Journal of the University Librarians Association of Sri Lanka, Vol. 25, Issue 2, June 2022, 1-33,
DOI: http://doi.org/10.4038/jula.v25i2.8055

Planning and Designing Learning Spaces in Academic Libraries: A Case Study at Information & Learning Centre (ILC) of the Faculty of Science, University of Colombo

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Abstract

Planning and designing learning spaces in any library is not a short-term task of today's librarians because of the unpredictable and changing nature of user demands. This study focuses on planning and designing the learning spaces in the Information & Learning Centre (ILC), the new library of the Faculty of Science, University of Colombo. It was designed to support the multifaceted learning activities of the diverse user communities of the university. The main data collection method used for identifying expected learning activities was focus group discussions. Ten learning activities expected by users were identified and the most prominent ones were collaborative learning, student individual learning, learning by discovery (learning by searching and reading), focused learning (focusing on research studies) and library classroom learning (information literacy learning). After-hours studying, auditorium facilities, learning by video conferencing, and non-library classrooms are also recognized. Eleven learning spaces are designed according to the expected

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Received: 03 March 2022, Accepted revised version: 18 June 2022

learning activities within five study zones; collaborative, interactive, quiet, reference and open study zone, e-resource centre, Library skill lab, Library studio, auditorium, and classroom. These spaces have ensured three main requirements of a modern library; technology, furniture and ambience. 24/7 Wi-Fi facilities, state-of-art computer labs and other latest technical applications are integrated with modern, flexible and comfortable furniture. Continuous observations and assessment of user behaviour are considerably important to plan and design modern library buildings. Prioritizing user needs according to the specific environment and culture of the institution will yield unique and useful library spaces.

Keywords: Academic Libraries, Planning and Designing, Learning Spaces, Learning Centres, Sri Lanka

Introduction

Currently, students who enter the university are socially and culturally more diverse than previous generations. They prefer to work with peers and technological devices and always keep connected with different communities. Disregarding traditional learning methods they seek technologically rich, novel methods and expect a modern learning environment from university libraries that suit them. Most universities used to design their libraries to accommodate printed literature and also library buildings are designed accordingly. But the revolution of scholarly communication with emerging technology, the role of academic libraries has changed, all over the world. No longer, are academic libraries demanded with "traditional" collection and "information access support" but a new set of demands have emerged according to the expectations of new user groups. Hence, designing learning spaces of academic libraries to satisfy the new generation's demands is very important in attracting them to libraries. According to Lankes (2012) "Bad Libraries build collections. Good libraries build services. Great libraries build Communities".

The history of the University of Colombo goes back to hundred years with the opening of the Ceylon University College on the 21st day of January in 1921. The Library of the Ceylon University College was commenced in the same year with a set of books donated by Sir Ponambalam Arunachalam in memory of his late son Sri Padmanabha. From that day the Science collection was maintained by the professors of the different Science departments of the faculty and in 1984 by combining all the departmental libraries the Science faculty library was formed as one of the two branch libraries of the main library of the University of

Colombo. It comprised of around 30,000 books and periodicals but was located in a very old building of the faculty which was beyond repair level. The reading space had only 150 seating capacity with heavy, old wooden furniture. Due to the structure of the building, very limited IT facilities were adapted and the users had to satisfy with only 10 computers for searching research databases. Hence students were reluctant to visit the library due to its unfavourable learning environment and consequently, the importance of a new library building for the Faculty of Science was identified (Somaratna, 2009; QAAC, 2009; Somaratna *et al*, 2010; Somaratna & Pieris, 2011). During the last three decades, the requirement of a specifically designed library building for the faculty of Science was sensed significantly, but this was never materialized due to a dearth of sufficient funds. In 2015 reaching a juncture in the university library sector, the proposal initiated in 2013 for a seven-storeyed modern library building for the Faculty of Science was approved by the Government of Sri Lanka, allocating nearly 700 Million LKR.

Designing learning spaces was the main task of the new building project hence different communities of the University of Colombo were involved in accomplishing this task; librarians of the University of Colombo, members of the Library Committee, and the Building Committee of the Faculty of Science and the students of the Faculty of Science. The proposed library for the Faculty of Science, University of Colombo was named the 'Information & Learning Centre' (ILC), reaching beyond the traditional library concept.

Aims and Objectives

The main objective of this study was to elaborate on the process of planning and designing learning spaces in the library to reach maximum satisfaction levels of the diverse user community of the Faculty of Science, University of Colombo.

