

Communicating the Library as a Learning Environment

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Lack of commonly used vocabulary for informal learning environments hinders precise communication concerning what is observed, assessed, and understood about the relationship between space and learning. This study empirically extends taxonomies of terms and phrases that describe such relationships through content analysis of descriptions of completed library projects, concluding that focus and collaboration are the most prevalent terms. It also highlights how space affords learning. Study results will help practitioners and researchers to specify designs for improving library spaces, advocate for the value the library environment offers educational experiences, evaluate return on investment in renovation and construction, and contribute research toward understanding the relationships between learning and space.

What makes a library space a learning environment—or at least how do we describe this claim? Both the designer who is proposing a library design and the student demanding a library ambiance are limited in expressing a meaningful relationship between physical space and learning by the lack of a common language to communicate this relationship. A consistent outcome of higher education is the preparation of life-long learners. Yet, higher education planners are increasingly challenged to design spaces that enable this academic mission amidst changing basic assumptions about habits of learning and campus real estate. Construction and renovation projects are lengthy and expensive, yet there is no widely accepted language for campus designers to describe renovations or new physical spaces that foster self-directed learning beyond the classroom. While innovative teaching methods and increased emphasis on active student participation have driven changes in the design of classrooms, there is little understanding of how self-directed learning influences use of non-classroom campus spaces or design of campus co-curricular or informal learning environments.

Problem Statement

Nowhere is the requirement for physical space changed more dramatically in recent years than in the campus library, where self-directed learning has traditionally happened. Many behaviors for engaging with information have dramatically changed, leading to questions about which characteristics of library spaces support learning. In spite of the decreasing necessity to go to a library building to read a

book or journal, students complain when many of the traditional library spaces are open fewer hours or do not meet expectations for having access to safe, attractive, comfortable places to study, and to get help when needed. The relationship of social and physical environments to student learning experiences is complex and not well understood. Ethnographic observations and opinion surveys offer insights into student behaviors within spaces: where students choose to study, what they bring to the space, what satisfies them within the environment, what they do in the space, and even how they infer their presence in the library relates to their grades or completion of assignments. One of the difficulties in trying to generalize the value of elements of an environment, such as those offered in a library space, is that qualitative data gathered from specific case settings are difficult to generalize and apply to other venues. The lack of commonly used vocabulary about environments for informal learning hinders our ability to communicate precisely what is observed, what is assessed, and what is understood about the relationships of environment to learning.

This study aims to reduce this void by proposing a taxonomy of terms and phrases that describe the relationships of learning behaviors and environments intended to support them. The taxonomy offered here is empirically developed and emerged from existing vocabularies and descriptions of completed library projects. Designers, administrators, researchers, practitioners, and students will benefit from the results of the study in their efforts to specify designs to improve library spaces for learning, advocate for the value that the library environment offers the educational experience, evaluate the return on investment in renovation and construction, and contribute further research toward understanding the relationships between learning and space.

The following research objectives will guide this study:

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- Identify indicators of self-directed, active learning used to describe non-classroom building projects.
- Assess the use of learning-related terminologies in descriptions of library learning environments.
- Compile a set of commonly used vocabulary that currently describe library environments intended for informal learning.

Literature Review

In seeking what vocabularies currently exist to describe library spaces in relation to learning, the authors sought ideas in the literature about learning, behaviors and environments, and scanned works for sets of vocabularies. Indicators of learning to describe non-classroom spaces are not easily found in the research literature. However, practical guides that were found began to suggest common vocabulary.

The relation of space to learning has been a focus of attention for several decades, within groups such as Educause (2011), Society of College and University Planners [SCUP] (Painter, 2013), Learning Spaces Collaboratory (<http://www.pkallsc.org/>) and among collaborative partnerships on numerous campuses (Garrett, 2014) including the Science for Learning Centers funded by NSF such as LIFE [Learning in Informal and Formal Environments] (n.d.). The literature of a variety of disciplines reports research that explores broad components of the relationship of space to learning, including understanding what learning is and how to measure it; the behaviors associated with self-directed and active learning and how to observe them; and the built environments to enhance and inspire learning behaviors to occur and how to design them. Much of the work is set in the classroom where pedagogies may be “flipping” activities to encourage independent learning in such formal environments, but little has been found about informal learning and specific destinations where the learner is assumed to take ownership of the learning activities.

Part of the difficulty in finding evidence of the relationship of space and learning is that there is no commonly accepted vocabulary to describe either learning that occurs beyond classrooms or within environments that are designed for informal learning. Our literature review is organized to uncover evolved terminologies and to assemble a useful taxonomy to more systematically continue conversations among practitioners, designers and researchers. It focuses on learning, behaviors, and space design.

