STUDENT-CENTERED LEARNING PEDAGOGY AS INNOVATIVE PLACE MAKER IN CAMPUS:

Facility Management Research on Learning Spaces

by

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ABSTRACT

Spaces for learning in Japanese universities are inevitably changing; this change is part of a worldwide trend. The changes are caused mainly by adopting student-centered learning pedagogies -namely Problem Based Learning (PBL), in addition to the emergence of a new generation of campus users and introduction of Information Technology (IT) tools and applications in all aspects of life. This study tried to tackle the issues of Facility Management (FM) within university campus, the focus to be on studying the use of campus formal and informal learning spaces including common place, library learning commons and PBL classes. The primary issue guiding this study was how to create learning spaces that correspond with the increased use of innovative student-centered learning pedagogies and encourage effective collaboration between campus users; this meant the necessity of studying the physical and the social components of such learning spaces. Acquiring such information can enrich the developing knowledge of facility management in the field of campus planning and design. This study was qualitative in nature and included the use of techniques of visual documentation, observation, time-lapse photography, behavioral mapping and video recording. In the study of actual behaviors in outdoor common place structured observation was followed as a method based on time-lapse photography, while the study of dining facilities and PBL classes made use of observation sessions conducted by video recording. As for the study of users' activities in learning commons, the study was conducted using behavioral mapping.

The research showed that there was a misfit between new student-centered learning pedagogies and current learning environments especially in classrooms. Place making is an important element in creating successful campus formal and informal learning environments. The notion of student-centered

learning pedagogy as a new place maker in campus universities is global; such pedagogies -namely PBL- are being adopted in higher education institutions all over the world in various disciplines, this notion may be applied anywhere taking into consideration the context of each particular university. Place making in addition to its concern with physical features refers to the social and emotional meanings experienced in a setting by its habitual users. Campuses of effective learning spaces based on place making help to shape the people of tomorrow, since such buildings are where the students of today gain knowledge that builds their personalities and prepares them for their professional lives. Sitting places in outdoor common places should be studied in terms of location, layout and comfort; also the use of natural elements and providing people drawing activities is essential to succeed. Dining facilities should incorporate more seating alternatives taking into account the groups served, also the notion of common place can be supported by creating flexible meal blocks and easing congestion. The introduction of learning commons into many libraries in Japanese universities is the clearest demonstration of change in campus learning spaces. Learning commons must include a mixture of individual and group work areas. Use of flexible furniture, spaciousness and providing wide enough movement spines, in addition to incorporating IT tools is necessary to create inspiring learning commons. Classrooms need to be changed to cope with PBL processes. Using sociopetal flexible table configurations to accommodate various group sizes is essential to create conversational learning environments. Territoriality and privacy needs of students can be met by providing enough work table surface area. Supplying each group with a PC and a projector can facilitate using IT tools collaboratively. Effective collaboration entails being engaged in a repetitive pattern of activities and learning behaviors, during collaboration talking among group plays a pivotal role to guarantee smooth task sharing and successful problem solving. Students learning behaviors preference and engagement levels were affected by students learning styles. The facility managers in campus should take actual uses and behaviors of its frequent users into consideration to create effective learning spaces.

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DEDICATION

To….. My wife **Ebtesam**

…..For her continuous support, endless devotion and enduring patience especially during my doctoral study period away from Jordan

…..With **love**

CHAPTER ONE 1

INTRODUCTION

These days higher education is facing new challenges. Universities have developed to be composed of a complex of landscapes and buildings; according to Dober (2005) this complex supports the educational and recreational life of its diverse users as well as taking part in developing the surrounding community. Managing such facilities is a major challenge while trying to cope with the ever changing technologies of education and research is another issue, and this is where the rising field of Facility Management (FM) fits. Facility management goal in university campuses is to make use of the available assets and facilities aiming to increase the effectiveness of the total educational process while reducing the costs.

University campuses should strive to cater for the needs of its users whether formal or informal, but recently due to the fierce competition between universities to attract new students and distinguished faculty as well as retaining its old students and faculty, facilities pertaining to informal learning are gaining more focus, universities are starting to realize that creating a better campus environment parallel to academic excellence would pave the way for bypassing peer universities.

This dissertation tries to tackle the issues of facility management within university campus, the focus to be on studying the use of campus learning spaces in selected Japanese universities. The primary issue guiding this study is how to create learning spaces that encourage the adoption of new student-centered learning pedagogies; this means the necessity of studying the physical features and the social components of such places. Acquiring such information can enrich the developing knowledge of facility management in the field of campus planning and design.

1.1 RESEARCH FOCUS

1.1.1 Forces Influencing Change of Learning Space

Recently the whole campus environment is manifesting a lot of changes. A university that does not manage such change wisely cannot be successful. The change is mostly evident in informal learning spaces including common place in outdoors and dining facilities, and in learning commons at libraries. Even formal learning spaces that were considered resilient to change – namely classrooms- are gradually changing. Many forces are influencing this change. First, evolving technology is one of the most important forces of change. Recent technological developments influenced all aspects of life; including many applications in the field of learning. Students and faculty alike are becoming more dependent on technology to perform their daily life tasks. The university learning environment needs to provide comfortable spaces to use all types of technology, otherwise university students and faculty will not be able to make use of their capabilities to the fullest. Second, expectations of university stakeholders are changing; this includes students, faculty, parents and community. The community is demanding more skilled university graduates who are not only proficient in their specialized fields, but who are capable of working in groups to solve real world problems, have high skills in employing a wide spectrum of technology tools and can communicate effectively with peers. Students who are raised in an environment that is technology dependent are expecting university environments to be innovative and equipped with all sorts of technology tools that help them to keep connected to others and to learn effectively. Also, faculties are increasingly eager for rich research libraries and smart classrooms that enable them to apply technology to enhance teaching. Third, learning pedagogy is changing to be more student-centered, particularly classrooms that are optimized for lecturing while necessary, should not be the only form of formal learning spaces, new classrooms that are optimized

for group work, collaboration and that use technology to facilitate learning is required. Finally, we are seeing more fierce competition among universities; as they try to attract and retain excellent students and faculty members. Dator (2006) in reference to the focus of campus facilities management in the future urges to consider the future generations' trends and needs when mapping any institutions future directions, he predicts that higher education will focus more on the learner rather than on the teacher, researcher or administrator; more should be done to understand the different students' compositions, educational needs and delivery mechanisms within the coming 20 years. He further more argues that unless future campuses are built to accommodate certain predicted future trends we will stay designing traditional campuses and building curriculum around the concepts and needs of yesterday's students. This supports the need for wise management of inevitable change of campus learning spaces. More universities are acknowledging that academic excellence alone is not enough; they need to provide an inviting learning environment that encourages both informal and formal learning to be successful.

1.1.2 Student-Centered Learning Spaces in Universities

Strange and Banning (2001) recommend educational environments to provide three elements to succeed: a feeling of security and belonging, mechanisms to induce students to participate in activities and campus life and a sense of community, such elements assure the excellence of the educational process including its formal and informal parts. A sense of community is essential for the campus users to engage in fruitful interactions. Common place and learning commons are where most of the informal learning takes place in campus, while classrooms are where formal learning happens. The gap between the design and planning of both informal and formal learning spaces is becoming smaller, as both spaces seem to be changing into hybrid spaces for social independent learning, facilitated by innovative technological collaborative tools.