Specific Objectives

1. to identify the types of learning activities that users expect to carry out in the new library of the Faculty of Science.
2. to propose ideas to create learning spaces in the library building with a suitable learning environment and technological adaptations
3. to identify challenges that would encounter when designing learning spaces for the new library building

Research Questions

1. What are the learning activities that users expect to carry out in the new library of the Faculty of Science?
2. What are the kinds of learning spaces that relate to the expected learning activities?
3. What are the environmental atmospheric factors needed for the learning spaces concerning the learning activities?
4. What would be the challenges encountered when designing learning spaces?

Literature review

Changing Nature of Academic Libraries

The revolution of information technology has contributed to the change in the unique central role of the University Library as a main repository of information. The rapid growth of the availability of online information sources is the main reason for this (Applenton, Stevenson & Boden, 2011) In the USA it was observed a sharp decline in usage statistics of academic libraries and it leads to rethink about library spaces to attract more users by deviating from the traditional concept "Library as a place" to "Learning space" (Carlson, 2001). According to Gayton (2008) "The apparent death of academic libraries, as measured by the declining circulation of print materials, reduced use of reference services, and falling gate counts, has led to calls for a more "social" approach to academic libraries: installing cafés, expanding group study spaces, and developing "information commons" (p. 60).

The role of academic libraries has undergone a series of evolutionary changes over the past few decades. Radcliffe *et al* (2008), describe the evolution of the library under four generations; first generation as the "collection centric", second generation as the "client-centric", third generation as the "experience-centric" and the fourth generation as the "connected learning experiences". The climactic point of this process is the fourth generation library. As described by Radcliffe *et al* (2008), "fourth-generation libraries offer diverse learning experiences where printed and digital information can be combined in an environment which is user-focused and service-rich, where students can work collaboratively in spaces that support current social and learning patterns" (p.8). Further

fourth-generation libraries blur the demarcations between libraries and other learning spaces in the university. Sarah *et al* (2019) discuss trends in university library spaces through an evolutionary approach from the pre-1970s to 2000 onwards. They describe trends from 2000 onwards as group discussion spaces, social spaces, learning commons, shared spaces, rival learning spaces, technology as a huge driving force to change and the symbolic importance of libraries come to front. Cunningham & Tabur (2012) identified influencing factors of university library spaces in 2012, which are changing nature of learning and teaching methods, changing nature of the student population (distance learning, online learning, and part-time studying), and changing nature of technology. As the users of the library are 'digital natives it identifies the importance of having physical spaces with technological adaptations. By identifying shared services as a future trend it proposes the joint use of library space for career centres, learning resources and information services, sharing with education or community colleagues. Further, Weise (2004) and Choy (2011) cited in Sarah *et al* (2019) introduce an alternative name for academic libraries as 'learning resource centre' which reflects the qualities of future academic libraries, deviating from the term 'library' which conjures up of dusty shelves.

Designing Learning Spaces in University Libraries

According to one of the architects, who was involved in designing a new library at the Nevada Las Vegas "…think of your library as an environment rather than a facility – a place of interaction, learning and experiencing rather than a place for storage and equipment" (Oblinger & Oblinger, 2005; p,13). Further, he proposes the features of a learner-

centred approach when designing learning facilities; "design learning spaces around people, support multiple types of learning activities, enable connections, inside and outside, accommodate information technology, design for comfort, safety, and functionality and reflect institutional values" (p.11). (Oblinger & Oblinger, 2005 cited in Radcliff *et al*, 2008). This is proven by Scott Bennett's model of library design, which posits a shift from a book centred to a technology-supported, learning-centred paradigm of library space. The finding shows that library building paradigm shifts are complex phenomena that include changes in social and educational practices. (Khoo *et al*, 2016).

Michalak (1995), introduces some conceptual approaches for master planning of new library buildings and librarians are advised to design flexible spaces with minimum numbers of partition walls, create open spaces, incorporate network facilities and power points, and distribute lighting systems. As learning spaces, he identified research service areas with consultation rooms, where librarians can conduct sessions on complex research strategies. Spaces to conduct library instruction sessions, group or collaborative study areas for collaboration with academics, librarians, peers, and other teams, and self-study areas that foster quietness are among the other learning spaces. Furniture for comfortable reading with an opportunity to connect users' portable devices from any study seat they have chosen and technological aspects; network facilities, multimedia, computer work stations, and state-of-art equipment are identified as necessary facilities (Michalak, 1995). Similarly, Head (2016) identifies approaches, challenges, and best practices related to planning and designing today's academic library spaces by introducing four types of learning activities from an academic library. They are collaborative

learning, individual studying, tutoring by campus learning partners, and occasional classes taught by campus instructors. As the challenges of designing academic libraries he identifies, noise mitigation, shared space allocation, provision of electric power, and IT facilities. Because the success of library learning spaces depends upon shared knowledge and understanding of learning and research changes facing the university he stressed the importance of working together of librarians and architects, to apply that knowledge and understanding to the 'unique environment' in the specific institution.

