewer students seemed to prefer sitting diagonally across from the other student in the second study relative to the first, the difference was not significant.

Thus, it seems that the new tables with the territorial markers worked to make sitting next to or directly across from someone else quite acceptable, thereby significantly reducing the number of people leaving the room if there were no preferred seats. Interestingly, about one-fifth of the students in the second study (relative to less than 4% in the first study) checked the "*other*" response, and noted that "*It does not matter*," where they sit, again reflecting a more-accepting seating outlook.

In sum, in accordance with our expectations, students not only evaluated the new layout more positively than the original one, but also indicated seating preferences that seemed to reflect trends toward more efficient use of the study hall, as compared to those obtained in Study 1.

GENERAL DISCUSSION AND CONCLUSION

As noted above, the studies reported in the present paper were undertaken to provide a solution to an existing problem of inefficient usage of a library study space. We suggest that the steps we took in responding to this problem may be useful for tackling other environmental design problems: (a) making observations to identify the nature of the problem and collecting survey data to identify the needs and preferences of the target group; (b) suggesting design solutions, which are (one hopes) implemented by the administration; and (c) assessing the new condition by comparing pre- and post-measures, and hence reaching conclusions about the degree to which the intervention has

Table 1
Means and standard deviations involving (a) ratings of the importance of variables in Study 1 (n = 78), and (b) sufficiency ratings of the newly implemented tables in Study 2 (n = 86).

	Study 1: importance ratings involving table selection		Study 2: sufficiency ratings of the implemented tables	
	Mean	SD	Mean	SD
Being near a window	4.08	1.07	4.12	.89
Providing privacy	3.71	1.18	3.80	.93
Distance to others	3.49	1.20	3.40	1.01
Presence of others using the table (in Study 2: being able to study without being disturbed by others)	3.82	1.33	3.59	1.00
Silence	4.49	.91	4.23	.93
Availability of an electrical outlet & internet access	4.63	.87	4.60	.76

Table 2
Percentage of students reporting different seating preferences with regards to another student in Study 1 (n = 78) and Study 2 (n = 86).

Choosing a seat w.r.t. another student	Would sit next to the other student	Would sit across from the other student	Would sit diagonally across from the other student	Would decide not to sit
Study 1	3.8% (3/78)	2.6% (2/78)	42.3% (33/78)	51.3% (40/78)
Study 2	15.1% (13/86)	15.1% (13/86)	33.7% (29/86)	22.1% (19/86)
Pearson Chi^2 (1, N = 164)	5.90[*]	7.76[**]	1.28	15.13[***]

The significance levels shown in the table footnotes are also valid according to tests involving Yates' Continuity Correction as well as Fisher's Exact Test.
  [*] $p < .05$ (two-tailed).
 [**] $p < .01$ (two-tailed).
[***] $p < .001$ (two-tailed).

been useful in solving the problem and increasing the level of satisfaction and efficient use of the area. One such example that we should acknowledge here is Foster and Gibbons' (2007) seminal research at the University of Rochester, in which they applied student input to a successful collaboration with architects.

Our pilot observations and the results of the first study indicated that students seemed to prefer to sit by themselves at tables in academic libraries though the tables had multiple seats available. When choosing to sit at a table already occupied by one person, students seemed to prefer to sit diagonally in relation to (rather than next to or across from) another user; and when provided with some alternative seating spaces (in the form of drawings), they seemed likely to prefer tables with well-defined territorial markers and that provided more privacy, in congruence with the related studies referred to early in the paper (e.g., Bennett et al., 2005; Gal et al., 1986; Holder & Lange, 2014; Kilic & Hasirci, 2011; Loder, 2000; Webb et al., 2008; Xia, 2005; Young, 2003). Providing privacy may help control crowding, which was found to be one of the five most important space attributes, along with the amount of space, comfort, noise level and cleanliness of library study areas (Cha & Kim, 2015).

In response to those findings, our basic design suggestion was to implement new tables with territorial markers, which solved the problem of resistance to sharing tables (based on both our post-evaluations and the unsystematic observations of library staff). The students, who had been reluctant to sit next to or across from others before the reconfiguration, now used those spaces, which were well-defined by formal, physical divisions. We suggest that the presence of physical partitions, by providing well-marked personal study spaces, may be effective in producing a change in users' territoriality behavior and preventing first-comers from spreading out too much.

