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A framework for planning academic library spaces

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INTRODUCTION

Purpose (mandatory)

The focus on designing spaces for users in the last decade or so signifies the gradual change in the mission of libraries from provision of resources to that of a pro-active partner in learning. Planning for user space in support of learning is far more complex as it needs to take into account the variety of users' needs and behaviour. Before specifying the actual layout and design of users' spaces it is important to consider all the major factors that affect the use of the intended library space. This paper provides a guide to library planning base on the experience of the authors at Nanyang Technological University (NTU) Libraries.

Design/methodology/approach (mandatory)

The framework for planning library spaces developed at NTU Libraries consists of four components – collaborative space, sanctuary space, interaction space and community space. Discussion on the rationale of these spaces and suggestions for their implementation will assist others in asking appropriate questions on their own library space planning exercise.

Findings (mandatory)

The paper reinforced the view that a good library building has to provide a wide variety of spaces, some of which are contradictory as the needs of a student is different from another. A student also has different needs at different times. Providing and balancing these needs is essential.

Originality/value (mandatory)

This paper provides a tried and tested conceptual framework for use by library space designers.

Keywords:

Library space planning, Academic libraries, Collaborative spaces, Quiet spaces, Interaction spaces, Community spaces

INTRODUCTION

Academic libraries are no longer focused on developing accommodation space for shelving of print and physical collections. It is difficult to justify to authorities who hold the purse strings for new shelving spaces when the prevailing view is the inevitable displacement of physical collections with the digital. Library spaces have gradually been remodelled to be student study and work space and learning commons, with collection space pushed to the sides or out of the library building proper.

The move from accommodation of collections to focus on user space signifies the major but gradual shift in the primary role of the academic library that has been observed for some time. Academic libraries are changing from being a provider of information resources to that of a

facilitator and activist in the business of knowledge acquisition by users in learning, teaching and research activities. Today, information resources provided by an academic library to students occupy only a small fraction of the total available information in the world. Instead, students are using a wide range of information beyond that provided by their library.

However, the easy availability of information in abundance also makes it difficult for students to use information appropriately and effectively. Thus, one of the main roles of libraries today is to help students to be more effective information users instead of merely providing materials and resources. The mission of an academic library is thus much broader in scope and a notch up the food chain of the learning business. For example, at Nanyang Technological University (NTU) Libraries, the mission of the Library is “to enable staff and students to engage optimally with the ever changing information environment in order to succeed in their research, learning and teaching goals”.

Importance of physical library spaces

Physical space plays an important role in helping the library to achieve user-centric missions. In many academic institutions, significant number of students pass through library space daily. It is often said that the library on campus is a third place, a kind of holding, in-between and neutral space that serves as a transition between dormitory and work. Students are in fact captive audience which third places like libraries can potentially shape their learning behaviour and help them to achieve their academic goals.

We all live and work in spaces and enclosures that are largely created artificially. The way in which spaces are shaped, organised and designed has an impact on our personal well-being, work productivity and sense of community. This of course is the *raison d'être* of the profession of architecture and interior design. Students need appropriately configured and well-designed spaces to suit the variety of activities they engage in. In an era of rapid technological changes, widespread use of social media communication and adoption of various learning modes, students today can choose a wide range of activities to structure their daily lives to suit their needs and preferences. These range from solitary reflection to participating in large community events. To support learning and knowledge discovery work of students, libraries need to be part of these activities by offering a variety of services, activities and programmes. Creating effective library spaces where these can be carried out and where students reap the most benefit is an important goal of the Library.

About ten years ago, NTU Libraries started planning library spaces to accommodate the university's rapid expansion of academic and research programmes and student population. The Library expanded from 3 sites to 8 today, with renovations and changes to spaces regularly. We developed a planning framework and guide to assist us in future space development. In essence, we believe that library spaces should cater to four different needs – collaboration, sanctuary, interaction and community spaces. This paper elaborates on this framework. Though we have not been entirely successful in securing the desired library spaces to implement our plans, the framework serves as a useful guide for thinking and planning.

GUIDES ON PLANNING LIBRARY SPACES: A BRIEF LITERATURE REVIEW

Planning for library buildings and renovation involves many considerations that relate to understanding and predicting the needs of library users. As these needs change with technology, pedagogy and indeed the larger educational landscape, library planning is not simply a listing of desirable features and spaces required. In library building projects involving external space designers and architects, typically a design brief is prepared by the Library to translate desirable outcomes of the library into specific space and facility needs. This is then used by the space designers to transform ideas and requirements into physical reality. There are many guides to library planning, both conceptual and practical, in the library literature. Some of the general guides are listed below.