The campus with all its components should be seen as a learning space as Oblinger stresses in an interview held by Calhoun (2006), these components include formal learning spaces such as lecture halls and informal learning spaces including common place, dining facilities and emerging learning commons. She claims that the design of such places implies certain possibilities of use and restricts others; she refers to this concept as "built pedagogy", as she explains that the design of space would lead to certain pedagogy, for example a courtyard or a lounge with fixed seats makes pulling chairs impossible for informal chats, or using traditional classrooms for holding PBL classes where students need to work in groups. Facilities management research is considered to be a way to investigate all fields related to campus design and use, using research is the way to understand better the use and patterns of activities taking place within all campus spaces and particularly learning spaces and also it provides insight about the needs of students and other campus users.

Komatsu and Kato (1994) described common place as being all non specialized spaces that are connecting to and adjacent to specialized spaces which are designed to fulfill the formal purpose of any building or facility, the effect of student-centered learning pedagogies in such places and the effect of informal activities on formal ones are gaining more attention and needs to be studied in other facilities including university campuses. In the context of university campus the specialized spaces are represented by the facilities of formal learning and those facilities that are meant to support them or those that provide specific services for the campus users such as classrooms, laboratories, libraries, dining facilities, administrative buildings and students housing as well as many others. While common place is mostly composed of left over spaces inside the buildings themselves or the outdoor spaces found between these buildings within any campus landscapes, such spaces include students' lounges, corridors and outdoor courtyards. Common place in this study refers to the above mentioned definition and incorporates a broader understanding for this concept to include any space in campus that exhibits the qualities of a common place whether physically or within the framework of users' activities that are informal in nature and are not part of the specialized purpose intended for that facility; for example a

dining facility that is being used by students to hang out or as a meeting space exhibits qualities of a common place that induces the students to behave as if they were there to engage in a wide range of activities besides eating.

The scope of this research focuses on learning spaces in light of emerging student-centered pedagogies and namely PBL, such pedagogy is leading all learning spaces to focus on independent social learning activities. Informal learning space was studied in various facilities including studies of common place in outdoor places and dining facilities, as well as learning commons in libraries which is becoming a hub of interaction and merges between formal and informal learning opportunities for all campus users including students, faculty and visitors. Formal learning space was studied by considering several cases of PBL classes, the use of innovative student-centered pedagogy imply the need for new classroom planning and design that part away from traditional space configurations optimized for lecturing. Understanding the patterns of use of such learning spaces and the range of learning activities is a must in order to provide feedback on the physical and social components that promote effective learning.

1.1.3 Place Making to Create Effective Learning Spaces

The concept of place making in campus planning and design introduced by Dober (2003) refers to the overall structure of campus, including the organization and positioning of its buildings, landscapes, routes and other elements. It also entails edges definition and the interaction and harmony of campus with its surrounding environment. Dober (2003) explains that place making on the micro scale includes place marking which focuses on giving each element of the design or each building its unique character by defining certain physical attributes leading to a feeling of unity and a sense of place, within the concept of place making issues of physical and social components of campus learning spaces are

stressed to create effective learning environments. The change of pedagogy in this respect from teaching to learning, and to be more student-centered, introduces new dynamics of place making to both informal and formal learning spaces design. The use of new pedagogies and namely PBL is expected to have profound effects as a place maker on the learning space in campus.

Using such a concept is essential in campus learning spaces; having in mind the user's needs whether physical or social to insure an effective learning space. In regard to the importance of catering for the humans' needs in design, Deasy and Laswell (1990) urge the designers of places either where humans' live, work and perform any task or that tries to meet any human need to have access to data pertaining to the possible users of space and the predicted patterns of use and apply them as guides for such designed products. Furthermore, they stress that all designed places affect its users' behaviors and sometimes this effect might be never intended or never anticipated by the designer.

A deeper understanding of the users of campus and their needs is a must to better shape the future campus and increase the effectiveness of current ones. Mostly users of a campus include students, faculty, staff and local community people. A university campus is meant to be a learning place; its major task is to provide a better learning environment that considers the basic needs of students as a priority since they form the majority of frequent users of campus.

In this research the actual observed users' learning behaviors and needs were studied; most case studies discussed later incorporate recording users' behaviors within its actual setting as it happens aiming to understand the actual behaviors and activities provided by learning spaces rather than those that may be intended by the designer. Understanding such learning behaviors and figuring out its stimulus and the physical and social components associated with them in successful settings pave the way to replicate such features in future campuses or current ones as a formula that guarantees that a campus will be more successful in serving the needs of its users.

1.2 OBJECTIVES

The main objective of this dissertation is two fold; first it aims to study the place making qualities both physical and social that encourage the campus users to use learning spaces systematically in a manner that promotes independent learning. I want to know if as I assume by primary observation, that successful learning spaces possess place making elements and if so what are these elements and were they influenced by student-centered pedagogies and namely PBL. Second research findings in campus learning spaces can impact campus planning, design and facility management by providing solid recommendations to be used as guidelines to design future university campuses or at least to be used to upgrade the current ones to be more successful in stimulating effective learning in campus; learning that stresses dialogue among campus community, innovative problem solving skills and takes into consideration students learning styles and learning behaviors preferences.

1.2.1 Study Justification

Many studies focused on learning environments such as schools, colleges and universities, but most of them as Deasy and Lasswell (1990) point out, considered learning as a process in terms of teacher and students in classroom discarding the fact that learning activities take place whenever individuals respond knowingly to a stimulus, and ignoring the emerging student-centered learning pedagogies that shift focus from teachers to learners. He also ascertains that learning involves acquiring new knowledge, skills, experience and wisdom; as such this may occur anywhere in a school room or a corridor and in this case even in a campus common place and learning commons.

Students and other campus users usually spend long time in campus especially those living on

campus and graduate students. Kennedy (2001) recommends that this necessitates the campus environment to be designed to be more livable; this means giving students more than classrooms and formal learning, it means providing them a comfortable place with many choices to perform a wide range of activities such as shopping, listening to music, eating, meeting or just to hang out and relax. Hood (1993) relates comfort to physical and psychological elements, and with creating opportunities for users to interact with other users they care about or share a certain experience with.

This study will explore the place making elements in campus learning spaces including common place, learning commons and PBL classrooms. The focus would be on issues of learning behaviors, interaction and how collaboration may be facilitated in learning spaces. Patterns of use and range of learning activities of learning spaces will be considered by observation and other research methods to better understand the effect of student-centered learning pedagogy and namely PBL on campus planning and design. This research findings can impact campus planning and design and facility management by providing solid recommendations to design and operate campus learning spaces more effectively adding to the higher education experience in general.

1.2.2 Research Questions

The primary research question providing focus for this study is:

Within the context of facility management what are the social and the physical qualities that encourage the campus users to use the campus learning spaces including common place, learning commons and PBL classrooms systematically with consistent and diverse patterns of activities in a manner that promotes adopting student-centered learning pedagogies within campus and in that

context do these places exhibit place making elements influenced by these innovative learning pedagogies?