Although students seem to like studying in an area bounded by partitions, our results indicate that they prefer to sit at tables with partitions lower than those of carrels, in congruence with previous studies (e.g., Eastman & Harper, 1971; Loder, 2000; Webb et al., 2008; Young, 2003). It could be argued that although there seems to be a need for territorial markers on work surfaces, students may find carrels restrictive because while studying, they psychologically seem to enjoy the presence of others. When no partitions were available, students seemed to use objects as territorial markers (Schneekloth & Keable, 1991), as also noted at the beginning of this paper. Thus, tables with clear territorial markers, as in the current study, could be an optimal solution for open study areas, providing a personal territory, as well as preserving

the feeling of togetherness; i.e., satisfying the seemingly conflicting needs for functional separateness and psychological togetherness. A key challenge in creating successful library spaces, according to Demas and Scherer (2002) is balancing different needs like solitude and interaction, physical barriers and no barriers, quiet and noise, and so on. We think we have come close to achieving this balance with the new tables, and increased their efficiency, not only by resizing furniture as suggested by Xia (2005), but by redefining user territories.

Interestingly, our results also seem congruent with the recent self-related findings which suggest that such general self-orientations as autonomy and individuation may not be opposing with those of

Table 3
Differences between mean evaluations made for the original layout in Study 1 (n = 78) and the new layout with table partitions in Study 2 (n = 86).

	Study 1		Study 2		t	df
	Mean	SD	Mean	SD		
Sufficiency of the number of tables	3.18	1.09	4.12	0.86	−6.14[***]	162
Sufficiency of the study area on the tables	2.76	1.24	3.82	1.10	−5.81[***]	161
Degree of privacy	2.38	1.19	3.60	1.11	−6.72[***]	159

[***] $p < .001$ (two-tailed).

Fig. 2. The new tables with territorial dividers.

relatedness or connectedness with others, as is generally assumed, but in fact complementary; hence, being able to satisfy both those basic needs tends to be associated with optimal psychological functioning (e.g., Imamoğlu, 2003; Ryan & Deci, 2000). Accordingly, the trends implied by our results may not be just limited to library behavior but may be associated with more general self-related mechanisms. Future research is needed to explore the relationship of those trends involving library behavior with more general self-orientations.

Furthermore, in line with the related literature (e.g., Brown-Sica, 2012; Cowan, 2012; Foster & Gibbons, 2007; Fournier et al., 2010; Halling & Carrigan, 2012; Holder & Lange, 2014; Montgomery, 2014; Norton et al., 2013; Vaska et al., 2009; Xia, 2005), our study suggests that electrical outlets for electronic devices are very important for today's students. We took such needs and preferences into account in our proposed table design, and students seemed to be highly satisfied with those facilities. Furthermore, the need to spread out one's materials, as observed in the behavior mapping study, was addressed by providing shelves in the table design to create more space.

Some researchers (e.g., Foster & Gibbons, 2007; Webb et al., 2008) have recommended the use of soft furniture in libraries instead of traditional tables and chairs. As noted above, we have used an armchair and coffee table arrangement as a buffer drawing in the assessment part of Study 1 to explore how students would respond to untraditional furniture in library spaces. Contrary to the above recommendations, and in line with Holder and Lange's (2014) results, our findings indicated that the preference rating for this type of study area was lower than that for the traditional options, which suggests that most students still prefer tables for studying. Although some argue against comfortable seating and/or the use of soft furniture (e.g., Clee & Maguire, 1993) in congruence with the present findings, we think that more research may be needed to explore whether providing such a seating arrangement in some library spaces would be preferred by users with different needs, such as those wanting to read a book in a home-like environment.

LIMITATIONS AND STRENGTHS OF THE STUDY

This study was conducted in one university library hall involving university students, so the results should be viewed with that limitation in mind. More research is needed to understand the degree to which the present results can be generalized to different types of respondents and libraries in other locations and cultures. In addition, although this is a before–after (two-part) study, one should keep in mind that because we did not have a control group (e.g., with a different group of students whose study areas were renovated with new tables of the same kind as the previous ones), there is a possibility that the more positive ratings of the study areas in the second study (after the renovation) could be due not only to the nature of the improved study areas, but also due to the fact that a renovation took place, that is, the Hawthorne effect (Gillespie, 1991). Although very few respondents who took the first survey also took part in the second one (five out of 86 respondents), this should still be noted as a possible limitation of our study.

We should also remind the readers that the new tables were derived from available designs with regard to the input of the responding students, and hence, furniture similar to our new tables (with dividers that are less restricting than carrels) have been used in libraries; for example, as computer stations that feature boundary screens between computer tables (e.g., information commons at Binghamton University, Bartle Library; Herman Miller Furniture Company, 2014), and the Y-shaped divided computer tables at the Humanities and Social Sciences Library at McGill University, mentioned earlier (Holder & Lange, 2014).