Jochumsen et al. (2012) proposes a four space model that has been used in public libraries in Nordic countries. It provides desired outcome of library spaces at a conceptual level. The four are inspiration space; learning space; meeting space and performative space. "The four spaces are not to be seen as concrete 'rooms' in a physical sense, but rather as possibilities that can be fulfilled both in the physical library and in cyberspace. In an ideal library these four spaces will support each other, and thereby support the library's objectives." According to the model, the library's overall objective is to support four goals: experience; involvement; empowerment and innovation. These could also be overlapping functions that interact in library space physically and virtually.

Cunningham (2012) shares a schema which can be used by architects and librarians when considering user needs in library space design. In this schema, the lower levels of the pyramid, i.e. access and linkages (comprising location, zones, collection, information and network) and users and activities (comprising reading, writing, collaborating, furniture, tools, equipment and flexibility) indicate the most basic needs of library users. The higher levels of the pyramid, i.e. comfort and image (comprising ambience and sense of scholarship) and sociability (comprising communal, social, quiet, noisy, independent and group) indicate the highest level attribute of comfort and feel for an ideal learning space.

Rizzo (2002) provides some useful guidance in listing the following four types of space: highly active and engaging communal places; interactive collaborative places for individual research and group work; quieter less active places such as reading rooms, study rooms and alcoves and out of the way contemplative places for quiet reflection and deep thought. According to Rizzo, a successful library spaces design would have a good balance between these types of spaces. It should also be able to morph over the annual cycle of use to closely match demand over time. For example, many university libraries typically require more quiet study space around examination time and more group collaborative space during project working.

Narum (2013) proposes the following four questions be considered for future learning space design. Firstly, what do we want our learners to become; secondly, what experiences make that becoming happen; thirdly, what spaces enable those experiences and lastly, how do we know? Narum suggests that by focusing on "becoming", it may be easier to see how investments in physical spaces made a difference in how students experienced learning. These questions may not be specific to libraries but highly relevant as academic libraries' mission is often related to how they could support learning, teaching and research.

Clugston (2013) provides the interior designer's perspective on design principles for new libraries and learning commons. According to him, libraries should include flexible or multi-

functional space that can be reconfigured daily, weekly or monthly to suit a number of functions ensuring the space is fully used. Spaces should allow for creation of choice with a variety of spaces to suit different learning styles and needs. Other principles include provision of sufficient volume of space to ensure that learners are comfortable; removal of barriers between formal and informal spaces; inclusion of collaborative and social spaces; and clear, direct information and communication.

Beard & Dale (2010) provides five categories of various user spaces based on their observation of higher education institutional libraries in the UK. They are namely; short stay individual information gathering, open-space flexible group work, individual silent study, small-group intentional collaborative work, and finally, structured teaching and learning. Each zone is designed to support a different pedagogical or learning focus. Beard & Dale suggests that applying learning points from others in an innovative, flexible and agile way while taking into consideration its own needs could be a hallmark of good library design.

EMPHASIS ON USER SPACE

The transformation of traditional library space usually starts with reconfiguring collection, study and reading spaces to more collaborative and technology enriched space. There is hardly an academic library now without such an area. A survey report published by Association of Research Libraries (SPEC Kit 342, 2014) revealed that many libraries (84% of 72 responding libraries) have plans to make significant changes to at least one of their learning spaces in the near future, including adding classrooms, labs, collaborative study spaces, and makerspaces, along with removing collections. Other examples of new spaces include visualization labs, faculty commons, gaming labs and hackerspaces. The report calls these new spaces 'Next-Gen learning spaces'. Such spaces are distinguished from information commons or other library innovations by their purpose and by the activities libraries encourage within them. Next-Gen learning spaces are service-rich environments created in collaboration with campus partners that support active learning and multidisciplinary instruction along with providing a platform for scholarly communication and cultural enrichment (Association of Research Libraries, 2014).