Learning, Behaviors and Environment

Johnson et al. note that many branches of psychology, sociology, anthropology (Collins and Goffman, 2004, Dunbar et al, 1997, Turner, 2001, Hall 1963, Pentland, 2008,

as cited in Johnson et al, 2015), and more recently, neuroscience and machine learning studies (Meltzoff, 2009, Gershman et al, 2010, Klingberg, 2013, Dunsmoor et al, 2015), have studied face-to-face behavior and learning to explore how people behave and exchange information when they interact and engage one another (Johnson et al 2015). Among the common insights that have emerged from efforts to explore learning and space are that “experiential learning enhances student engagement and success (Garrett, 2014, np),” and that engaging study behaviors foster learning. FLEXspace, a non-profit service originated at SUNY is developing, with help from community crowdsourcing, a sustainable, reliable and consistent database of images and descriptors of learning environments to help plan and build classrooms (Stephens, 2015). Other works have returned to social identity theory and behavioral economics that articulate important interrelationships of social, emotional and cognitive framing (Haslam, 2001, Turner, 1991, Kahneman et al, 1982). These studies demonstrate fundamental human dependence on social relationships as a means of obtaining, interpreting, and recalling information. Educational psychology adds the concept of making choices as a learning outcome that may also be viewed as important to behavior. A repeated insight about learning behaviors is that “a key factor in informal learning settings is their highly social nature.” (Life n.d.)

In the late 1990s, researchers studying how people learn began to question the characteristics of spaces and to formulate implications for the design of learning environments, suggesting four perspectives on the design of learning environments: “the degree to which they are student centered, knowledge centered, assessment centered, and community centered” (Bransford, Borwn, and Cocking 1999). Felix (2011) summarizes the shift to the constructivist-learning paradigm from which we conceive of learning as active and collaborative and through which knowledge is constructed from engagement with information. This paradigm has evolved from work mostly undertaken in formal learning settings such as classrooms. The paradigm may also apply to informal learning environments and parallels, for example a series of evolving core library objectives: helping students make connections between their existing knowledge and their academic tasks, ensuring contextual access to well-organized information resources, offering feedback to students on their information navigation, and building a sense of community welcomed in library spaces. At numerous academic libraries each of these objectives concentrates on relationships between library staff and students. What are missing from these approaches though are the collective support systems and social motivations that students seek from each other. Peer assistance, studying with, or studying along, is today a

fundamental characteristic of student learning behaviors in libraries.

Learners' motivations suggest descriptors of spaces that inspire learning. Bennett describes a learning-centered paradigm of library space (2009) in which users engage in solo and group learning with digital resources. Book stacks are less visible, while spaces for learning and collaboration are becoming more prominent, for instance in the form of information commons and learning commons. Such spaces intend to support intentional learning, in which acquiring learning, as a skill, becomes part of the student's motivation for engaging in study. Students want to learn both as a means and as an end, and especially in groups, "taking responsibility for high-level skills normally exercised by the teacher" (Bereiter and Scardamalia, 1989). Montgomery drew on the ideas of Bennett (Learning Spaces, n.d.) and others in developing a survey modeled on questions from the National Survey of Student Engagement, to ask students how different spaces in a library worked for different types of study (solo, studying along, and group study). She found a range of behaviors in differently configured spaces and identified student needs for solo spaces, for social and group spaces, and for solo spaces in the middle of group spaces (Montgomery, 2014).

Space planning requirements offer additional opportunity for relating learning activities with physical environments. Bennett (2015) observes that planners, when faced with prospects to invest in a campus physical plant, often prioritize fixing barriers that poorly designed or inadequately functioning facilities place on both building and library operations. For example, the highest specifications in RFPs (request for proposals) and construction documents focus on repairing or replacing heating and ventilations systems to address building deficiencies and maybe consolidating reference desks or adding compact shelving to improve library services. Not that these are bad priorities, but they trap planners and designers to do more to fix "the building in ways that support the university's mission than with enacting that mission" (p. 218) Though as Bennett notes, "libraries commonly have vision and mission statements with ringing declarations about learning," (p 219) when library spaces are planned, learning is seldom a high priority in driving design.