On the other hand, we think that the present research has a number of strengths. First, as will be remembered, the present studies were conducted in Turkey, a traditionally collectivistic culture (Hofstede, 1991), from which relatively few studies are available. Although more research in different cultures and contexts would be useful to further tackle the

generalizability issue, as referred to above, the fact that our results seem to be congruent with those coming from a more-individualistic culture like the United States (e.g., Cowan, 2012) provides support to the general importance of our conclusions. In this regard, it should also be noted that the present paper reports a series of studies involving different techniques (e.g., observations, questionnaires, manipulations, before–after comparisons in a field experiment), the results of which provided converging evidence for our conclusions.

We think that another strength of the present study may be that it represents a good combination of exploring some theoretical issues while tackling a practical efficiency issue in a library (with the ultimate aim of solving an environment–behavior problem). Accordingly, it exemplifies how research can be used to contribute to improving environments, thereby contributing to discussions on the "applicability gap" (e.g., Russell & Ward, 1982; Seidel, 1985; Spencer, 2007) in environment–behavior studies. Renovating a library is difficult and expensive (Bennett, 2006), and studies based on behavior research could be beneficial for others looking to change similar behavior and reduce costs and effort.

In light of the present findings, we conclude that a simple solution such as providing territorial markers (together with the other improvements suggested) on study tables seems to have been effective in increasing satisfaction and efficiency in a study hall, apparently because it has satisfied users' needs for both privacy and connection, in congruence with the insight in the famous quote from Robert Frost's poem, Mending Wall (1970): just as "Good fences make good neighbors," territorial dividers appear to make more satisfactory and efficient use of study tables in academic libraries.

Acknowledgements

References

Acker, S. R., & Miller, M. (2005). Campus learning spaces: Investing in how students learn. *EDUCAUSE Research Bulletin*, 1–11.

Applegate, R. (2009). The library is for studying: Student preferences for study space. *The Journal of Academic Librarianship*, *35*, 341–346. http://dx.doi.org/10.1016/j.acalib.2009.04.004.

Bennett, S. (2003). *Libraries designed for learning.* Washington, D.C.: Council on Library and Information Resources.

Bennett, S. (2006). The choice for learning. *The Journal of Academic Librarianship*, *32*, 3–13.

Bennett, S. (2007). First questions for designing higher education learning spaces. *The Journal of Academic Librarianship*, *33*, 14–26. http://dx.doi.org/10.1016/j.acalib.2006.08.015.

Bennett, S., Demas, S., Freeman, G. T., Frischer, B., Oliver, K. B., & Peterson, C. A. (2005). *Library as place: Rethinking roles, rethinking space.* Washington, DC: Council on Library and Information Resources.

Brudvig, I., Corn, C., Harris, R., Kempf, B., Marx, S., Mercer, N., ... Roberts, E. (2009). *Anthropological study of Shain Library: Uses, perceptions, and recommendations. Anthropology Department Student Projects.* Paper 1. Retrieved from http://digitalcommons.conncoll.edu/anthrosp/1

Brown, H. L. (2004). *Student usage of library resources at one academic library.* University of North Carolina, Chapel Hill: Unpublished master's thesis.

Brown-Sica, M. S. (2012). Library spaces for urban, diverse commuter students: A participatory action research project. *College & Research Libraries*, *73*, 217–231. Retrieved from http://crl.acrl.org/content/73/3/217.full.pdf

Campbell, D. E., & Schlechter, T. M. (1979). Library design influences on user behavior and satisfaction. *Library Quarterly*, *49*, 26–41.

Cha, S. H., & Kim, T. W. (2015). What matters for students' use of physical library space? *The Journal of Academic Librarianship*, *41*, 274–279.

Clee, J., & Maguire, R. (1993). Library environment and library usage. *Library Management*, *14*, 6–9. http://dx.doi.org/10.1108/01435129310043824.

Cohen, A., & Cohen, E. (1979). *Designing and space planning for libraries: A behavioral guide.* New York: R. R. Bowker.

Cowan, S. M. (2012). *Assessment 360: Mapping undergraduates and the library at the University of Connecticut.* University of Connecticut Libraries. Retrieved from http://www.clir.org/pubs/resources/resources.html/articles.html.

Cunningham, H. V., & Tabur, S. (2012). Learning space attributes: Reflections on academic library design and its use. *Journal of Learning Spaces, 1.* Retrieved from https://libjournal.uncg.edu/index.php/jls/article/download/392/287.

DeClercq, C. P., & Cranz, G. (2014). Moving beyond seating-centered learning environments: Opportunities and challenges identified in a POE of a campus library. *The Journal of Academic Librarianship, 40,* 574–584. http://dx.doi.org/10.1016/j.acalib.2014.08.005.