Latimer (2011) expresses a move from the collection-dominated library buildings of the 19th and 20th centuries to the service-rich, user-focused ones of the 21st century with a new name instead of the library. Accommodate both print and electronic resources, work along and groups at desks or in comfortable chairs, and studying in silence or surrounded by a hubbub of noise are the features identified by him. Seeing the positive end of the new generation who are more diverse and social he says instead of a decline in the need for academic libraries, demand has increased. Further e-resources and IT give more opportunities to bring new users and use space in different and innovative ways. Internet facilities, wireless networking, and mobile technology are identified as technical advancements related to 21st-century libraries. Net generation students are opposite of old-style reference rooms, where they are expected to do self-studies while sitting on straight wooden chairs, without access to technology. They expect more comfortable and relaxing spaces with facilities to access technology and allowed them to interact with each other (Oblinger & Oblinger, 2005; Mushroofa, 2013; Somaratna, 2019).

Further, they have explained the library as the venue in the university where academic work can be carried out in a social context. When libraries incorporate technology into their environment they become more suitable for student group discussions, informal socializing, and unlimited computing. Further libraries also can promote community by facilitating spaces for an informal gathering of students. To achieve this most of the libraries are designed with a coffee shop, in the lobby areas, or adjoining the library. This helps encouraging students to continue their informal conversations on academic-related topics.

Very few studies have been conducted in Sri Lanka on the space planning of academic libraries. Wijayasundara (2018) proposes a space planning model for the USJP library by identifying four spaces; knowledge reservoirs, learning zones, interactive spots, and service areas. According to her, space planning in libraries may differ from library to library due to the size of the building, availability of funds, number of users, and varied user needs.

Methodology

The main data collection method was the qualitative data collection through focus group discussions. Focus groups met at different stages of the library building project. The first focus group meeting was conducted in 2015 to identify basic learning activities that are expected to be carried out in an academic library. The group consisted of the academic library staff (08) of the University of Colombo, including the Librarian, deputy librarians and the senior assistant librarians. The Librarian of the University of Colombo chaired the session and the Senior Assistant Librarian of the Faculty of Science served as the moderator. A

brainstorming session was conducted to identify all possible learning activities that are expected from a modern academic library. All the participants were given an equal chance to express their views and emerged learning activities were listed down.

The second focus group aimed to refine the learning activities identified by the first focus group. The focus second group consisted of the members of the Library Committee of the faculty of Science. The meeting of this group was attended by 28 participants, including 07 faculty members representing all the seven departments of the faculty of Science and 21 student representatives from level I to level IV of the faculty. All the participants were given an equal chance to express their views. Learning activities identified by the first focus group were refined and forwarded to the third focus group.

The third focus group was organized with the members of the building committee of the Faculty of Science. The Dean of the Faculty of Science chaired the session and the group consisted of the Heads of all the seven departments of the faculty and three more nominated faculty members. The learning activities identified by previous focus groups were refined and finalized here.

Based on the identified learning activities, required learning spaces were designed by a specially appointed committee for the new Library building project. The committee comprised of the Senior Assistant Librarian of the Faculty of Science and three senior academics nominated by the Faculty. Furniture requirements and technological adaptations for each learning space with expected student accommodation were identified by the committee. After having a series of discussions with architects, engineers and the Network manager, the furniture arrangement and the

technical aspects were finalized according to the allocated space for the proposed library building.

Results and Discussion

In total 45 participants attended the meetings of 03 focus groups on three occasions. The number of participants in each focus group meeting was 8, 27 and 10 respectively. By profession, focus group participants were librarians, faculty and students and their experience ranged from less than five years to 35 years. The length of the focus group meetings ranged from 30 minutes to one and a half hours. Participants' demographics are described in table 1.