To answer this question several supporting questions need to be posed, providing more focus to the quest of this research, and providing a framework that provides a satisfying answer to the above stated problem, these questions are:

i. Where can learning happen in campus beside in classrooms and supportive specialized learning spaces?

ii. What are the patterns of use and the range of activities observed within common place, learning commons and PBL classrooms?

iii. How can environmental behavior principles interpret the current patterns of use?

iv. What are the prominent place making elements of effective learning spaces influenced by student-centered learning pedagogies?

v. How future learning spaces could be designed to induce collaboration?

1.2.3 Primary Assumptions

This study is primarily qualitative in nature and quantitative in a lesser degree. It depended on observation procedures and behavioral mapping. Observation included: first, primary observation field trips using the camera as a recording tool to investigate various learning spaces including common place and learning commons. Second, structured observation of selected settings with the aid of time-lapse photography as in outdoor common places or video recording as in the case of dining facility and PBL classroom studies. Also behavioral mapping procedures were used in the learning commons

studies. The assumption is that the observations will represent the actual activities and patterns of use taking place within campus learning spaces in relation to the physical and social qualities of such spaces. In addition observation can grasp the complex learning behaviors, collaborations and group dynamics as they happen, such behaviors are difficult to record using other methods.

Understanding the effect of student-centered learning pedagogies on the design and planning of campus learning spaces is important, it enables designing effective future learning spaces that encourage collaboration, group work and socializing. Although this research is based on case studies from Japan, some basic concepts used for analysis of observation and data may be valid to be used elsewhere in the world by considering its local context. Absolute generalization of this study results is not intended since it is more exploratory in nature to grasp the basics of learning space use. Several field trips were carried out to many universities having in mind that visiting a place is the best way to understand it and capture the essence of its physical and social components. These trips mostly focused on investigating the use of outdoor common place, dining facilities and learning commons as well as exploring place making elements unique to Japanese universities.

The use of questionnaire and interview was limited. One questionnaire results will be discussed as part of the architectural planning and design 1, PBL class case study in chapter five. The questionnaire was prepared first in English then it was translated into Japanese in cooperation with Akikazu Kato laboratory members; it was then given to students to collect their input about their experience during the PBL class. Several interviews were also conducted in cooperation with Akikazu Kato laboratory members, for example an interview was conducted with the manager of Osaka University main library. The aim was to understand the management procedures and future plans of administration as well as the current situation in Osaka University main library and namely in relation to the learning commons. These interviews are out of the scope of this study and will not be discussed.

1.3 METHODOLOGIES

This research focuses on studying the physical and social features of campus learning spaces and the actual behaviors of its users. The goal was to gain a better understanding of the effects of adopting student-centered learning pedagogies on campus space design. This study can contribute by providing feedback that helps to create better learning environments. To achieve this goal several methodologies were applied in relation to each objective. The aim was to provide satisfactory answers to the primary question posed and the supportive related questions.

1.3.1 Listing of Objectives and Research Methods Applied Respectively

Conducting this research included the following objectives and methodologies (Fig.1-3-1):

i. Studying where learning happens in campus and the physical features of these learning spaces required the use of observation surveys extensively.

ii. In the study of actual behaviors of learning space users, structured observation and behavioral mapping was used. Structured observation in outdoor common place followed a method based on time-lapse photography, while the study of dining facilities and PBL classrooms made use of observation sessions conducted by video recording. Behavioral mapping was used exclusively for the study of learning commons.

iii. Evaluating students' opinions about their experience in PBL classrooms was achieved using a questionnaire that also identified students learning styles.

iv. The development of the theoretical background guiding the framework of research, coming up with the basic questions and the procedures of data gathering and analysis was informed by a review of the

body of literature related to the issues under concern.

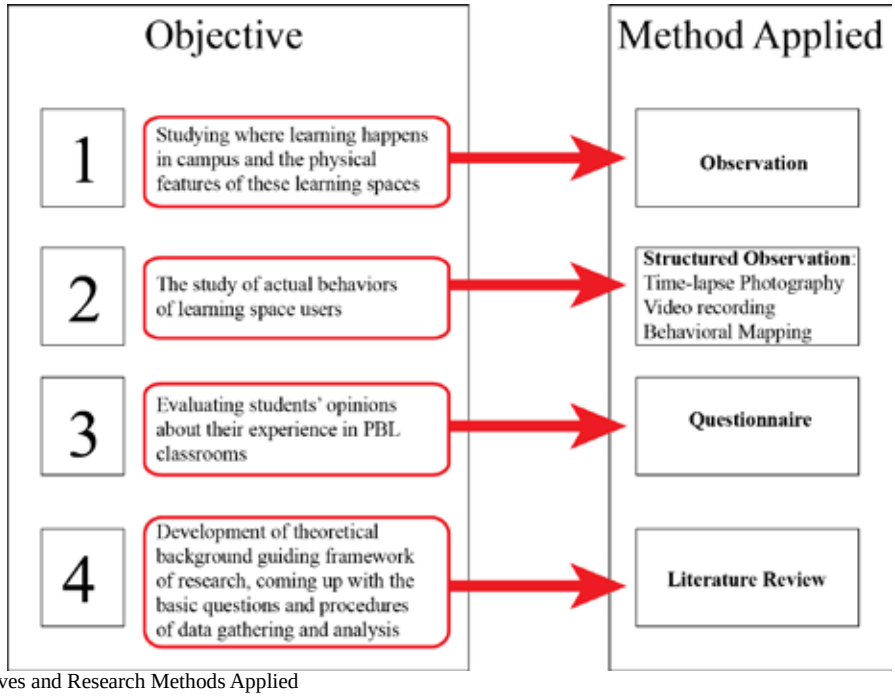


Fig.1-3-1. Objectives and Research Methods Applied

1.3.2 Procedures and Data Collection

Collecting the needed data required the use of various methods and procedures as discussed below:

i. ***Casual Observation Surveys***: this procedure was carried out in several Japanese university campuses; the focus was on outdoor common place, dining facilities and learning commons. In these surveys the physical features of relevant learning spaces were explored and documented by photography in addition to the actual patterns of use, later this data was combined as recommended by Sommer and Sommer (2002) with the vivid first visit personal feelings and impressions. These visits helped to find the general change trends in learning spaces and helped to select appropriate cases worth conducting further detailed studies. The use of photography in observation is not new as Collier and Collier (1986) stress the importance of it, being a machine that is very sensitive to the attitudes of its user. They

continue to argue that a camera does not limit the sensitivity of the human observer; it is rather an aid to extend human memory and grasp precious moments of interaction and conveys information faster and more precise than words making it a perfect tool for observation.

ii. ***Time-Lapse Photography***: this procedure was used mostly in outdoor common place studies. The selected place was divided into zones then each observer of the observation team equipped with a camera would be assigned a particular zone with the task of taking a series of photos of the outdoor place using an appropriate number of shots that cover the full area with 5 minutes intervals between photos for a given period of time. The location of observers and divisions of zones and survey timing was based on several primary casual observations of common place selected upon possessing qualities of place making and extensive use by campus users. Whyte (2001) used time-lapse filming in his research of public places, he elaborates that this method is an ideal device to study people‘s behaviors in areas of gathering as the case of campus common place. Based on Cooper-Marcus and Francis (1998) the needs of campus users should be the determinants of outdoor common place design, by observation certain repetitive patterns of use declaring the needs of users would show up, grasping such needs and patterns of use is the goal of using this procedure in the selected case studies.