Demas, S., & Scherer, J. A. (2002). Esprit de place: Maintaining and designing library buildings to provide transcendent spaces. *American Libraries, 33,* 65–68.

Eastman, C., & Harper, J. (1971). A study of proxemic behavior: Toward a predictive model. *Environment and Behavior, 3,* 418–437.

Foster, N., & Gibbons, S. (2007). *Studying students: The undergraduate research project at the University of Rochester.* Chicago: Association of College & Research Libraries. (Retrieved from http://www.ala.org/acrl/sites/ala.org.acrl/files/content/publications/booksanddigitalresources/digital/Foster-Gibbons_cmpd.pdf).

Fournier, J., Lane, C., & Lyle, H., III (2010). *Designing campus learning spaces: A report on students' current and future needs.* University of Washington. (Retrieved from https://www.washington.edu/itconnect/wp-content/uploads/2013/12/Designing_Campus_Learning_Spaces.pdf).

Fox, R., & Stuart, C. (2009). Creating learning spaces through collaboration: How one library refined its approach. *Educause Quarterly, 32.* (Retrieved from: http://www.educause.edu/ero/article/creating-learning-spaces-through-collaboration-how-one-library-refined-its-approach).

Frost, R. (1970). Mending wall. In E. Connery (Ed.), *The poetry of Robert Frost.* (Retrieved from http://www.poets.org/poetsorg/poem/mending-wall).

Gal, C. A., Benedict, J. O., & Supinski, D. M. (1986). Territoriality and the use of library study tables. *Perceptual and Motor Skills, 63,* 567–574.

Gayton, J. T. (2008). Academic libraries: "Social" or "communal?" The nature and future of academic libraries. *The Journal of Academic Librarianship, 34,* 60–66. http://dx.doi.org/10.1016/j.acalib.2007.11.011.

Gifford, R. (2002). *Environmental psychology: Principles and practice* (3rd ed.). Colville, WA: Optimal Books.

Gillespie, R. (1991). *Manufacturing knowledge: A history of the Hawthorne experiments.* Cambridge: Cambridge University Press.

Halling, T. D., & Carrigan, E. (2012). Navigating user feedback channels to chart an evidence based course for library redesign. *Evidence Based Library & Information Practice, 7,* 70–81.

Herman Miller Furniture Company (2014). *Case study: Binghamton University.* Binghamton, New York, US: Bartle Library. Retrieved from http://www.hermanmiller.com/content/dam/hermanmiller/documents/case_studies/CS_BIU_FULL.pdf.

Hofstede, G. (1991). *Cultures and organizations: Software of the mind.* London: McGraw Hill.

Holder, S., & Lange, J. (2014). Looking and listening: A mixed-methods study of space use and user satisfaction. *Evidence Based Library and Information Practice, 9,* 4–27. Retrieved from http://ejournals.library.ualberta.ca/index.php/EBLIP/article/download/21810/17154.

Hunley, S., & Schaller, M. (2009). Assessment the key to creating spaces that promote learning. *Educause Review, 44,* 26–35. Retrieved from http://net.educause.edu/ir/library/pdf/ERM0923.pdf.

Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist, 60,* 581–592.

Hyde, J. S., & Mezulis, A. H. (2001). Gender difference research: issues and critique. In J. Worell (Ed.), *Encyclopedia of women and gender: Sex similarities and differences and the impact of society on gender. 1.* (pp. 551–559). Boston: Academic Press.

Imamoğlu, E. O. (2003). Individuation and relatedness: Not opposing but distinct and complementary. *Genetic, Social and General Psychology Monographs, 129,* 367–402.

Ittelson, W. H., Proshansky, H. M., Rivlin, L. G., & Winkel, G. H. (1974). *An introduction to environmental psychology.* New York: Holt, Rinehart and Winston.

Kilic, D. K., & Hasirci, D. (2011). Daylighting concepts for university libraries and their influences on users' satisfaction. *The Journal of Academic Librarianship, 37,* 471–479.

Loder, M. W. (2000). Seating patterns and improvements in a small college library. *College & Undergraduate Libraries, 7,* 83–94. http://dx.doi.org/10.1300/J106v07n02_08.

May, F. (2011). Methods for studying the use of public spaces in libraries. *Canadian Journal of Information and Library Science, 35,* 144–156. Retrieved from http://muse.jhu.edu/journals/canadian_journal_of_information_and_library_science/v035/35.4.may.pdf.