Table 1

Focus group participants' demographic variations

Participants' demographic variables		Focus Group 1 N=8	Focus Group 2 N= 27	Focus Group 3 N=10	Total N = 45
Age	< 25 years	----	N = 19	----	N = 19
	25-35years	N = 1	----	N = 1	N = 2
	35-45years	N = 4	N = 3	N = 2	N = 9
	45-55 years	N = 1	N = 2	N = 3	N = 6
	> 55 years	N = 2	N= 3	N= 4	N = 9
Gender	Female	N = 7	N = 21	N = 4	N = 32
	Male	N = 1	N = 6	N = 6	N = 13

Profession	Librarian	N = 8	N = 1	N = 1	N = 10
	Faculty	----	N = 7	N = 9	N = 16
	Student	----	N = 19	----	N = 19
Working experience/ student experience	< 5 years	----	N = 19	----	N = 19
	5-15 years	N = 5	N = 3	N = 3	N = 11
	15-25years	N = 1	N = 2	N = 4	N = 7
	25-35 years	N = 2	N = 3	N = 3	N = 8
	>35 years	----	----	----	----

There were 12 members in the new library building committee and the composition of this committee is 04 faculty members, two librarians, three engineers, two architects and one IT manager. Their working experience ranges from five years to 35 years as detailed in table 2.

Table 2

Demographic variations of the committee members of the new library project

Participants' Demographic Variables		Number of participants (N=12)
Age	< 35 years	----
	35-45years	N = 8
	45-55 years	N = 2
	> 55 years	N = 2

Gender	Female	N = 3
	Male	N = 9
Profession	Faculty	N = 4
	Librarian	N = 2
	Engineer	N = 3
	Architect	N = 2
	IT Manager	N = 1
Working experience in the profession	< 5 years	----
	5-15 years	N = 6
	15-25years	N = 3
	25-35 years	N = 3
	>35 years	----

Research question 1

Learning activities that are expected to be carried out in the new library of the Faculty of Science

Ten learning activities were identified through the focus group discussions. When a focus group participant used the same language to explain a learning activity more than once, it was counted as the one idea and figure-1 represents the expected learning activities in the descending order of the frequencies as a percentage of the sample that discussed each learning activity.