iii. ***Video Recording***: it was used to record users' activities in dining halls and PBL classrooms. Those recordings were used to understand learning behaviors, movement spines and group dynamics in PBL classrooms. Also, they were used to plot place centered maps in the dining facilities, according to Sommer and Sommer (2002) these maps allowed for showing where students mostly sat and the patterns of seat choice. Collier and Collier (1986) favored using video recording in observation sessions that involved crowded settings as the case in the dining facilities and PBL classrooms; it enables tracking activities more precisely within time. They affirm that such method would extend the understanding of the setting to include not only what activities may take part, when and where but also how such behaviors happen giving a more complete image. Sommer and Sommer (2002) elaborate more on the advantage of using this method to record the details of activity that may be missed by the single eye

observation in such a crowded place.

iv. ***Behavioral Mapping***: this method was used in the study of learning commons, because the managers did not allow the use of video recording as in the case of Osaka University main library learning commons, or because the use of video recording was unpractical due to the vast area of the space under observation which required a large number of DV cams as in the case of Nagoya University main library learning commons. Cherulink (1993) explained that this method was first developed to research mental hospital environments yet the dynamics of this method which uses floor plans to track users' movements and patterns of use within specified intervals for a given period of time lead to its application to many other environments. In this study floor plans of the learning commons were made, a number of observers were selected to cover the whole area under study. Each observer noted on the mapping sheets the use of selected tables for a period of several hours conducting mapping for intervals of 15 minutes with 5 minutes break between them. Sommer and Sommer (2002) assume that regardless of observation method whether direct observation, time-lapse photography or video recording the behavioral map itself only contains items that can be observed by researchers. In this case the focus was on the selected zone users including number of group, gender, table used, type and duration of activity, tools used and the duration of interactions.

v. ***Questionnaire***: it was used to measure students' opinions about their experience during PBL classes, a questionnaire was prepared first in English, then it was translated to Japanese in cooperation with my colleagues of Kato laboratory. The questionnaire had two parts, the first made use of Kolb's learning style inventory to find students learning styles, while the second part had various questions to evaluate the PBL process, classroom environment, aspects of group work and class learning objectives. Here I would like to point out that although the questionnaire was conducted twice in 2010 and 2011, only the results of the 2010 questionnaire will be discussed in chapter five as a part of case study 3.

vi. ***Review of Literature***: the purpose was to survey the body of literature that informed the basic questions of research and would guide the procedures of data collection and analysis, and many sources

of literature were sought.

1.3.3 Tools of Data Analysis

Data gathering included the use of multiple procedures leading to the diversification of the collected raw data including hundreds of photos, hours of video recording and hundreds of behavioral mapping sheets. Handling such a huge amount of data given the limited time of research required the use of an organized method of data analysis that ensures organizing the findings and facilitating reasoning of results leading to sound conclusions that provide answers to the primary question of this dissertation. Most of the tools used in analysis were based on Collier and Collier (1986) methods applied to the use of photography and video recording in observation providing a structure for the flow of analysis followed in this research (Fig.1-3-2). The analysis phases included:

i. ***Unstructured Examination of Data***: where data is observed and viewed as a whole whether photos or video recordings, during this process the mind is open to receive all signs and ideas found in collected data. The aim is to discover the connecting and contrasting patterns, the significance of activities and patterns of use of learning spaces. Photos and video recordings were viewed writing feelings and impressions and what portions of data they are in response to; also questions and focus points brought by data were written to provide direction for more research. This helps to find a container to put the rest of research within it.

ii. ***Inventory Logging***: this included summarizing the data into a collection of evidences considered to be the essence of research, this included numerical and descriptive data portions extracted from the whole body of research such as the total number of users of space, peak hour, activities and general trends, trying to define the focus of research which is here the study of the patterns of use and the range of activities performed by the campus users in learning space in relation to the place making elements

apparent in these spaces. All effort was made to find the formulas that help to increase interaction and collaboration in campus learning spaces as a reflection of the application of student-centered learning pedagogies such as PBL. In this phase the main research tools inventories were developed in relation to the categories of activities observed assisting to achieve the research goals.

iii. ***Structured Analysis***: this is the climax of analysis, here more details were sought from data having in mind specific questions to answer; activities frequencies and durations, movement spines, groups of students, place where activities happened and manner of users were plotted onto plans of considered learning spaces, the degree of details in the plotting depended upon the type of learning space. Also this phase included counting of users, activities and other significant happenings taking place leading to statistical information as well as detailed descriptions of certain events to be compared with others.

iv. ***Reasoning and Conclusion Formation***: this is done by searching the significance and meaning of details by returning to the complete field records and relating these to the more detailed findings, influenced by the review of literature, then the conclusions were made.

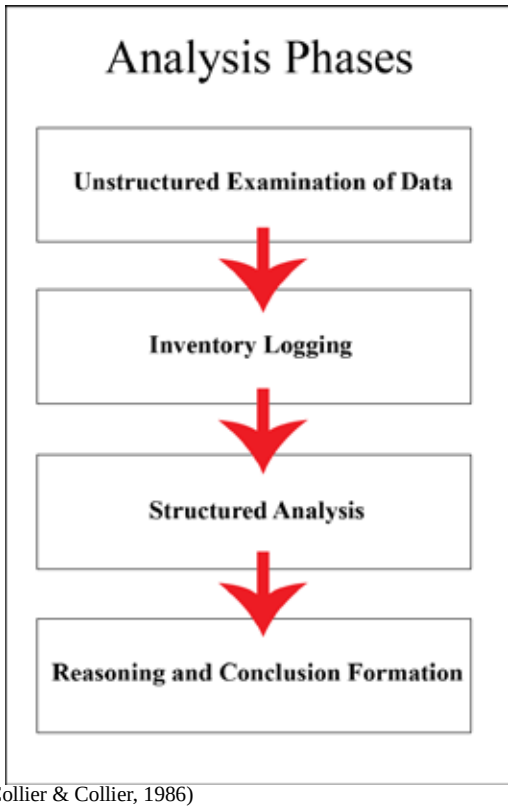


Fig.1-3-2. Data Analysis Phases (After Collier & Collier, 1986)

1.4 RESEARCH OVERVIEW

This research follows the case study approach, as Sommer and Sommer (2002) confirm that this method ensures to present the full image of issue under study; that is understanding the details of campus learning spaces use in relation to student-centered learning pedagogy as a place maker, this comes by considering the entire context rather than breaking it to its components. Also this approach helps to catch the reader's interest by leading the reader to understand the real situation by following the details of place and activities rather than get puzzled by statistical dull data. Cherulnik (1993) stresses that such an approach would be important in investigating environmental-design focused studies. Here learning spaces are studied relating its users actual behaviors and patterns of use to the place making qualities, making it necessary to present a range of cases providing for the consistency of learning behaviors and resemblance of physical qualities in terms of showing place making elements.