Vocabularies

Sets of vocabularies to describe spaces in terms of learning are found in published research and guides to assess learning spaces. Most of the assessment research conducted to understand use of spaces designed for learning has used qualitative methods such as observation and opinion surveys. Studies interpreting visual recordings or observations of activities in learning environments, for

example, offer descriptive categories used for ethnographic analysis, but these are not vetted standard language for communicating space features. Some propose that these qualitative approaches indicate that it may be premature to seek a technical specification list and that requirement lists to describe learning within environments may come later when continuous improvements in space design are made.

Scott-Webber and Strickland, researchers at the Steelcase furniture design firm, created a survey instrument for a post-occupancy assessment (Scott-Webber and Strickland, 2013) of formal learning spaces [classrooms]. It uses twelve student engagement factors identified from a content analysis of prior research, including brain and learning sciences, and the National Survey of Student Engagement. The factors provide a similar set of descriptors as ones used in other assessment surveys: collaboration, focus, active involvement, opportunity to engage, repeated exposure to material through multiple means, in-class feedback, real-life scenarios, ability to engage ways of learning best, physical movement, stimulation, feeling comfortable to participate, and creation of enriching experience.

Much work in this area has been done by the Learning Spaces Collaboratory (<http://www.pkallsc.org/>), a group of campus planners, architects, and academics looking to explore the relationship between learning, becoming, learning spaces, and assessment. They suggest a goal of moving "toward shaping a common language, identifying, and exploring contextual questions, agreeing on a common set of metrics for assessing" with regards to connecting "space to the larger institutional vision and mission."

Another key piece of work in this area is the Learning Space Toolkit, an online resource assembled by North Carolina State University and industry designers to assist with "designing and sustaining technology-rich informal learning spaces" (Learning Space Toolkit, n.d.). The Learning Space Toolkit taxonomy has three levels; the highest level delineates large groupings such as activities, components and attributes of the space, and audience; the next level down describes major clusters under each heading, such as focusing or collaborating, aesthetics, seating and work surfaces, levels of technology provided, and flexibility of the spaces. The most granular level describes specific activities, products, or attributes of the second level, such as immersive displays or formal configuration versus casual seating.

While some of the items on this list are related to learning activities or behaviors (i.e. reading, reflection), many others are objects in or attributes of environments. It could be argued these behaviors and "things" could also be labeled under the psychological and design framework of affordances, in that they provide, offer, or furnish the opportunity for behaviors to the user (Gibson, 1986). Gaver

(1991) took this further when discussing affordances in relation to designing computer interfaces and states that the best affordances are designed so that they are easily perceived and need no cognitive explanation; a person can intuit the intended function of the object or environment.

Gibson suggests that the thing or the environment **is** the affordance, whereas another theoretical framework offered by psychologist Donald Norman initially seems to suggest the thing affords a behavior and that the behavior is the affordance. Later Norman (1988, p. 12) asserts that the things are the affordances, "Consider a pair of scissors...The holes are affordances: they allow the fingers to be inserted."

In the context of Norman's study of affordances of objects:

...affordance refers to the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used. A chair affords ["is for"] support and, therefore, affords sitting . . . Affordances provide strong clues to the operations of things . . . When affordances are taken advantage of, the user knows what to do just by looking: no picture, label, or instruction is required. [Norman, 1989, p. 9]

Terms to describe spaces for informal learning have been borrowed from research on learning activities and outcomes in formal teaching rooms, and have emerged to assess occurrence of learning behaviors in non-classroom settings. Such terms overlap with words used to specify space design in communication with architects and designers. The study of affordances of objects suggests interpretations of words used to describe environments and their use, without offering a defined taxonomy. The Learning Space Toolkit is the only set of vocabulary found to explicitly characterize environments for informal learning to occur.

Methodology

This study seeks to address this gap by uncovering language used to describe features of designed spaces for informal learning. The study relies on a descriptive qualitative research approach that is illustrative, exploratory, and subjective in its interpretation of recorded documentation. The methodology follows basic protocol of content analysis applied to a case study and is selected for its match to conditions best suited to these forms of qualitative research. The problem the study examines exists in the natural setting of communications among and by a multitude of stakeholders interested in describing space with an implied or explicit relationship to learning. The researchers have no control over the language used to describe such environments, so cannot conduct an experimental study of variables of expressions used. Rather, they seek to gain a holistic understanding of the relationship

of learning and space through inductive logic applied to specific communications found in the case study. Through this interpretation, they aim to form more general terms. Unlike a statistically oriented study seeking to quantify occurrences of phrases, this qualitative study aims to identify new vocabulary and questions for future research.