Miller, H. (2008). *Library redefined.* Retrieved from http://www.hermanmiller.com/research/solution-essays/library-redefined.html

Mohanty, S. (2002). *Physical comfort in library study environments: Observations in three undergraduate settings.* University of North Carolina, Chapel Hill: Unpublished Master's paper. Retrieved from https://cdr.lib.unc.edu/indexablecontent/uuid:2588a96c-2eeb-4287-9cd6-8e197a6199a1.

Montgomery, S. E. (2014). Library space assessment: User learning behaviors in the library. *The Journal of Academic Librarianship, 40,* 70–75. http://dx.doi.org/10.1016/j.acalib.2013.11.003.

Norton, H. F., Butson, L. C., Tennant, M. R., & Botero, C. E. (2013). Space planning: A renovation saga involving library users. *Medical Reference Services Quarterly, 32,* 133–150.

O'Connor, R. A. (2005). Seeing DuPont within Sewanee and student life. *The Library Planning Task Force, final report for the Jesse Ball DuPont Library. 57-76,* Retrieved from http://library.sewanee.edu/libplan/LPTF%20Final%20Draft%204-11.pdf.

Potthoff, J. K., Weis, D. L., Montanelli, D. S., & Murbach, M. M. (2000). An evaluation of patron perceptions of library space using the role repertory grid procedure. *College & Research Libraries, 61,* 191–202. http://dx.doi.org/10.5860/crl.61.3.191.

Rempel, H. G., Hussong-Christian, U., & Mellinger, M. (2011). Graduate student space and service needs: A recommendation for a cross-campus solution. *The Journal of Academic Librarianship, 37,* 480–487.

Russell, J. A., & Ward, L. M. (1982). Environmental psychology. *Annual Review of Psychology, 33,* 651–688.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55,* 68–78.

Schneekloth, L., & Keable, E. (1991). *Evaluation of library services: A tool for managing change, Occasional Papers, No. 91.* Urbana-Champaign, IL: University of Illinois Urbana-Champaign Graduate School of Library and Information Science.

Seidel, A. D. (1985). What is success in E & B research utilization? *Environment and Behavior, 17,* 47–70.

Shill, H. B., & Tonner, S. (2003). Creating a better place: Physical improvements in academic libraries. *College & Research Libraries, 64,* 431–466.

Shill, H. B., & Tonner, S. (2004). Does the building still matter? Usage patterns in new, expanded, and renovated libraries, 1995–2002. *College & Research Libraries, 65,* 123–150.

Sommer, R. (1965). Further studies of small group ecology. *Sociometry, 28.* Retrieved from http://www.jstor.org/.

Spencer, C. (2007). Introduction: Environmental psychology is eminently applicable, but is it being applied? In E. Edgerton, O. Romice, & C. Spencer (Eds.), *Environmental psychology putting research into practice.* Newcastle, U.K.: Cambridge Scholars Publishing. Retrieved from http://www.cambridgescholars.com/download/sample/58677

Stewart, C. (2010). *The academic library building in the digital age: A study of construction, planning, and design of new library space.* Chicago, IL: American Library Association.

Stewart, C. (2011). Building measurements: Assessing success of the library's changing physical space. *Journal of Academic Librarianship, 37,* 539–541. http://dx.doi.org/10.1016/j.acalib.2011.09.002.

Suarez, D. (2007). What students do when they study in the library: Using ethnographic methods to observe student behavior. *Electronic Journal of Academic and Special Librarianship, 8.* Retrieved from http://southernlibrarianship.icaap.org/content/v08n03/suarez_d01.html.

Vaska, M., Chan, R., & Powelson, S. (2009). Results of a user survey to determine needs for a health sciences library renovation. *New Review of Academic Librarianship, 15,* 219–234. Retrieved from http://dx.doi.org/10.1080/13614530903240635

Webb, K. M., Schaller, M. A., & Hunley, S. A. (2008). Measuring library space use and preferences: Charting a path toward increased engagement. *Libraries and the Academy, 8,* 407–422.

Xia, J. (2005). Visualizing occupancy of library study space with GIS maps. *New Library World, 106,* 219–233. http://dx.doi.org/10.1108/03074800510595832.

Young, P. H. (1993). Visions of academic libraries in a brave new future. In F. W. Lancaster (Ed.), *Libraries and the future: Essays on the Library in the Twenty-First Century* (pp. 45–59). New York: Haworth Press.

Young, V. E. (2003). *Can we encourage learning by shaping environment? Patterns of seating behavior in undergraduates. Association of College and Research Libraries Conference.* NC: Charlotte. Retrieved from http://www.ala.org/acrl/sites/ala.org.acrl/files/content/conferences/pdf/young.PDF.