Case studies selected for this dissertation were all from Japanese university campuses. The assumptions were made within the context of Japan. These universities were selected as a sample representing Japanese universities based on its overall qualities of place making, in addition to its abilities of providing its users with learning spaces -especially informal learning spaces including common place and learning commons- that are used by users around the clock, and showing a persistent pattern of use and a wide range of activities. While all the cases of PBL classes -formal learning spaces for PBL- are from Mie University, because this university is particularly focusing on the development of its curricula to include the use of innovative student-centered learning pedagogies, and the faculty of the selected classes showed interest to gain feedback that enables them to manage their PBL classes in a more effective manner.

The dissertation after this brief introduction moves in chapter two to shed light on some of the primary concepts that informed this body of research. Chapter three tries to explore where learning may

take place beside classrooms or supportive specialized learning facilities, it primarily looks into learning behaviors in common place, including outdoor common place and dining facilities common place. Chapters four and five are the climax of research in learning space use and related issues. The focus was on studying collaboration and other learning behaviors in learning commons and PBL classes. Here the major findings of research are presented. The last and sixth chapter discusses the findings and explains them in relation to the concept of student-centered learning pedagogy and place making, within the context of facility management. The aim is to provide solid recommendations for creating effective learning spaces in university campuses.

1.5 SUMMARY

This study will explore campus learning space focusing on the patterns of use and range of activities within such spaces in relation to their place making qualities influenced by the adoption of student-centered learning pedagogies. The guiding question was: Within the context of facility management what are the social and the physical qualities that encourage the campus users to use the campus learning spaces including common place, learning commons and PBL classrooms systematically with consistent and diverse patterns of activities in a manner that promotes adopting student-centered learning pedagogies within campus and in that context do these places exhibit place making elements influenced by these innovative learning pedagogies?

This chapter started with discussing some primary concerns informing the flow of research related to the forces influencing change of learning space, student-centered learning space in universities and place making to create effective campus learning spaces. Also it outlined the objectives of the study, the primary and secondary research questions as well as the procedures of data collection and analysis

applied. In the next chapter the related body of literature will be reviewed in depth.

CHAPTER TWO 2

THEORETICAL FRAMEWORK OF RESEARCH

This review of literature will explore the existing body of research related to issues of campus planning and design. This chapter tries to explore many concepts in relation to the focus of this study, the aim is to understand the studied topic and formulate the basic inquiries providing the framework of this dissertation. The relevant issues include facility management, place making in campus, learning commons, Problem Based Learning (PBL), learning styles and environment-behavior concepts that can influence the built environment planning and design.

2.1 FACILITY MANAGEMENT AND STUDENT-CENTERED LEARNING PEDAGOGIES

2.1.1 Definition of Facility Management

Quality and economy are the goal of any higher education institution, applying principles of Facility Management (FM) helps any organization to achieve its intended goals. Becker (1990) claims that facility management existed when the first buildings appeared in history, yet he explains that the 1980s in the USA was the critical demarcation of the modern facility management movement's birth, and soon it spread around the world from the United States and Britain to Japan, Australia, New Zealand, the Netherlands and other parts of Europe. Springer (2001) ascertains the role of Herman Miller Inc. in the latter half of the 1970s when it established the Facilities Management Institute (FMI), this organization helped to establish the new profession of facilities management and gave birth to the International

Facilities Management Association (IFMA).

Becker (1990) states that generally facilities management is a term used to encompass the activities in planning, designing and managing complex facilities such as offices, hospitals, schools, and universities. He explains that facilities management refers to buildings in use, to the planning, design and management of occupied buildings and their associated building systems, equipment and furniture to enhance the organization's ability to meet its objectives, this clearly differs from architecture and interior design and shows that facilities management refers to the institutions effectiveness as a whole in reaching its intended goals. Springer (2001) elaborates that facilities management is a multidisciplinary or transdisciplinary profession drawing on theories and principles of engineering, architecture, design, accounting, finance, management and behavioral science, facilities management as a new discipline builds on this foundation to create a new set of theories and practices.

Rondeau, Brown and Lapides (2006) explain that the definition of facility management evolved with time; in the 1970s the FMI defined facility management as managing and coordinating interrelated people, process, and place issues and functions within the entity or the organization, later on in 1982 facility management was defined by the United State Library of Congress as the practice of coordinating the physical workplace with the people and work of the organization; it integrates the principles of business administration, architecture, and the behavioral and engineering sciences. IFMA (2012) now defines facility management as a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, place, process and technology (Fig.2-1-1).

Becker (1990) relates the appearance and spread of facility management to include all private and public organizations to several factors including: information technology, global competition, high cost of space, employee expectations and cost of mistakes. Universities are not an exception, in fact being a complex formed of multiple combinations of buildings and functions indicated that a university would be one of the places where facilities management principles need to be applied to ensure the effectiveness of such institutions.

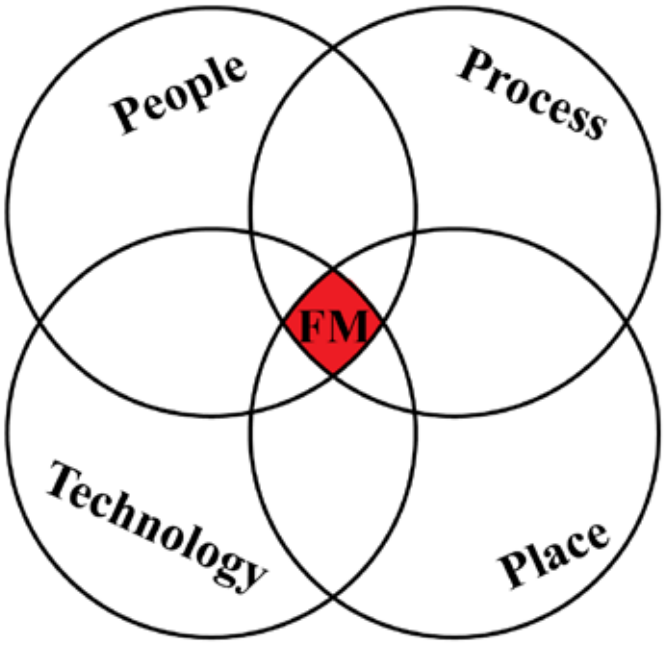


Fig.2-1-1. Focus of FM as Defined by IFMA (Rondeau, Brown & Lapides, 2006)

2.1.2 Applications and Impacts on Campus Design

FM according to Springer (2001) touches on elements of human resources, process engineering, ergonomics, architecture and interior design, the critical components in this discipline include planning and maintaining and providing the assets that support the efforts of people at work, or those using the facility in general. Daigneau (2006) explains the importance of facilities management in relation to campus planning and design, especially its impacts on shaping higher education future and the appearance, components and functions of the university campus. He refers to the choices that a facilities professional makes in the campus of today that would affect the university campus for years to come, and this effect would include the capacity of such a higher education institution to fulfill its intended goals. Cotts, Roper and Payant (2010) point out that facility management tries to tackle and balance many concepts including cost effectiveness, productivity, improvement, efficiency and users quality of

life. Learning space in campus is changing; facility management can make use of previous concepts to guarantee that such change is successful. Using outdated learning spaces and namely classrooms contradicts with healthy facility management practices.