This case study is designed according to the method's basic components: 1) a theoretical perspective, 2) propositions about the topic, 3) the study objectives and specific questions, 4) method for collecting data, 5) units of analysis, 6) logic and criteria for interpreting the findings, and 7) the intended output of the study.

Research Design

Lacking a singular theory that models the relationship between learning, behaviors, and material informal learning spaces, the theoretical perspective from which this study is designed is one that combines insights from several social theories that focus on learning behaviors, the emphasis on the social aspects of learning as indicated by student engagement, and the intentionality of space design.

Libraries are long-standing representatives of non-classroom informal learning spaces and thus are selected as the venue for this case study. To address the study's three objectives, the following questions are posed:

1. What terms are associated with informal, self-directed, active learning?
2. What terms associate learning with recent library construction and renovation projects?
3. To what extent are identified learning-related terminologies used across descriptions of library learning spaces?

The intended output of the study is twofold: to gauge the extent to which learning is explicitly associated with library space and in doing so, to assess the applicability of existing vocabularies about learning behaviors to describe library space. The research strategy emerged from iterative review of descriptions about new library renovations and construction. The authors conducted three stages, though not in a linear fashion. They: 1) identified vocabularies from the literature that associate learning and space, 2) identified quotes from a selected sample of descriptions of library spaces and inferred terms that associate learning with space, and 3) estimated the extent to which established vocabularies used to relate learning and space describe contemporary library space designs.

From the literature, the authors identified the Learning Space Toolkit taxonomy framework as the most complete in describing active learning behaviors in learning spaces. The vocabulary emerged from exploration of formal learning

environments such as classrooms. Other research, such as studies by Bennett and Montgomery, began with a shorter list extracted from active learning behaviors identified from NSSE (National Survey for Student Engagement). However, a review of the vocabularies concluded the Learning Space Toolkit to be more comprehensive. It provides 27 high level terms in the existing taxonomy used to associate learning and space. This total is the basis for determining the extent to which learning-related terms have been applied to library spaces.

To identify learning-related terms used in describing library spaces, the authors first identified a sample of descriptions and then analyzed the content. The authors used the Bowker Almanac to create a list of 25 new academic library construction and renovations that were completed in 2013 (Bogart 2013) or 2014 (Bogart and Inouye, 2014). They posited that websites created by the academic institution, library, or design architects are primary communication vehicles for descriptions of each project. The authors searched the web for such communication sources for each identified project and discovered 84 websites. From these descriptions of the library spaces, each author systematically retrieved and copied quotes that mentioned student behaviors or design features related to learning.

Although the copied quotes, totaling approximately 400, were the study’s initial units for content analysis, they did not directly provide standard phrases to track the extent to which terminologies that associate student behaviors and design features to learning are used. At first, the authors counted the number of times a quoted phrase was used, but quickly determined this was not a satisfactory metric because of writing styles and variance in the duplication of phrases used in any one document.

The authors next determined that it was more important to identify which student behaviors, represented in the quotes, appeared in each project, in order to see patterns of activities associated with library space. Using these quotes, the authors inferred commonly used concepts that link learning to physical space. Guided by the vocabulary presented in the Learning Space Toolkit, the authors served as coders, discussing differences of interpretations to reach agreement on categorizations. When a term, interpreted to be from the Toolkit taxonomy, appeared anywhere within the description of the space, and regardless of how many times it appeared, it was counted once for this analysis. These counts of coded term appearances were then analyzed to address the study’s research questions.

Table 1. Use of terms to identify library projects identified in Learning Spaces Toolkit

Taxonomy Heading	N=25	Percentage of the 25 projects using a term	Taxonomy Heading	N=25	Percentage of the 25 projects using a term
1.1 focus	17	68.00%	1.4 share	6	24.00%
1.3 collaborate	17	68.00%	5.1 undergraduate	6	24.00%
3.1 basic technology	15	60.00%	2.1 display	5	20.00%
4.4 enclosure	15	60.00%	2.3 work surface	5	20.00%
4.7 atmosphere	15	60.00%	5.2 graduate	5	20.00%
2.5 production	13	52.00%	1.2 create	3	12.00%
3.2 enhanced technology	13	52.00%	2.4 writing surface	3	12.00%
1.5 socialize	11	44.00%	5.3 faculty	3	12.00%
4.3 flexibility	10	40.00%	5.5 mixed	3	12.00%
4.6 support services	10	40.00%	4.1 ownership	2	8.00%
2.2 seating	9	36.00%	3.4 experimental tech	1	4.00%
4.2 access	9	36.00%	5.4 external/public	1	4.00%
4.5 group size	9	36.00%	5. audience	0	0.00%
3.3 advanced tech	7	28.00%			
Total = 213					

Findings

Within the quotes taken from descriptions of library renovations and construction, the authors counted 272 appearances of concept codes they identified or inferred as relating behaviors and space features to learning. These included 213 appearances of terms identified in existing vocabulary associated with learning spaces as well as 59 additional terms uncovered through this study.