THE NTU LIBRARIES SPACE FRAMEWORK

Students have diverse needs arising from their fields of study, the year they are in, learning behaviour, motivation, personal preferences, etc. An individual student also has different needs at different times. These needs are expressed in activities that students engage in. Thus, no one type of space will meet all the needs and cater to the variety of activities. Successful library spaces have to be varied. To ensure that we consider all the needs of students when planning library spaces, we developed a simple framework to guide us in the planning process as well as to communicate to internal and external parties and stakeholders. We felt that student learning activities could be served by 4 different kinds of space – collaboration, sanctuary, interaction and community. Collaboration space refers to active areas where students work with one another in various group configurations to maximize their collective strength. Sanctuary spaces recognize that ultimately, it is the individual who is doing the learning and thus needs suitable spaces for thinking, reflection and creative work. Interaction spaces provide opportunities for students to seek assistance and consult resources provided by the library. Lastly, community space fulfils the needs of students to have a sense of identity and belonging to a larger learning community. These four spaces work in combination to provide the student with a

comprehensive selection of environment to suit their needs at different times. In the sections below, we will elaborate on the rationale of these spaces and provide suggestions on what to consider in their planning and design.

1. COLLABORATION SPACE

In our framework, the term collaborative space refers to space that caters to students working together as a group and not the more comprehensive notion of learning commons and its variants. The latter usually incorporate collaborative as well as a wide range of other spaces for individuals. In our framework, we wish to isolate the different types of spaces for discussion. An information commons or learning commons could incorporate one or more of the four spaces we describe here.

The interest in developing group-focused collaborative space is driven by the increasing adoption of collaborative learning, cooperative learning and other group-based approaches in undergraduate instruction. There is strong evidence in the literature on the benefit of group learning in academic work. For example, a meta-analysis of research on small group learning in science, mathematics, engineering and technology (SMET) undergraduate courses concluded that “students who learn in small groups generally demonstrate greater academic achievement, express more favourable attitudes toward learning, and persist through SMET courses or programs to a greater extent than their more traditionally taught counterparts.” (Springer et al., 1999).

Requirement for group work is usually initiated by teaching staff who adopt cooperative and collaborative learning methods, though it does not preclude students from forming their own learning groups. Most on-campus students value social interaction and therefore it is common to observe groups of them huddled together inside and outside of libraries. This is in fact an important part of the undergraduate experience. Providing group space for such purposes, particularly in relation to learning contributes to the success of a university mission.

Collaboration space in libraries

Groups of students can get together anywhere to meet, hold discussions or collaborate on a piece of work or project. All that is needed is shelter from the elements with a well illuminated place to sit and perhaps a surface with electricity supply to work on. Such spaces are often found in campuses, e.g. along corridors, in the canteen, open study areas, student lounges, etc. However, libraries provide much more functionality in collaborative work space that can contribute to better learning outcome for groups. This is due largely to the fact that spaces in the library are “managed”, i.e. it has the constant attention of library staff in monitoring, improving and re-organizing them in relation to the total library services and in alignment to the mission of the library. Also, to some extent, the symbolism of the library as a place of knowledge and learning lends credibility to its learning spaces.

Collaborative space for group work is usually characterised by attributes in seating configuration, furniture and furnishing, flexibility and adaptability, equipment and ambience. Each of these factors is discussed below.

Seating configuration

A variety of seating space in supporting group work is essential in designing an effective collaborative space. Seating (including work surfaces) should be configured to cater to the needs of different group activities, different group size and accommodation of the necessary seating and technological support.

In planning collaborative space, the first obvious step is to identify the needs of groups working in spaces outside of their formal classroom. There are many types of group work that students may engage in. Some of these are:

- Brainstorming
- Project work
- Presentation practice
- Writing out reports and papers
- Solving problems
- Peer learning
- Informal social interaction

Each of these group activities requires slightly different types of space, seating arrangement and amenities to achieve optimal use. For example, in brainstorming discussions, which often involve larger groups, it is usually suggested that a round or U-shape seating configuration with emphasis of equality among participants is preferred. For project work, there is a greater need for generous writing surfaces, either horizontal or vertical and sufficient circulation space for ease of movement among group members. For informal social interaction, close seating proximity with low table for drinks and maximal visual contact might be preferred. In planning spaces, it is therefore necessary to analyse the various types of group activities that students may engage in and which activities is most prevalent. In practice, it is likely that a single space configuration may meet the needs of more than one activity.

Catering to different group sizes is an important consideration. Usually the most common group size is between 4 to 5 members. It is generally agreed that this allows sufficient diversity of views and abilities to make group work effective. However smaller and larger groups than this have their uses and the collaborative space need to cater to them as well. It may be useful to divide group size into 3 categories – 2-3, 4-5 and 6-12 to aid in planning the numbers needed. The most common group size, i.e. 4-5, should form the majority of seating arrangement in normal circumstances. Making available spaces for different sized groups provide choices for students to match their type of group work.