In any university campus facilities management is represented by a department or a division, its tasks would include the design, construction, renovation, maintenance, repair and operation of campus facilities, grounds and utilities. In addition to the previous tasks facilities management's divisions are engaged in issues of planning future development and all major administrative tasks concerning any department or the university campus as a whole, the goal is increasing effectiveness of campus operation, serving the campus users by providing their needs and reducing the costs by keeping a balance between quality and costs. Dator (2006) in reference to the focus of campus facilities management in the future urges to consider the future generations' trends and needs when mapping any institutions future directions, he predicts that higher education will focus more on the learner rather than on the teacher, researcher or administrator; more should be done to understand the different students' compositions, educational needs and delivery mechanisms within the coming 20 years. He further more argues that unless future campuses are built to accommodate certain predicted future trends we will stay designing traditional campuses and building curriculum around the concepts and needs of yesterday's students. This supports the need for wise management of inevitable change of campus learning spaces.

The campus with all its components should be seen as a learning space as Oblinger stresses in an interview held by Calhoun (2006), these components include formal learning places such as lecture halls and informal learning places including common place, dining facilities and emerging learning commons. She claims that the design of such places implies certain possibilities of use and restricts others; she refers to this concept as "built pedagogy", as she explains that the design of space would lead to certain pedagogy, for example a courtyard or a lounge with fixed seats makes pulling chairs impossible for informal chats, or using traditional classrooms for holding PBL classes where students need to work in groups. Facilities management research is considered to be a way to investigate all

fields related to campus design and use, using research is the way to understand better the use and patterns of activities taking place within all campus spaces and particularly learning spaces and also it provides insight about the needs of students and other campus users. This is considered to be the first step to provide feedback to campus facilities managers who themselves can strive to create flexible spaces that may accommodate several activities with minor changes as a stepping stone to create effective learning spaces providing both formal and informal learning opportunities.

Dessoff (2007) ascertains that the needs and demands of students, faculty and staff as well as the pressure on institutions to compete for new students are driving the change of housing, food services, student unions, book stores and campus common place facilities which form the base of informal learning that supports the formal learning part within campus. He elaborates that students want more choices, variation of types of food and styles of services as more students are seeing dining in campus as an event, also campuses need to apply flexibility in its common place and dining facilities to accommodate for tomorrows needs and to compete with off campus facilities and services that are attracting more students these days.

The importance of learning spaces was clear in a study conducted by Cain and Reynolds (2006), this study included a survey of 16,153 students from 46 USA and Canadian higher education institutions, it showed that the academic issues came first in considering a certain university to apply for, yet other campus facilities were a major concern to the students particularly common place and informal learning facilities in general. Within this regard female students cared more about the qualities of residential facilities, their major facilities, library, classrooms, student centers and open space while male students were more focused on qualities of computer and technology facilities, research and lab facilities and athletic facilities. This study also demonstrated the importance of the first impressions to any university campus especially for female students.

Snyder (2006) refers to universities as one of the few institutions that had a great continuity, it is one of the oldest institutions that are continuing to function and develop even after around 4500 years since

the invention of the first similar institutions by the Sumerians in 2500 BCE. He stresses the importance of understanding the critical challenges facing facilities management and universities in general in the near future; he mentions demographics and technology as two powerful forces in higher education, further more he assures that within the future the current notion of higher education would be replaced by the notion of longer education; campuses are making use of internet and information technology advances to keep a co-learning relationship with students into their real practical lives, this makes it possible to acquire experience-based feedback and offers to up-skill them by distance learning.

APPA thought leaders series edited by Lunday (2006) tackled the future of higher education with particular attention to its built environment, she stressed the importance of sharing a strong sense of stewardship for the buildings and infrastructure that make up our campuses, the commitment to responsible management of investment in university facilities and the necessity to align the mission of university facilities with the mission of the institution as a whole. Lynday (2006) believed that in order for a campus to succeed those responsible for facilities in campus must be involved in the highest levels of decision making in the university, yet many facilities professionals are occupied with the day to day demands on managing the physical plant, overseeing capital programs, dealing with staff and wrestling with budgets that they have a limited perspective on the big-picture issues essential to the policy making level. She identifies the trends affecting the higher education's future that should be considered by facilities managers, these include: financial constraints, competition, changing demographics, demand for innovation and tradition, changing stakeholder expectations, accountability and resistance to change. Lynday (2006) further more relates the previous trends to the top ten issues affecting facilities management profession within the context of university campus, these major issues include:

i. Resource scarcity and affordability

ii. Performance measures and accountability

iii. Customer service

iv. Information technology

v. Developing the lab and classroom of the future

vi. Facility reinvestment and total cost of ownership

vii. Work force management and demographics

viii. Sustainability

ix. Energy and environment resources management

x. Safety, security and business continuity

Lynday (2006) points out that to effectively manage the entire campus physical assets, the educational facilities professional must understand all aspects of their facilities as well as their impacts on the complex mission of the institution. She ascertains that linking programming, design and construction and facilities operations is essential to achieve successful educational outcomes. Within this context the study of campus learning spaces including common place, learning commons and classrooms is considered to be an important part of gaining knowledge about the aspects of campus facilities as a stepping stone to create an effective informal and formal learning environment.

2.2 PLACE MAKING IN CAMPUS PLANNING AND DESIGN

2.2.1 About Campus

University campus affects the lives of people all around the world whether those who join a university to continue their studies in the phase of higher education or work and teach in their facilities or even the people found in the local communities surrounding physically these universities. The university campus planning and design is a major task that needs to be tackled in relation to the social and physical needs of its users to ensure that this organization would function to achieve fully its

intended goals.

Many researchers tried to deal with this topic, yet the work of Richard P. Dober (2003; 1996a; 1996b; 2000) on campus planning and design is one of the prominent efforts that has helped to guide those concerned with campus planning and design to shape the university campus into a facility that is livable, inspiring and humane in nature while satisfying its basic functional main tasks.

According to Turner (1995) Campus stems from a Latin term meaning field, he relates the first use of the term campus to the description of the first American universities. He elaborates that it was used to describe American universities which included buildings arranged within green areas and since then it became the term to be used when referring to all universities properties included within its boundaries. Yet the use of term campus is not exclusive for universities, this term is used to describe any complex of buildings formed of a group of buildings related together in terms of serving a common function and sharing the same grounds such as hospitals.

Turner (1995) states that the American campus concept is related to the collegiate ideal rooted in the medieval English universities where students and teachers lived and studied together in small regulated universities, soon the American campus developed its own distinctive qualities; the American higher education focused on academic and extracurricular activities resulting in the diversification of university campus buildings and facilities to include not only classrooms and other academic spaces but also dormitories, dining halls and recreation facilities. The task of a campus designer became not only designing a single building but creating a woven fabric where buildings and ground are organized to create a community optimized for learning.

Dober (1996 a) ascertains that a campus is an ensemble of buildings, landscapes and infrastructures used for higher education. He also describes knowledge as the prime purpose of higher education, in such institutions knowledge is utilized in teaching, research and community service. Building knowledge includes creating opportunities of both formal education and informal learning; the first is based on providing specialized formal learning facilities such as lecture halls while the latter is achieved

by creating common place where students and other campus community members can informally meet and interact freely to share their experiences and enjoy the campus life. Dober (2003) stresses the role of using place making elements in creating campuses that provide for the needs of its community and as a means to ensure the creation of a memorable unique campus.