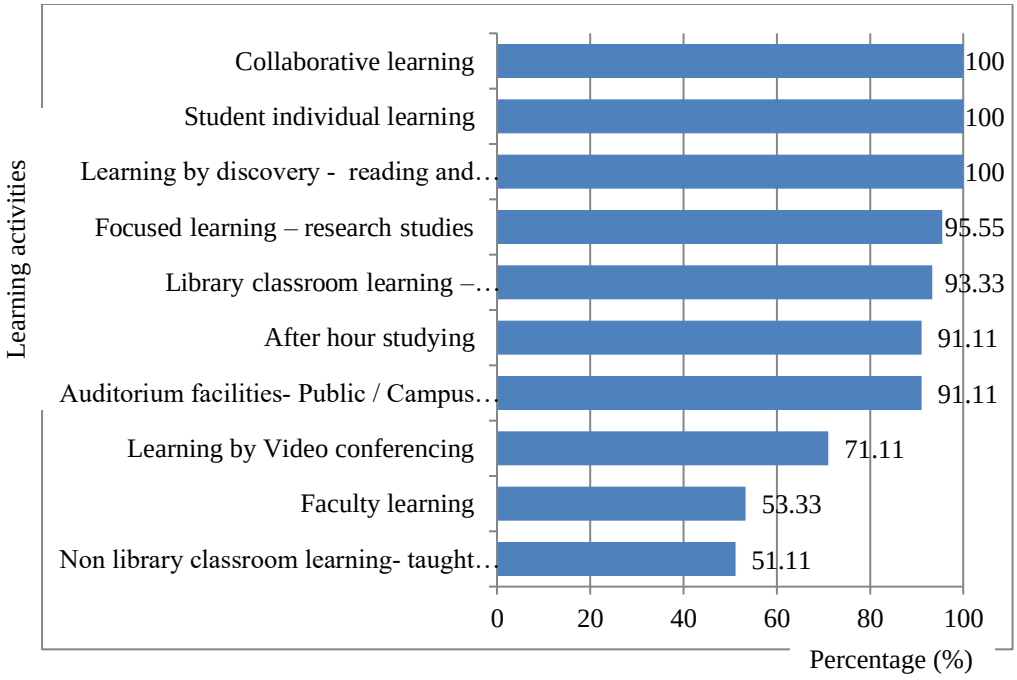

Figure 1 *Expected learning activities from the new library*

Table 3 represents the detailed data for expected learning activities to be carried out at the library. Among the nine learning activities that emerged through the first focus group with librarians, collaborative learning, student individual learning, learning by discovery, library classroom learning and focused learning are the most prominent (Table 3). In the second focus group which consisted of members of the Library Committee and the students, a new learning activity was identified as non-library classroom learning and 51.11% of the participants proposed this learning activity. All the ten learning activities identified through the first two focus group discussions were re-evaluated and finalized at the third focus group discussion which was held with members of the Faculty building committee chaired by the Dean of the Faculty of Science.

Table 3

Detailed data for expected learning activities by each focus group

Learning activity	Focus group 1 (N=08)	Focus group 2 (N=27)	Focus group 3 (N=10)	Total (N=45)
1. Collaborative learning	08 100%	27 100%	10 100%	45 100%
2. Student individual learning	08 100%	27 100%	10 100%	45 100%
3. Learning by discovery - reading and searching	08 100%	27 100%	10 100%	45 100%
4. Focused learning – research studies	08 100%	25 92.59%	10 100%	43 95.55%
5. Library classroom learning – information literacy	08 100%	24 88.88%	10 100%	42 93.33%
6. After hour studying	06 75%	27 100%	09 90%	41 91.11%
7. Auditorium facilities- Public / Campus events	08 100%	23 85.18%	10 100%	41 91.11%
8. Learning by video conferencing	06 75%	18 66.67%	08 80%	32 71.11%
9. Faculty learning	--	16 59.26%	08 80%	24 53.33%
10. Non library classroom learning- taught by faculty	04 50%	09 33.33%	10 100%	23 51.11%

When ranked the overall findings of all three focus groups, from the most expected to the least expected learning activity, the collaborative learning, student individual learning and the learning by discovery were identified by all the participants and the frequency in percentage is 100%.

Collaborative learning (100%) is one of the main learning activities that was identified by all the interviewees. According to modern teaching and learning trends, outcomes are mostly expected through collaborative work. As identified by the focus group participants, a set of activities under collaborative learning are brainstorming sessions, assignment/ report writing, project work, peer learning, practising presentations, writing reports and solving problems.

All the group members stressed on the importance of "student individual learning" (100%) giving equal priority to collaborative learning which is most of the productive intellectual work accomplished with people who are working in silent environments. Self-studying is a learning method, where students are involved in their studying after classroom learning. By practising self-study they can thorough their knowledge by further exploring learning topics. By engaging in self-studying students are benefited in different ways. They learn more effectively and discover more about the topics they learned in the classroom. Students are allowed to learn at their own pace and it also increases their self-esteem. This encourages in-depth learning of subject matters and helps explore new research ideas which are vital for the research output of the university. Since self-studying is the basis of the learning process, providing facilities for it is one of the premier expectations of an academic library.

The third learning activity 'Learning by discovery' (100%) is a process of learning without being taught by a teacher. Students can engage

in learning by discovery through several methods such as research, reflection and investigation. Two self-learning methods came up in the focus group discussions; learning by reading and learning by searching, blended with traditional book reading and modern e-reading. By combining both information gathering methods, 'learning by discovery' was identified as one of the most important learning activities of the proposed library. Several studies have reported the importance of learning by discovery using search engines to seek information. Hence the ILC centre would encourage students of the University to learn by discovery using print as well as electronic information sources.

'Focused learning' is another learning aspect that is identified by the focus groups Around 93% of the interviewees expected to promote focused learning through the new library and they expect assistance for their research through discussions and workshops that would be conducted by librarians and other facilitators. These discussions and workshops should focus on their research, academic writing, research assistance, IT assistance and other skills which are specifically needed to accomplish their research. Promoting focused learning by the library will help inculcate research habits among university students, and at the same time, it will bridge the gap between the library and the faculty.

Librarians as teachers in the university involve in teaching soft skills to students, through information literacy programmes. Always there should be a suitable space in the library with required learning aids to conduct information literacy or library instruction lessons. All the faculty members (100%), librarians (100%) and 88.88% of students expect library classroom learning as the prominent learning activity. Apart from the above-mentioned learning activities, after-hour studying (24/7 study

hours) (91.11%), public/ campus events - auditorium facilities (91.11%), learning by video conferencing (71.11%), non-library classrooms- taught by faculty (53.33%) and faculty learning/reading (51.11%) were the other learning activities expected from the new library building.