Table 1 summarizes the actual appearance of specific vocabulary [taxonomy headings] identified in the Learning Spaces Toolkit across descriptions of library designs showing the number of library project descriptions in which the term appeared at least once. Of the 27 terms identified in the Toolkit, 26 [96.3%] appeared in at least one of the library project descriptions. The table also shows the extent to which each term has been used as a percentage of the number of potential projects [n=25]. At least half of the projects used seven of the terms: focus, collaborate, basic technology, enclosure, atmosphere, production, and enhanced technology.

In addition, the authors identified terms they felt were not adequately captured by the concept codes presented in the Learning Spaces Toolkit but which repeatedly appeared in actual descriptions of library learning spaces. Those terms, appearing in at least two site descriptions, are shown in

Table 2 with indication of how many sites mention the concept in their descriptions.

Discussion

The authors identified an existing taxonomy of terms used to relate learning and spaces. The Learning Spaces Toolkit identifies 27 terms used in formal learning spaces. These reflect coded terms suggested in the literature as phrases reflecting active learning and associated design elements. The authors identified an additional set of seven concepts that appear in descriptions of library spaces that were not incorporated in this learning space taxonomy evolved primarily from language about formal classroom learning spaces. Extrapolating the most frequently used existing terms from the Toolkit along with those additional terms identified in the sample of library space descriptions, the authors propose an adapted taxonomy of terms that relate learning and library spaces. The resulting 34 terms and the number of library projects using each are listed in Table 3.

Appearance of learning-terms associated with library spaces

The two most frequently described activities found in this study featured concepts of focusing and collaborating. Focusing is associated with individual study behaviors, while collaborating is associated with group work. These map fairly closely to Bennett’s ideas of “study alone” and “collaborative learning,” and fit with traditional ideas of what happens in library space. Descriptions of productivity spaces and technology may imply that self-directed, active learning is taking place in that space, but are an imperfect proxy for learning. While the technology is described, the learning behaviors, such as collaborating on a project using that technology, are inconsistently included in the descriptions.

The majority of the terms analyzed describe the physical design and ambience – the affordances - of the space. Learning-related terminologies are used modestly across descriptions of library learning spaces. Studying and collaborating behaviors are discussed, but the context is that these activities have space provided for them, with nothing noted about the importance of these behaviors to the student or the learning process. There were numerous terms describing the technological, physical, and atmospheric attributes of the space, and the implication is again that these will afford learning and productivity, though there is no discussion of why or how. The phrases primarily describe a library space as a box with many options for the student to choose the activity they are most interested in performing, in the setting that best suits them. Trends such as sustainable LEED certified buildings, event spaces, and comfortable furniture receive equal billing with creation, sharing, and

Taxonomy Heading	N=25	Percentage of the 25 projects using a term
4.9 aesthetics	13	52.0%
2.6 proximity to collections	11	44.0%
2.7 teaching space	9	36.0%
4.8 environmental	9	36.0%
4.10 location proximity to high use spaces	7	28.0%
4.11 exhibit/display	7	28.0%
4.12 sound control	3	12.0%
Total	59	

Taxonomy Heading	N=	Taxonomy Heading	N=
1.1 focus	17	3.3 advanced tech	7
1.3 collaborate	17	4.10 location proximity to high use spaces	7
3.1 basic technology	15	4.11 exhibit/display	7
4.4 enclosure	15	1.4 share	6
4.7 atmosphere	15	5.1 undergraduate	6
2.5 production	13	2.1 display	5
3.2 enhanced tech	13	2.3 work surface	5
4.9 aesthetics	13	5.2 graduate	5
1.5 socialize	11	1.2 create	3
2.6 proximity to collections	11	2.4 writing surface	3
4.3 flexibility	10	4.12 sound control	3
4.6 support services	10	5.3 faculty	3
2.2 seating	9	5.5 mixed	3
2.7 teaching space	9	4.1 ownership	2
4.2 access	9	3.4 experimental tech	1
4.5 group size	9	5.4 external/public	1
4.8 environmental	9	5. audience	0
Total = 272			

teaching spaces. This may be understandable, given that the descriptions used in this case study primarily market the space to potential users or clients. However, one might wonder if thought was given to the types of learning behaviors that the libraries were encouraging and the importance of these kinds of learning to the overall student and learning experience.