Today's campus is composed of many specialized buildings as well as a vast area of spaces and landscapes surrounding these buildings. Dober (1996 a) elaborates that at the start of higher education in North America the functions and buildings were simple. He states that such buildings included housing, chapel, classrooms, library, dining hall and some administration buildings. Dober (1996 a) suggested that such simple functions could have been housed within a single building at the start, yet the growth in enrollment, diversification in specialties and the technological developments required more functions and facilities to ensure that higher education institutions could fulfill its intended goals. Today each college or university activity is enclosed in one or more of its own buildings. Based on Dober (1996 b) the following three elements are important in campus:

i. ***Instructional Facilities***: Some instruction is carried out in gymnasia, auditoria and other facilities, but most of the teaching load which is the formal learning is enclosed in classrooms and laboratories. Classrooms tend to be utilized in a higher rate than laboratories, yet laboratories are more diverse in nature depending upon majors and accordingly showing greater differences in their internal organization and equipment arrangements. They include wet and dry science and engineering facilities, drafting, music and art studios and other rooms for demonstrating or practicing techniques and experiments.

ii. ***Libraries***: For many years the library was considered to symbolize the core of campus formal learning and a building of a special importance. These days the library became more complex as the technologies advanced, such a building needs to provide for the traditional book stacks and reading areas as well as the new forms of knowledge storing and retrieving such as internet data bases and others, no single building can satisfy the needs of users so the trend is to have a main library and many other supporting libraries bound for departments and research laboratories, such libraries will differ in size

and context according with the level of education offered and academic programs.

iii. ***Centers of Extracurricular Life***: Those non-instructional buildings form the core of campus informal learning by providing chances of interaction between the campus community members, such centers would include: college and university unions, faculty clubs, chapel and churches in addition to auditorium and theaters.

2.2.1.1 Outdoor Common Place

Outdoor common place includes the spaces found between campus buildings and the major circulation paths and roads. This place is the core of campus informal learning; it is a place of relaxation, study and interaction between campus community members. Many studies dealt with outdoor place in general and few focused on the campus outdoor place. Dober (2000) stressed the importance of such places to encourage spontaneous meetings and interaction between users. He also related the rate of use of such places to having appropriate climate, seating fixtures and suitable design elements.

Cooper-Marcus and Francis (1998) assume that the needs of the campus outdoor place users should determine the way such places are designed, by studying the patterns of use and range of activities one can derive certain recommendations and guidelines to follow. Cooper-Marcus and Francis (1998) discussed that in relation to campus outdoor place use, each student or campus user has a work or home base around which his or her daily campus activity occurs. They indicated that such a need for having a home away from home may be helpful in designing outdoor place by looking for the campus buildings as homes and the adjacent outdoor places as having some elements of front porches and front or backyards and in between those spaces other communal places are found. The outdoor places should provide for all the actual and predicted patterns of use and groupings of users. This may be done by providing combinations of seating alternatives for single, couple and more than three users as well as

providing tables and a balance between fixed and movable seats. Cooper-Marcus and Francis (1998) show that natural areas rich in trees and greenery and other related elements are the most successful. These tend to be the places where students like to sit, eat lunch, interact or just relax to break the stress of the daily routine, refresh and get ready to resume productively the process of learning.

Outdoor common place in campus have many similarities with public outdoor places, in this regard Deasy and Lasswell (1990) stress that interaction in such outdoor settings is related to providing activities and proper sitting places and fixtures that permit group formation. They noticed that mostly small groups would be formed of two, then three and finally more than three people, based on that there should be some sitting places for such group combinations as well as for single users who do not intend to interact and prefer to be alone. Deasy and Laswell (1990) further more support the notion that people and activities attract more people. The major movement spines in outdoor places should be planned to provide a continuous flow of users to such places, and it should ensure visual and physical ease of access to sitting places and outdoor common places in general.

Zacharias, Stathopoulos and Wu (2004) demonstrated that microclimate conditions mainly sun, wind and the presence of other people would determine the frequency of use of outdoor places. They stressed the quality of sitting place rather than quantity as a factor to enhance outdoor use. Outdoor common place should provide a wide range of sitting alternatives as well as different locations for sitting; in the sun or in the shade protected from the wind. Outdoor common place should be rich in elements that help to ameliorate climate such as trees, greenery and water elements.

Abu-Ghazzeh (1999) stresses the importance of campus outdoor place and the activities that the users are engaged in to alleviate stress, he also points out the need for a variety of such places to accommodate the wide range of activities and users within campus. Outdoor common place should be looked at as being outdoor rooms of activities, this leads for creating different outdoor sittings that meet the needs of their users based on the actual observed activities and patterns of use. Amsden (2004-2005) ascertains that the design of outdoor common place in a campus would affect how campus users move in

such spaces and what activities they may engage in. Providing seats with tables would encourage a wide range of activities including eating, studying and many others, while a poorly located sitting place that is inaccessible or visually blocked leads to poor use and a low occupancy rate.

Nasar and Jones (1997) argue that outdoor place in a campus should provide its users a feeling of safety by ensuring that it is always safe to be used whether in groups or alone, at day time or even at night hours. Such a feeling can be produced by carefully locating outdoor place in relation to campus buildings and circulation routes and selective use of appropriate types of trees and other elements in a way that ensures continuous visual connection to other campus users which helps to limit the opportunities of crime and vandalism. Newell (1997) shows the importance of considering the users place preferences based on their physical and social qualities. He indicated that being in a place that one prefers gives the user a feeling of relaxation and more freedom to engage in activities. The places where most users sit or engage in activities would be indicators of such preferred places in any campus.

Al-Homoud and Abu-Obeid (2003) explained that the physical components of outdoor place in a campus would affect the ways in which students would use the available places in terms of group formation and interaction. They indicate that social interaction is affected by increasing spatial enclosure and that seclusion would be affected by the exposure to pedestrian flow in outdoor places. An outdoor place near a major movement spine or a major users' attraction would be most frequently used by students and other campus users.

As for Whyte (2001) the study of public space use in New York City was his main concern, yet many of his ideas and findings may be relevant to campus outdoor place. He stressed the need to provide enough sitting places, fixtures and that such places should provide its users physical and social comfort as well as many alternatives that guarantee the freedom of choice. He ascertained the necessity of creating gathering places to encourage the users to engage in informal interactions, such places should be designed as stress free environments, it should make use of greenery and water elements as well as food facilities that tend to draw people who themselves tend to draw other people. All the above

mentioned elements help to create livable outdoor places that form a hub of activity around the clock and can be applied to university campuses as recommended by Banning (1995) who considers the above mentioned elements to be essential design elements that promote creating a sense of place within the campus environment.