Seating also needs to cater to various technological support, such as computers, projection screens, electronic whiteboards, cameras and recording devices, equipment and not forgetting low-tech structures such as whiteboards and work surfaces. Integrating technology with custom-designed work spaces can provide a seamless and efficient work space for groups. However, the short life-cycle of technological equipment also means that flexibility in re-configuring or changing equipment needs to be seriously considered.

Furniture and furnishing

Appropriate furniture and furnishing in the Library can make a huge difference to the attractiveness and functionality of library spaces. This in turn raises its desirability in attracting students to use the spaces fully. A few decades ago, most library furniture is usually procured off-the-shelf as the requirements for tables and chairs and their layout are fairly simple. Today, more attention on group spaces often requires the service of interior designers. Custom designed furniture meets specific requirements of group seating space and helps students form a unique space experience that will become a long-term memory in their lives as alumni. On the other hand, custom-designed furniture is often fixed and not easily movable. This may restrict future unanticipated need for space change. In practice, a balance of custom-designed and off-the-shelf furniture is often adopted.

In group seating spaces, it is often advised that students be allowed to control their physical environment, such as lighting, ventilation, easy equipment access and even acoustic conditions and visual access, though some of these may contradict other design and planning considerations. Furniture should be provided to reflect the different needs in different group work spaces. Just as in group space, there should be a variety of seating types. For example, in casual spaces, soft homely seats are appropriate whereas project work space will require more body support and task oriented design. How we are seated may also influence how we think and work. Intuitively, chairs that allow our body to lie in relaxed position are better for brainstorming than those that force us to sit upright.

Flexibility & adaptability

It is often difficult to predict the uses that students make of the group space available to them. Just as pedestrians walk on the grass patch to reach their destination more efficiently instead of following the longer paved pathway planned and built for them, students will find ways to use the group space that they find sensible. Generally, students prefer to create their own space to suit their needs of the moment.

Some group spaces should therefore be purposely designed to allow students to configure their own space. This can be done by using portable and modular furniture. For example, tables that can be fitted to larger pieces using modular parts, vertical writing screens on castors that double up as partition screens, chairs and stools that are light enough to be carried around, computers and monitor on wheels, etc.

Equipment

Many group tasks today require or are aided by the use of technology. Most group spaces have to be technologically enabled to serve the basic needs of students when working in groups. Large computer monitors, projection screens and electronic smartboards where group members can share their files or work together on a common file are becoming the norm. Mounted cameras and recorders for capturing proceedings of meetings or filming of presentations can add value to the group space. Video conferencing equipment and software for group use can help connect groups together virtually. Connectivity to shared displays using junction boxes and screen and video casting via Bluetooth or Wi-Fi should be easy and does not require technician or specialist assistance.

Other technologies for group work like large panel multiple touch screens and digital surface tables are attractive. However, in deploying technology for group use, it is important to assess the real use by students. Even though students may be technologically savvy, if the learning curve in using the technology is significant, they will just not be used. Furthermore, applications for new technology tend to be few and its reliability uncertain. This does not preclude the adoption of new technology for exploratory or feasibility studies. The objective of the adoption needs to be clear and that such equipment should not be too deeply embedded in the group space in case there is a need to withdraw them. It is also important not to forget low-tech tools such as whiteboards and erasable writing surfaces. We observed in our libraries that they are very well used despite the availability of smart boards and electronic screens.

Ambience

The ambience of a place is the character and mood it conveys to people experiencing the space. In libraries, this results from a combination of physical environmental factors such as architectural details, lighting, colour, design and layout of furniture and equipment, etc., as well as human factors such as activities being carried out and the general demeanour of people in the space. Ambience has an impact on the increased use of the library by students. In a survey of 182 Canadian and American libraries by Shill and Tonner (2004), it was found that improvement in the overall facility ambience of libraries after renovation work is a factor in contributing to increased facility usage.

Using the services of a good interior designer to create an attractive and appropriate ambience is essential to create a successful space. Ambience is also created by activities of people and the layout and design of group space should emphasize the buzz generated by people working together. For example, in the Learning Commons in Lee Wee Nam Library at NTU, work alcoves called pods are placed closed to each other and also along other work benches. Students in groups have visual contact with others and yet have some semi private space to conduct their business. There is also a constant spill over of students in the common areas which create a sense of busy activities in the space. Seeing other fellow students working together can have a positive impact on their disposition towards group work. Observers have pointed out this social dimension of learning. For example, Crook and Mitchell (2012) call it “social ambience” where “students appeared to gain inspiration of reassurance from merely being among others they knew were in a shared predicament”.