The authors agreed that mention is made of learning-related terms in descriptions of contemporary library spaces. However, they conclude that use of only 15% (5 out of 34) of terms emerging as key to discussing active, self-directed learning is a low penetration of learning vocabulary to library space design.

Limitations of findings and future study directions

The flexibility and emphasis on exploration rather than prediction of the case study allow the authors to discover how library space is associated with learning in actual communications that influence their renovation and construction. This approach supports a deeper understanding, at least in initial stages, of the perceived link between library spaces and expectations of learning to occur in them. But the inherent weaknesses of content analysis methodology applied to a case study challenges the study's

test of reliability and validity as well as generalizability of its findings to other settings. The personal involvement in data selection and inferences made in the study are inherently subjective; the researcher's knowledge, education, experiences, and preferences all influence coding decisions and inferences made, thus adding bias to the findings. By involving both authors and discussing differences in insights made throughout the project, the study attempted to minimize the effect of such personal bias.

The authors agree that this pilot study will benefit from further study to combat the challenges to reliability and validity. We recommend that the proposed modified taxonomy be used in content analysis of additional cases of descriptions of library projects, those completed in subsequent years and recorded in different documentations such as requests for proposals or architects' submitted bid proposals for renovation and construction projections. Triangulation with other research methods, specifically surveys of student perceptions of the learning intention of library spaces might further establish a useful vocabulary.

The authors are particularly interested in conducting a "member check" with those who produced the documentation about the library spaces. They are eager to interview planners, architects, designers, librarians, and

possibly faculty and students who participate in the planning process that leads to a completed renovation or construction library project to identify the extent to which learning is explicitly considered as a successful outcome of the project. Through the publication of this pilot study the authors hope to also stimulate further discussion among others exploring this topic to establish validity of the proposed taxonomy.

Conclusion

Research that aims to understand the relationship of learning to library space has extended exploration of learning behaviors and design elements in classrooms and other formal educational environments. This study contributes to this nascent research field by piloting a standardized way to identify suggested descriptive language about learning behaviors and experientially examining its applicability to actual descriptions of library spaces. The authors related terms used in actual descriptions to other insights about the relationship between learning spaces and learning behaviors. Their work in this case study concludes that: 1) vocabulary about learning as a central tenet in the description of formal learning spaces does have applicability to informal learning library environments; 2) terms related to focus and collaboration are currently the most frequently associated concepts communicated as relating learning to library spaces; and 3) there are several concepts that library space design descriptions add to association of learning and space. In conclusion, the authors augmented the Learning Spaces Toolkit to include the new terms found in this study's library project descriptions and offer a proposed taxonomy in Appendix A.

The original motivation for this study was an interest to identify the extent to which planning library space renovations or construction projects explicitly consider student learning as an outcome of new designs. The authors wondered, as institutions undertake new renovations or construction, how might a common language be applied for design, communication, and assessment of new spaces? The authors quickly realized that the lack of a commonly used vocabulary to describe informal learning environments hampered developing interview scripts to engage architects, planners, and librarians in conversations about their process for designing space improvements.

There is much value in developing a common vocabulary, but the words themselves need a bridge to other frameworks or understandings of both environment and learning, in order to impart meaning to the space planning and achieve intended outcomes. The authors, at the suggestion of Scott Bennett [Personal communications, January 14, 2016], turned to the framework of affordances to discern meaning and connection in the taxonomy. Contained within the

taxonomy are words that discuss learning behaviors or activities, such as focus (behavior), listening, meditating, reading, studying (all activities listed under focus), and words that discuss things that afford behaviors, such as seating and its attendant examples (mobile ergonomic chair, lounge seating, barstool, booth, carrel, etc.). The authors came to understand that identifying what is important to learning in a space may benefit from an articulated distinction between features that are "things" necessary at a minimum to support learning behaviors to take place—e.g. functioning HVAC equipment or a consultation station—from "affordances" that clearly communicate to enact learning. Furthermore, behaviors themselves can be affordances, and may be the important missing middle link between the descriptions of the things found on the websites and the learning behaviors central to library missions. For example, functioning HVAC affords a comfortable environment, which can afford concentration, which can afford learning. HVAC would still be considered an affordance, but Norman might consider it "hidden," in that students would not enter an environment and intuit that the HVAC system was there for their concentration, though they might seek out a comfortable building in which to study. In other words, according to Norman the affordances "result from the mental interpretation of things, based upon our past knowledge and experience applied to our perception of the things about us, (1988, p. 14)" whereas Gibson felt objects, environments, and even people are affordances whether they were perceived that way or not. Gibson asserts that the affordances themselves are neutral; they are "properties taken with reference to the observer," meaning the needs of the observer determine how attractive or unattractive the affordance is.