Research question 2

Learning spaces of the new library building that relate to the expected learning activities

Learning spaces of any academic library need to be carefully designed according to expected learning activities. Identifying learning spaces is not an easy task because all the learners' expectations are reflected by learning spaces. 11 learning spaces were identified for the new library building in relation to the expected learning activities. They are collaborative study zone, quiet study zone, interactive study zone, reference zone, open study zone, library skill lab, librarian's classroom, library studio, library auditorium, faculty reading room and non-library classroom. All these learning spaces have different seating capacities as shown in table 4.

Table 4

Respective learning spaces concerning expected learning activities

	Learning Activity	**Learning Space**	**Seating capacity**
01	Collaborative learning	Collaborative study zone	140
02	Student individual learning	Quite/self-study Zone	70

03	Learning by discovery - reading and searching databases	Interactive study zone/ Reference Zone	150
04	Focused learning – research studies	Library Skill Lab	60
05	Library classroom learning – information literacy	Librarian's classroom	60
06	After hour studying	Open study zone/ Informal learning space	80
07	Auditorium facilities- Public / Campus events	Library Auditorium	275
08	Learning by Video conferencing	Library Studio	60
09	Faculty learning	Faculty Reading Room	15
10	Non-library classroom learning- taught by faculty	Non Library Classroom	300

The collaborative study zone and the interactive zone are the most popular learning space among millennial students. These spaces are located on the 3rd and 4th levels of the new library building and it is expected to accommodate 140 students. Deviating from the previous generations, collaborative learning or group learning is now practised by the majority of the students who enter universities and most of the time they work with their peers or classmates. During the last two decades, the curricula of university courses also changed significantly and they have embedded project work, presentations and group assignments along with

the main subjects. In the traditional university setup, it is difficult to find a common space for collaborative learning to accomplish such learning activities. Providing enough space with modern technology and learning aids would help students buildup their confidence and competitiveness through their learning activities and eventually, the quality of higher education ascends. Preserving the traditional value of an academic library, individual study spaces or quiet study zones are designed with 70 seats on the first and the fourth floors of the new library building.

Library shelving areas and computer labs are identified as interactive spaces giving chance to students to learn by discovery – reading books and using databases. One aspect of learning by discovery is the buildup of one's knowledge, by searching for new information to discover facts and correlations. An academic library encourages students to discover knowledge in two ways 'learning by searching' and learning by reading'. The information & Learning centre (ILC) is designed in accordance with the aim to facilitate discovery learning activities by introducing the blended concept, traditional shelving areas and E-resources centres. It is designed to accommodate modern information sources (electronic resources, e-books, e-journals, electronic databases) as well as traditional information sources (books and periodicals). To access electronic information sources, two computer labs are designed with 50+30 computers with Internet facilities. Student reading areas with shelving spaces are incorporated into the building, facilitating traditional reading methods.

The library skill lab is specifically designed to encourage focused learning, based on research activities and the seating capacity is 60. Another most important learning space of the ILC building is the

Librarian's classroom where students are allowed to gain Information literacy skills through librarians. The open study area or the informal learning area is designed on the ground floor of the library featuring a more relaxing environment through a natural landscape and wind breeze. This area also accommodates a coffee shop and vending machines. Library studio is featured modern studio facilities with high-end video cameras, sound controllers and other relevant equipment. This allows video conferencing and lecture recording facilities for the University community. The academic staff reading room is specifically designed to attract teaching faculty to the library with a conducive learning environment and its seating capacity is 15. This can be used as an individual learning space or small group discussion or a meeting place. By providing such a learning space, academics can avoid the difficulties that they face in locating a seat among students of the Faculty. The Library auditorium is a community place designed for public gatherings and university/ faculty functions such as research symposiums, conferences, guest lectures, seminars and workshops. By identifying this as a common auditorium to the university it can be utilized for several teaching and learning activities and is located on the sixth floor of the ILC. The Non-library classroom is located on the fifth floor of the library and its seating capacity is three hundred. This is learning space with a seating arrangement that allows adjusting according to learning requirements.