In summary, the rise in the number of library spaces catering to collaborative and group work of students has changed the character and students’ perception of academic libraries. Group spaces, often part of information commons are the most visible space in many libraries today and their popularity with students has been consistently reported in academic libraries globally. It is therefore important to focus our attention on their planning and design by considering the various elements described above.

2. SANCTUARY SPACE

In contrast to group and collaborative spaces where a high level of noise is inevitable and acceptable, the traditional quiet space which was prevalent and indeed synonymous with libraries in the past, has been pushed to the background. As Lankes (2012) wryly observed, “Today’s great libraries are transforming from quiet buildings with a loud room or two to loud

buildings with a quiet room". Despite the popularity of collaborative and noisy spaces in libraries today, the demand for silent spaces by students is high. Intuitively, we understand that a noise-free environment is necessary for effective learning and studying. This is borne out by the increased demand for silent spaces during students' revision and examination periods when intensive learning, revision and studying take place.

Productive intellectual work is mostly accomplished by people who have quiet moments and the time and space to think and focus. Whether works are thought out and written at home (Franz Kafka), peaceful lake-side villa (Gustav Mahler), library, or gazing at the ceiling (Albert Einstein), the common denominator is quiet individual effort. As Picasso said, "without great solitude no serious work is possible". Just walking along the aisles of any library quiet space will confirm this. Indeed, the very act of reading requires silence as Nicholas Carr (2010) points out, "in the quiet spaces opened up by the prolonged, undistracted reading of a book, people made their own associations, drew their own inferences and analogies, fostered their own ideas. They thought deeply as they read deeply".

Different people are affected in different ways by the level of noise in an environment. Standing et al. (1990) cited previous studies that show the decrease in learning performance of introverts (as compared to extroverts) in the presence of low level noise. Their own study reinforced earlier findings and showed that "reading comprehension was significantly impaired by noise for introverts but not for extroverts". Moreover, according to Susan Cain (2011), introverts are likely to have a preference for solitude, reflection, contemplation, working independently, writing over conversation, etc. These are activities best done in quiet environment. It would seem that the need for silent work space is stronger for students who lie more towards one side of the introversion-extroversion spectrum. If we are to believe the estimate that at least half of the population tends to be introverts, the need to provide for silent spaces in the library cannot be denied.

Silence is not just the absence of noise but also of distraction and unwanted stimuli. The value of silence in any learning activity is the minimization of unwanted stimuli so that full attention can be directed on the main task at hand. Though many believe that millennials today are able to juggle and attend to simultaneous listening of streaming music, viewing of Youtube videos and reading a book in front of them, their ability in achieving effective results in learning may be an illusion. Results of a study by Ophir, E. et al. (2009) suggests that "heavy media multitaskers are distracted by the multiple streams of media they are consuming", and are "more likely to respond to stimuli outside the realm of their immediate task" and thus "sacrificing performance on the primary task to let in other sources of information". In other words, heavy multitaskers do not perform well on the intended task (e.g. learning) that they are engaged in.

To reflect a more nuanced interpretation of quietness or silence, we use the term sanctuary to describe spaces conducive to the formation of knowledge and insight in an individual. A silent environment is desirable for reflection, introspection, review, contemplation, analysis, creative thinking, writing, etc., in fact any activity that require a sense of communion with oneself in order to think and create knowledge. Although the word sanctuary is associated with religion, it also connotes a sense of peace, individual cultivation, freedom from distraction, harm and the hustle and bustle of a hurried life.

Planning considerations

The traditional quintessential silent space in the library is the individual carrel where generations of students gravitate towards when they need a thorough intellectual workout by themselves alone with their books and notes. The eye-level enclosures of a carrel prevent distraction from the sight of fellow students and yet still allow them to feel their presence. It is a cross between the isolated room and the big open desk space but an economical solution from the library's point of view.

However, there should be a variety of silent spaces to meet different needs for different degree of quietness. At the deep end of silent spaces are places of solitude with no distraction from noise and interference. A typical implementation is the single study room. Another is a strictly monitored communal space. For example, University of Hong Kong Libraries has a 'deep silent room' where the use of technology including computers and personal devices is prohibited. This is designed 'in response to users' demands for such a space (Fox & Sidorko, 2013). On the other end are moderately quiet open places away from main human traffic but in a community of other students seeking the same level of quietness. We noted earlier that social ambience is important for students to feel a sense of participation in an anonymous group of people doing the same activity as them and this kind of space caters to that need. The gradation of quiet spaces in between can be mediated by incorporation or prohibition of technology access, positioning of visual interest (e.g. external views or indoor artwork), layout and design of seats and desks, adjustment to acoustic environment, proximity to other library areas (e.g. book shelves), etc.