While the Learning Space Toolkit vocabulary list does not distinguish between easily perceived affordances and hidden affordances, a great deal of this list does afford the user the opportunity to engage in learning behaviors if they choose, and thus the ability to produce, communicate, or learn. It is possible to make a distinction between the activities in section 1 of the list as primarily learning activities or what is afforded (with the possible exception of some of the items under 1.5, socialize), and sections 2-5 as being primarily the things of affordance.

This pilot concludes with a better framework to continue exploration of the contemporary notion that a library is a learning environment; that it goes beyond being a warehouse for the preservation and organization of information resources and extends its physicality to advance learning—the creation and dissemination of new knowledge. As libraries transform their role within their educational and community hosting institutions shared clarity of how to describe the purpose of space in relation to a library's

contribution to learning will benefit designers, planners, administrators, librarians and clients in communication and formation of stronger mental models of the contemporary library.

As the planning community draws closer to a standard vocabulary of descriptive terms, the need for libraries and designers moving forward is to make more explicit the relationship between the thing and what it affords, which may occur along a continuum of affordances. A chair affords sitting, which affords studying or reading, which affords learning, without drawing the line between the thing – the chair – and the mission-central activity of learning in the library space, what is to differentiate us from any other space with chairs? Bennett sums it up, saying,

It's relatively easy to get the affordances right, but they won't function as well as they should if they are not...rigorously informed by [a] strong concept of learning. In my experience, we all too often do only the easy things (affordances) and leave the actual learning to chance [S. Bennett. Personal communications. January 14, 2016].

Libraries provide many affordances and in part, it is the particular combination of affordances that contributes to their uniqueness. Let us also be more intentional about discussing how those affordances contribute to the learning libraries profess to enable.

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Appendix A: Proposed Taxonomy Augmenting the Learning Spaces Toolkit Vocabulary

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| 1. Activities | 1.3.4. meeting |
| 1.1. Focus | 1.3.5. presenting |
| 1.1.1. Listening | 1.3.6. performing |
| 1.1.2. Meditating | 1.3.7. video conferencing |
| 1.1.3. Reading | 1.3.8. visualizing |
| 1.1.4. Studying | 1.3.9. discussing materials with other students |
| 1.1.5. Viewing | 1.3.10. studying along |
| 1.1.6. Independent study | 1.3.11. discussion with others who have differing values |
| 1.1.7. Studying alone | 1.3.12. critiquing |
| 1.1.8. Reflection | 1.3.13. communicating |
| 1.1.9. Ownership of own learning | 1.3.14. participating in a learning community |
| 1.1.10. relaxing | 1.3.15. presentation practice space |
| 1.2. Create | 1.3.16. study together |
| 1.2.1. Building | 1.4. share |
| 1.2.2. Designing | 1.4.1. assisting |
| 1.2.3. Editing | 1.4.2. teaching |
| 1.2.4. Filming | 1.4.3. tutoring |
| 1.2.5. Producing | 1.4.4. advising |
| 1.2.6. Sketching | 1.4.5. discussing materials with faculty members |
| 1.2.7. writing | 1.4.6. teaching/classroom discussion |
| 1.2.8. research outside of class with a faculty mentor | 1.5. socialize |
| 1.3. collaborate | 1.5.1. eating and drinking |
| 1.3.1. brainstorming | 1.5.2. gaming |
| 1.3.2. demonstrating | 1.5.3. networking |
| 1.3.3. discussing | 1.5.4. café |