Research Question 3

Environmental requirements of the learning spaces concerning the learning activities

The learning environment makes a significant impact on student learning. It is influenced by 3 factors technology, furniture and appearance. All these three aspects of the learning environment are addressed in the new library building.

i. Technology

Technology is one of the main learning commodities that is popular among modern learners. In today's academic libraries as learning centres, technological adaptation should be carefully designed because by practising the modern learning methods, today's university students expect technically boosted academic libraries. Hence each learning space of the Science Faculty Library is designed with modern technological facilities that suit the expected learning activities. There are 16 technological adaptations identified: Wi-Fi facilities, state-of-art computers, E boards, interactive boards, multimedia projectors, large display boards/ TVs, sophisticated sound systems, network ports and power outlets for each study table, Video cameras and studio equipment, Library management software with RFID security system, self-check-in/out machine with a return bin, laptop charging facilities, public address system, PABX system and CCTV camera system. These would help the users to switch from one method of learning to another with a single click. Further, this process encourages the BYOD (Bring Your Own Device) concept among library users by confirming the practice of students bringing their own computers, phones, etc. to do their work. (Cambridge Advanced Learner's dictionary and thesaurus, 2020). Table 5 reflects how technology is adapted in each learning space of the library.

Table 5

Distribution of the technological adaptation in each learning space

Technological Adaptations	Collaborative Zone	Quiet Study Zone	Reference Zone	Library Skill Lab	Librarian's Classroom	Open Study Zone	Library Auditorium	Library Studio	Faculty Reading Room	Non-Library Classroom
Wi-Fi facilities	√	√	√	√	√	√	√	√	√	√
State of- art Computers	√	√	√	√	√		√	√	√	√
E-boards/Smartboards				√	√		√			
Interactive boards	√									
Multimedia projectors				√	√		√			√
Large display boards/ TVs	√	√	√			√		√		
Sophisticated sound system							√	√		√
Network ports	√	√	√	√	√	√	√	√	√	√
Library Management Software			√							
RFID security system with RFID security gate			√							

Self-check-in/out machine with a return bin powered by RFID			√							
Laptop charging facilities	√	√	√	√	√	√			√	
Video cameras and studio equipment								√		
CCTV Camera	√	√	√	√	√	√	√	√	√	√
Public address system	√	√	√	√	√	√	√	√	√	√
PABX Telephone system	√	√	√	√	√	√	√	√	√	√
VRF AC system	√	√	√	√	√	√	√	√	√	√

ii. Furniture

Furniture type and the arrangement of furniture make a significant impact on the learning spaces. Selecting the right furniture for each learning space is important because it helps increase student participation in learning and it leads to dynamic student engagement in learning activities. It also helps retain the learning capacity of students. As today's students demand for comfortable as well as enjoyable environment while learning, the furniture of the learning spaces has to be carefully selected ensuring the right furniture for the right learning space.

While providing large study tables for the quiet study zone with comfortable cushioned armchairs, the collaborative and interactive study zone is furnished with light-weighted small study tables with comfortable

cushioned chairs. This selection leads to the rearrangement of the furniture in the collaborative space according to the size of the learning group. Sofas and beanbags are selected for the interactive space facilitating a more comfortable learning experience. To use the e-resources or learn through the Internet, two fully equipped E-resource centres are established with computer tables cum rotating chairs, arranged in rows. Special furniture is used in the library skill lab and the librarian's classroom with flexible study tables which can be arranged as round tables as well as long rows. This arrangement and the furniture type help maximize the utilization of the limited space in the new library building. The library studio is furnished with a large conference table, and comfortable cushioned chairs. The open/ after-hour study zone on the ground floor comprises of ten, 8 seater study tables with hybrid chairs that are suitable for the outdoor environment. The Library auditorium is another learning space in the new library building which facilitates conferences/ gatherings of the university. Introducing a state of art library auditorium it is furnished with 300 modern auditorium chairs with foldable writing pads. The head table is located on the stage with 6 high-back executive chairs and alongside a podium. The non-library classroom is furnished with 300 comfortable lecture chairs cum writing pads.

Ambience / Library Atmospherics

The ambience of learning spaces, describes atmospheric and environmental factors, including sight, sound, scent and temperature. This can be more described by the general feel of the interior design of the learning space. Temperature, acoustics, lighting, the interior colour scheme as well as the furniture arrangement of the library influence the

students' perception of the library. In the new library different learning spaces show contrasting ambiences as quiet/loud, lit/dark, public/private, open/cosy and spacious/crowded.