By necessity, quiet spaces tend to be confined to one area so that library staff can manage the space to help maintain its purpose and character. However small isolated areas (e.g. a secluded corner space, areas with unique external views) can be designated as part of the sanctuary space. Appropriate design and signage can be used to indicate its purpose and intended use.

If we wish to achieve the types of individual activities that a sanctuary space suggests, such as reflection, introspection, contemplation, review, analysis, creative thinking, writing, then there must be deliberate attempt to design or locate these spaces. This is not to suggest that there are specific design elements and space features for each of these subtly different qualities of thinking activities. The intention is to use these qualities to provoke the imagination of spaces for these purposes.

In summary, sanctuary space serves a function directly opposite of collaborative spaces. One focuses and serves the individual whereas the other caters to the needs of groups. One has to be quiet and the other is expected to have high noise level. Sanctuary and collaborative spaces are the yin and yang of the library building. They both must exist to complement each other. Their use can ebb and rise in relation to each other over the course of a day, a semester or a year, creating a dynamic that give life to the library building.

3. INTERACTION SPACE

Interaction space refers to designed space where a library user interacts with resources, services, librarians and other personnel. Though libraries today provide many of their services online, for example, access to e-resources, email reference, virtual chat, etc., there are still significant reasons for users, particularly students to make regular trips to the physical library for various

types of interaction. This includes browsing and discovery of print and physical materials, use of equipment, software and other resources, and meetings with librarians for instructional purposes or individual consultancy. Spaces where these interactions take place should be well planned and designed to maximize opportunities for fruitful and pleasant encounters between users and the library.

Interaction with librarians & other experts

Librarians interact with users in face-to-face mode mostly through instructional classes, reference desks services and individual consultation and advisory work. Though these services are increasingly transacted online, actual face to face interaction between librarians and students is important for both parties. For librarians, it is an important channel of establishing close relationship with their users while for students, such contacts enhance their learning experience.

For example, in a study on individual research consultation between users and librarians at University of Vermont, Magi and Mardeusz (2013) found that apart from satisfaction with resolving information seeking problems, “affective benefits of face-to-face communication are important to these students. Many stated that the consultation was valuable because it helped relieve their anxiety and feelings of being overwhelmed and made them feel encouraged, more focused, and even inspired”. Simons, K. et al. (2000) describe the idea of “learning library” using constructivist and pedagogical theories that suggest that collaborative study, peer mentoring and conversation as important vehicles for learning. These rely primarily on social interaction, and learners make use of “multiple coaching/mentoring opportunities, whether at the reference desk, in the formal instruction rooms, in casual conversations in study groups, or in meetings in librarians’ offices”.

Apart from informal social interaction with users, dedicated formal space for librarian-student interaction provides an effective environment for discussion and consultation. These can be equipped with computers and screens with appropriate seating to facilitate demonstration and hands-on guidance. The availability and visibility of such spaces would also help to create awareness and emphasize the role of librarians in offering such assistance and service to the student community. Consultation spaces that are designed to be semi-open and visible inform students that longer in-depth discussions of their work with librarians are welcomed.

Library instruction is now part-and-parcel of every academic library service. Most librarians today teach information literacy and research skills and not just how to use various library resources. There is also a greater desire in libraries to integrate information literacy skills within course work of students and for librarians to work in closer collaboration with faculty. Although librarians should be teaching anywhere and everywhere, it is important to have a dedicated teaching facility in the library. This allows the library to design the space according to the pedagogy approach it deem suitable as well as to have control over their use without having to worry about scheduling time.

Libraries can also provide space where other professionals and teaching staff in the university provide joint services to students. Turner et al. (2013) cited Somerville and Harlan (2008)’s discussion on the integrative aspect of the learning commons as being more active and involved in cross-disciplinary and cross-campus collaboration with pedagogy experts, subject

coordinators, and writing experts, for example, to further facilitate knowledge creation. Librarians are natural “connectors” between users and the information or resources they need. From multimedia design centers and specialized classrooms to digital scholarship centers, librarians are finding ways to enhance their users’ experience through the library and partner with academic researchers. These spaces encourage cross-disciplinary activities and are designed with new pedagogies in mind. Librarians can also help with the development and preservation of scholarly output (Association of Research Libraries, 2014).