COMMUNICATING THE LIBRARY AS A LEARNING ENVIRONMENT

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|---------|-----------------------------------|--------|-------------------------------|
| 1.5.5. | facilitates interactions | 2.3. | work surface |
| 1.5.6. | activity is visible | 2.3.1. | table |
| 1.5.7. | community/neighborhood engagement | 2.3.2. | workstation |
| 1.5.8. | lobby/gathering space | 2.3.3. | tablet-arm chair |
| 1.5.9. | event space | 2.3.4. | booth table (fixed) |
| 1.5.10. | place for conversation | 2.3.5. | counter/bar |
| 1.5.11. | hanging out | 2.4. | writing surface |
| 2. | components | 2.4.1. | mobile whiteboard |
| 2.1. | display | 2.4.2. | fixed whiteboard |
| 2.1.1. | projector, fixed | 2.4.3. | blackboard |
| 2.1.2. | projector, mobile | 2.4.4. | smartboard |
| 2.1.3. | projection screen, fixed | 2.5. | production |
| 2.1.4. | projection screen, mobile | 2.5.1. | paper printer |
| 2.1.5. | monitor | 2.5.2. | copier |
| 2.1.6. | smartboard | 2.5.3. | plotter |
| 2.1.7. | tack board | 2.5.4. | 3D printer |
| 2.2. | seating | 2.5.5. | lab/studio (e.g. maker space) |
| 2.2.1. | mobile ergonomic chair | 2.5.6. | scanner |
| 2.2.2. | fixed ergonomic chair | 2.5.7. | listening/viewing equipment |
| 2.2.3. | tablet-arm chair | 2.6. | proximity to collections |
| 2.2.4. | lounge seating | 2.6.1. | shelving |
| 2.2.5. | café seating | 2.7. | teaching space/seminar room |
| 2.2.6. | bar stools | 3. | technology |
| 2.2.7. | booth | 3.1. | basic |
| 2.2.8. | carrel | 3.1.1. | access to power |
| 2.2.9. | outdoor seating | 3.1.2. | wireless connectivity |

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- 3.1.3. general purpose computing
- 3.1.4. self service
- 3.1.5. electrical plugs
- 3.2. enhanced
 - 3.2.1. large screens or multiple displays
 - 3.2.2. specialized software
 - 3.2.3. production tools
 - 3.2.4. access to general staff assistance
 - 3.2.5. video conferencing
- 3.3. advanced
 - 3.3.1. immersive displays
 - 3.3.2. specialized hardware and facilities
 - 3.3.3. access to expert staff assistance
- 3.4. experimental
 - 3.4.1. prototyping emerging technologies or spaces
 - 3.4.2. dedicated specialized staff
- 4. attributes
 - 4.1. ownership
 - 4.1.1. individual institution
 - 4.1.2. shared between organizational units
 - 4.2. access
 - 4.2.1. open
 - 4.2.2. bookable
 - 4.2.3. dedicated
 - 4.2.4. mediated
 - 4.2.5. 24x7
 - 4.2.6. Handicapped accessible
 - 4.3. Flexibility
 - 4.3.1. None (fixed)
 - 4.3.2. Low (slight layout changes)
 - 4.3.3. Moderate (moveable furniture)
 - 4.3.4. High (minimal switching cost)
 - 4.3.5. furniture can be arranged by users
 - 4.3.6. spaces facilitate multi-use
 - 4.3.7. choice of spaces for users
 - 4.4. enclosure
 - 4.4.1. enclosed
 - 4.4.2. partially enclosed
 - 4.4.3. open
 - 4.5. group size
 - 4.5.1. individual
 - 4.5.2. two people
 - 4.5.3. small (3-6 people)
 - 4.5.4. medium (7-10 people)
 - 4.5.5. large (11+people)
 - 4.6. support services
 - 4.6.1. high-touch
 - 4.6.2. medium
 - 4.6.3. low
 - 4.6.4. none
 - 4.6.5. services
 - 4.6.6. single service point

COMMUNICATING THE LIBRARY AS A LEARNING ENVIRONMENT

- 4.7. atmosphere
 - 4.7.1. formal – conventional setting configured for research or work
 - 4.7.2. informal –casual setting for research, work, and social activities
 - 4.7.3. versatile – setting can be used for both formal and informal activities depending on configuration and user requirements
 - 4.7.4. cyclical – ambiance can change with time of day, activity protocols, lighting, etc.
 - 4.7.5. welcoming
 - 4.7.6. collegiate
 - 4.7.7. quiet
- 4.8. environmental/sustainable building
 - 4.8.1. LEED certification
 - 4.8.2. Recycled materials
 - 4.8.3. Low maintenance/reduced costs
- 4.9. aesthetics
 - 4.9.1. presence of natural light
 - 4.9.2. aesthetically pleasing
 - 4.9.3. view to a green space/skyline
 - 4.9.4. relaxing/serene environment
 - 4.9.5. use of color
- 4.10. location/proximity to other high-use spaces on campus
- 4.11. Exhibit/display space
- 4.12. Sound control
- 5. audience
 - 5.1. undergraduate
 - 5.2. graduate
 - 5.3. faculty
 - 5.4. external/public
 - 5.5. mixed