To improve the learning atmosphere of the entire library, all learning spaces are air-conditioned with a VRF system to keep the temperature level in the comfort level. Large glass windows are fixed in the building to get the natural light to the learning areas and provide more seating areas next to the windows. Noise level is a prominent topic when discussing library ambience and therefore quiet or individual study spaces are separated from collaborative spaces to minimize disturbances. Light charming colour is used on interior walls and floor carpets and furniture are selected with matching colours. Name posting, signing and floor maps are used in the new building for further improvement of learning spaces.

Research Question 4

Challenges encountered when designing learning spaces

Designing learning spaces in an academic library is a difficult task because today's academic libraries cater to a diverse group of students who follow various types of learning processes. Identifying learning activities related to next-generation university students was the first challenge of this project. Focus group discussions helped identifying probable learning activities that are expected to be carried out at an academic library, but due to the lengthy period (almost 8 years) from the planning stage to the project completion stage and the continuous changing nature of student learning and technology, there is a possibility of uncovering all the aspects of modern learning expected of an academic library.

Writing the project concept paper was the initial stage of the library building project and developing it to be strong enough to influence the government funding body was a difficult challenge. This particular project concept paper was rejected three times since 2013 due to several reasons and finally, it was accepted highlighting the new concept 'Information & Learning Centre' (ILC) deviating from the traditional library concept. Modifying the project concept paper with proper facts and justification on all occasions according to their comments was a real challenge.

Preparation of the BOQ (Bill of Quantities) including all the user expectations was challenging. States Engineering Cooperation (SEC) was involved in BOQ preparation and the faculty librarian had to work with the SEC team for nearly one year to identify all the project requirements starting from the site clearance for the building to identifying end-user requirements.

Preparation of the end-user requirements for the bid document was also challenging. The main responsibility was given to the faculty librarian as the end-user and it was a very hard task to list out and describe all the requirements of a modern library without any mistakes. Participating in pre-bid meetings and explaining the user requirements to bidders was extremely difficult because even though the bidders were very experienced and reputed construction companies, their experience in designing library buildings were quite low.

The new library building project was awarded under the "design and build" contract agreement and therefore university patrons are not given a chance to involve in the designing stage of the library building. Misinterpretation of the end-user requirements by the designers/architects was the major drawback of this 'design and build' project and also some

of the minimum requirements of a modern library building were not addressed by the designers. The major mistakes were found in areas such as temperature controlling (AC system), Wi-Fi facilities, the arrangement of network ports and power sockets, Lighting of the learning spaces, RFID security system and the selection of furniture for the learning spaces. Hence it was a quite hard task to influence the design team for interior changes of the learning spaces within the proposed structural frame and it took a considerable period of time to fix such issues related to the new library building while bound to the contract agreement.

Identifying learning atmospherics for each learning space was a huge challenge for the members of the ILC committee. Studying and commenting on architectural drawings, selecting and arranging furniture, identifying technological devices and commenting on proposed samples of items for the new building while keeping a good relationship with the contractor, engineers and architects and also working continuously in several internal committees such as planning and development committee, building committee, ILC committee within seven consecutive years were challenging tasks faced during the project.

Conclusions

The purpose of this study is to identify the expected learning activities of the library users and to plan and design library spaces according to those learning activities. Deviating from the traditional library, the Information and Learning Centre is a multipurpose venue, which aims to support and promote the teaching, learning and research activities of the university. The most prominent learning activities identified by focus groups are collaborative learning, student individual

learning, learning by the discovery (learning by searching and reading), focused learning – research studies and library classroom learning – gaining information literacy skills. Apart from these after hours of studying, auditorium facilities, learning by video conferencing, non-library classrooms- taught by faculty and the faculty learning are identified. Eleven learning spaces are designed in the Information and Learning Centre corresponding to the expected learning activities such as a collaborative study zone, quiet study zone, interactive study zone, reference zone, open study zone, library skill lab, librarian's classroom, library studio, library auditorium, faculty reading room and non-library classroom. These learning spaces are incorporated with the state-of-the-art technology, and modern furniture assuring a conducive environment.

Planning and designing learning spaces in any library is not a short-term task for today's librarians because of the unpredictable changing nature of user expectations. A new set of user expectations with new learning activities are emerging endlessly. Continuous observations and assessment of user behaviour are considerably important when planning and designing modern library buildings. Prioritizing user needs according to the specific environment and culture of the institution will yield unique and useful library spaces. As there are very few studies on the planning and designing of academic libraries in the Sri Lankan context this Information and Learning Centre at the Faculty of Science, University of Colombo will be a model library for the future designs of new academic libraries in Sri Lanka.

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