Interaction with library resources

Loan of print books in academic libraries has generally declined due largely to the convenient and easy availability of voluminous content in digital formats on a global scale. Essentially, the print collection has lost its battle to convenience in our fast-paced society. However, the library print collection is not just a store of books for users to borrow specific items. Print collections may not offer the most convenient way to access information, but it has great value in helping people make discoveries in their pursuit of knowledge and gain valuable insights.

Browsing the library collection is the chief way in which users interact with the print collection. We engage in browsing when we are not sure if information we need exists or when we are not entirely sure what we are looking for. We may be merely looking for ideas or seeking inspiration for solving a problem or creating a new work, or it may just be a stroll among the cumulated ideas of mankind. In browsing, we even hope for serendipitous encounters that will change our life as has often been recounted by successful people getting a lucky break from chance discovery of some information. These are the pleasures of learning.

Browsing is about exploration and discovery of information and ideas. It is more about connection and less about precision in finding information. The typical classified library print collection has proven to be a highly effective browsing tool for many people. Every book in a classified collection is related to its neighbor in some way or other, giving the browser a sense of the connectedness of everything. Though there are software applications and digital systems that provide browsing capabilities electronically, the experience is quite different from actual physical interaction with real objects in real space. Immersing in a sea of bookshelves and generally undistracted from other influences provide the user with an experience that deepens the pleasure of discovery and exploration in learning.

Libraries can focus more in supporting and encouraging browsing through good planning and design of shelving and layout. For example, instead of rows upon rows of shelves for efficient accommodation of books, there could instead be alcoves, resting areas, reading spaces and other areas interspersed throughout to create a sense of journey for the exploring browser.

Furthermore, if we are convinced that the discovery function of the library collection is more important than its location function now, we should consider alternative or supplementary ways to arrange and design the collection space to increase useful encounters between the user and ideas contained in books. Highlighting special parts of the collection or topical areas through temporary arrangements, attractive displays and exhibitions are time-honored ways to increase the exposure of the collection. These practices could be expanded and built on. Rippel (2003) suggested some ideas from bookstores for public libraries that could also apply to academic libraries.

Interaction with new technology

Many library users, in academic as well as public libraries, come to the Library to make use of computers and other IT equipment and services. This is a form of user interaction with library resources. However, it is commonly argued that the widespread ownership of portable and mobile computing devices removes the need of libraries in providing computer hardware to students in their premises. A small scale survey carried out at NTU Libraries in 2014 suggests however that users prefer to use computers provided in the Library because they do not want to carry their laptops around (68%), prefer larger monitors (19%) and does not own the hardware or software needed (12%). Though a more rigorous study of users' preference is needed, the observation is that students still expect and demand technology availability in the Library.

An important service that libraries should provide is technology that the average students usually do not have at home. This could simply be high-end computers, larger screens, dual or triple monitors, etc. Libraries are ideal places to provide computers and other IT equipment to the campus community because of their location, longer opening hours, user services support and recognized role in providing information services. Libraries are also good homes for introducing and providing new and experimental technology to students.

Thus, many libraries initiated and are involved with the introduction of "maker spaces" in recent times. According to a survey report published by the Association of Research Libraries in 2015 in SPEC Kit 348: Rapid fabrication / makerspace services, many of the 64 research libraries which responded are engaging with either currently or planning to be engaged with makerspace service deployment.

Meyer & Fourie (2015) noted that "makerspaces in libraries are devoted to creative idea development and production, to support for people to access material not normally available in their homes, and to opportunities to join others in creating and making things; thus also to the provision of social spaces for practical and creative activities". They also emphasized that though makerspaces should be fully embraced, it should be "on the terms of libraries and information services and their strong alliances to reading, literacy, seeking, organising, using and sharing information".

Dickson (2013)'s description of the role of the 21st century library to provide media creation spaces that move beyond information literacy to media fluency has echoed similar activities observed in makerspaces. In his book chapter titled 'Beyond analogue: the learning studio as media-age library', he explains the trend towards digital storytelling where students and staff would be producing more videos as part of the regular academic work output and hence the greater potential of the library providing the facilities for such purpose.

By their nature technology provision for users by libraries is expected to change with time, and very often in unpredictable ways. Space and facility provision for these services must therefore be flexible. Planning for re-use and re-configuration should always be considered at the start of any technology space. It generally means that the shape of the space, expansion possibilities, proximity to other areas, access routes, use of custom fixtures, provision of electrical power, data access points, etc., need to be well-thought through.

4. COMMUNITY SPACE

The Library used to be referred to as the heart of the university when learning and research activities depended on books, journals and other information resources physically located at its premises. Though this view has diminished somewhat due to obvious reasons, a library remains a special place in a university for its community building role. Unlike lecture theatres, classrooms, meeting rooms and laboratories owned by the respective academic departments, the library is a neutral and common space for all users, regardless of which faculty they come from. Also, unlike other neutral spaces like sports hall, student lounges, canteens and café, the library is chiefly identified and associated with learning and research. Students come to the library not for the primary purpose of dining, drinking, playing games or socializing, but as a participant in the whole enterprise of learning and education. In a sense, a library draws in learners and becomes a community space for them. Students gather in the library, with the common interest of learning, whatever their courses of study.

An institution, such as the university is essentially a community of people which exists for the purpose of pursuing and achieving a common goal. Its success depends on people having a sense of belonging to the community. Block (2009), in his book on building community in society at large, considers community to be about the experience of belonging - of being a member of a group and also of being an owner of it. He adds, "to belong to a community is to act as a creator and co-owner of that community. What I consider mine I will build and nurture. The work, then, is to seek in our communities a wider and deeper sense of emotional ownership; it means fostering among all of a community's citizens a sense of ownership and accountability." Thus the experience of community is essential in a university and the Library is a place that naturally provides this. Moreover, the strong social capital built up by libraries through their user-oriented work make them ideal in playing a central community role on campus.

Libraries reinforce their community role through several means. Library spaces are essential to mediate this. It is common for libraries to create and organize regular activities such as talks, presentations, book discussions, poetry reading, exhibitions, etc. These activities, if done regularly and routinely re-inforce the notion of the library as a learning place. Though most of these are held in rooms and enclosed spaces, it might be useful to conduct these in open areas in the library where users passing by can be drawn in or at least feel a sense of participation as part of a community. Such open activities create a different kind of atmosphere that adds to the richness of a community experience which could energize users' work and intellectual pursuits. Although noise generated from such events is often cited as a problem, library users are usually disturbed by unexpected encounters with noise. If advanced notice is given or if users expect higher level of noise for certain scheduled periods in the library, it is usually acceptable. The good experience we have in organizing these activities in open space in our Library encouraged us to plan and provide a highly visible and open "Event Central" where regular activities can be held in our new Research Commons at Lee Wee Nam Library.

A community is usually made up of people with diverse background but sharing some common interest that underpin the community. In a university community, students and staff are from different faculty and academic fields but all with a common goal in the pursuit of learning and knowledge. The Library in its community building and nurturing role pulls diversity together to achieve common community goals. It is a match-maker and intermediary that bring different groups of people on campus together. It can offer its space and expertise in helping an

individual or a group to expose and showcase their intellectual work and output so that others can become aware or participate in their further development. For example, our Library has planned for a new dedicated space where researchers and students can put up their research projects, which could be an object, an explanatory poster, a digital presentation or a piece of software at various stages of completion for public viewing and display. Feedback screens will be placed beside each display to encourage users, i.e. other members of the community to offer comments, advice or suggestions throughout the period of the display. Thus engineering students become aware of, and encouraged to participate in the work of humanities students and vice versa. The goal is to develop asynchronous feedback and interaction between different groups of users for mutual benefit and therefore increase the value of the community.

In looking at how libraries contribute to a sense of community in the university community, we are using physical space as an important conduit and platform. Community are also formed online and in social media. In fact, it is easier, cheaper and faster to establish a community of interest online. However, community based on physical space and location has a more powerful lasting impact. Humans are mobile, sensory, emotional and social beings that thrive on contact and physical proximity to others. A community of people together in a physical space, such as a library is essential part of human living. Libraries should have well planned and designed spaces to cater to the building and sustaining of community.

CONCLUSION

The purpose of the framework is to provoke our thinking on the multifaceted needs of our users. Long gone are the days when the library is primarily a single purpose building for access and use of library resources. Instead, the library today is a multi-purpose venue to promote and support the learning, teaching and research activities of the university. Whereas in the past, the exterior design of the library building iconized the grand purpose of the library as a storehouse of knowledge, the vibrancy and space variety of the library interior today express its heightened learning mission. Catering to the diverse use of the library building is the main challenge in planning and designing library spaces. A student who comes to our library has different needs from his fellow students. He also has different needs at different times of the day, week, month or year. Some of these needs require opposing environmental considerations, such as between quiet space and discussion areas, and it is difficult to cater to both especially for libraries with small footprints. In such cases a choice has to be made based on the preference of students and availability of quiet or activity spaces in other buildings and facilities near the library. Consideration of the variety of needs and prioritizing them according to the specific environment and circumstances of each institution will yield useful, interesting and unique library spaces.

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