2.2.1.2 Dining Facilities

Dining facilities in educational institutions are a place where campus community meets to eat and more importantly get involved in other activities. Whyte (2001) explained that food is one of the major attractions of people in outdoor places. The dining facilities of a campus work as a magnet attracting students and other campus users at scheduled break hours between lectures, it might seem that eating is the main purpose, but taking a closer look at the users in a dining hall would show that eating is a byproduct of other activities and interactions. Dober (1996 a) elaborates that the changes in the type and appearance of food services is one of the most significant changes taking place in campus centers. He described old dining halls to be conventional, static providing limited hours and minimal choice, these are being replaced by new style of dining facilities making use of the notion of full service, central kitchen, exhibition style cooking platforms and food courts or food malls.

Milshtein (1999) sheds the light on the new type of campus users, who are having new expectations and needs; more seating alternatives and food serving methods are needed to attract them and compete with off campus restaurants. She expects the conventional styles to fade away to be replaced with dining facilities in campus resembling private restaurants. Swanquist (1999) argues that campus dining facilities should be flexible and multifunctional; providing many meal alternatives and many combinations of seating, lounges and computer plug-ins, such spaces should be hybrid food service places that are comfortable and lively places to hang out and meet with friends and professors. An

observation of campus dining facilities would show that such places exhibit the qualities of common place, users use these spaces to study, use PCs and as a meeting place or just to relax and refresh.

Klassen, Trybus and Kumar (2005) explain the importance of planning food services in campus as it affects the quality of life in campus. They suggest that unlike restaurants where people go to eat, users seldom go to campus to eat, they are found there to attend classes and eating is more a social activity rather than a necessity. Klassen et al. (2005) relate the choices of food outlet in campus to its attractiveness as a meeting place and other services and to its proximity to the location of classes. They also stress the importance of considering the duration of dining process including walking to food outlet, choosing and buying meal and walking back; if reaching the food facility takes 3 minutes or less then it is considered to be a short time, if it is more than 3 minutes then it is a long time. According to Strange and Banning (2001) dining facilities are among campus facilities that foster the creation of a sense of belonging toward the campus community, such a feeling helps to create productive learning environments. Dining facilities are the places where most informal learning takes place in campus between campus users; this needs the design of such places to cater for the social and grouping needs of students and other campus users.

Kimes and Robson (2004) suggest that generally users prefer anchored tables in dining facilities more than unanchored ones since such tables provide more control to issues of privacy and territoriality. They stress that table configurations whether side by side or diagonal also affect the pattern of use and frequency of interaction. Kimes and Robson (2004) explain that in campus dining facilities students or users under stressful conditions tend to choose more anchored tables while in pleasant or relaxed conditions they like to choose more highly perceived value tables, such as those by the window with an exterior view. They also confirm that the use of communal tables would fade away since users only would use such tables if they have no other alternative and yet their discomfort would seem obvious by observing their body language and placement of belongings to restrict interaction and this in many occasions does not permit filling such tables fully defeating the purpose of communal tables.

According to Deasy and Lasswell (1990) the users of campus dining facilities are expected to fall within two types; first they may want to eat quickly and alone, second they may want to eat in a group and here eating is considered a social event and the meal duration would be affected according to the composition of the group and its intentions. Successful dining facilities should strive to provide a combination of tables to suite the predicted and actual observed patterns of use and range of activities taking the notion of dining facilities as being a common place for informal interaction and informal learning into consideration. Within the context of universities, students tend to deal with dining as a habitual event; each group of students would develop its own rituals in relation to eating and the social interactions related to it.

2.2.2 Definition and Elements of Place Making

Based on Dober (2003) campus design involves the use of a mixture of processes and procedures that give form, content, meaning and delight to the physical environment in any university. He further argues that universities differ in purpose, prospects, organizational structure, mission, history, sources of funding, size, location environment and combinations of teaching, research and community service, all these factors and other related circumstances help shape campuses. Since the previously mentioned issues should be unique for each university seeking for a distinguished identity and academic excellence this leads universities to be different in terms of their physical environments serving the declared goals. Dober (2003) ascertains that the chief components of a campus design are: buildings, landscapes and circulation systems, also campus design process should use the above mentioned components in place making and place marking to create memorable campuses.

Dober (2003) describes place making as the process of defining the structure of the overall design in a campus in other words it entails creating the campus plan. He elaborates that at the minimum level

place making includes:

i. The positioning and arrangement of campus land uses and pedestrian and vehicular routes.

ii. The location of buildings and functional open spaces such as play fields and parking lots.

iii. The definition of edges.

iv. The interface between campus and the surrounding environment.

According to Dober (2003) a plan created based on place making serves as the framework that joins the components of campus enabling them to be integrated into a unified scheme to meet overall objectives including programmatic, functional and visual aesthetics. Although such a concept is focused on issues of physical components of campus yet it stresses the effect of such elements in terms of creating an ideal environment that facilitates desired social interactions, so it could be said that place making entails both physical and social qualities of a campus, by focusing on such a concept we encourage the creation of a unique environment that meets both the physical and social aspects of the learning community.

Place making also includes another concept which Dober (2003) refers to as place marking. He defines place marking as a process that involves the definition and rational design of certain physical attributes which give a campus its own unique qualities, place marking elements include landmarks, style, materials and landscapes found in varying combinations, on strong image campuses. Place making and place marking are considered to be the main design factors that join hands together to give any campus a clear and a unique powerful image; place making giving it its overall structure and within it place marking furthermore deals with its sub components clarifying them and powerfully adding to their qualities, here the strength of the final campus image is related to the compounding of place making and place marking.

Dober (2003) assumes that place making is an essential first step in creating rational and pleasurable campus designs. He ascertains that any campus plan belongs to one of the following types of plans:

i. ***Serendipitous Plans***: The plans which developed as a result of accumulating decisions taken upon

several years concerning the campus buildings and landscapes without deliberate consideration of the total product.

ii. ***Deliberate Campus Plans***: The plans based on designed and organized planning of the parts leading to an organized well planned whole, it may include: new campuses, sector plans, insert and add-on plans and plans for regeneration. In new campus and sector plans there should be no problem in using place making and place marking as a basis while for the case of insert and add-on plans and plans for regeneration using place making and place marking needs careful modification and manipulation of existing campus.

According to Dober (2003) creating a distinctive campus is achieved by the following method which includes:

i. The location of the physical components of campus (buildings, landscapes, infrastructure) in order to achieve a physical pattern which is functional and attractive.

ii. The patterns are formed by forms that are appropriate for the institutions purpose, size, resources and organizations.

iii. These forms are positioned to reflect the best aspects of the particular site, locale and environment.

iv. Having an overall design that is as complete as possible as early as possible but adjustable to new conditions.

v. The site arrangements and design are located to encourage contact and communication among those using and visiting the campus and to generate a powerful image and a sense of place.

The last point states the importance of the actual use of campus facilities focusing on the informal learning process that enriches the campus life and flourishes in a well designed physical environment. Considering the actual pattern of use and range of activities performed in common place in this regard is a key factor in measuring the degree of success achieved by the produced campus environment.

Dober (2003) mentions that place making is a process in which the intended campus plan is justified

by trying to achieve first a wide understanding of the physical characteristics of campus area under study, second an agreement on what improvements should such a plan include and finally on confirmation of these improvements location and sequence of development. He further more suggests a nine-step place making process that can be modified according to progress and problems faced, such a process includes:

i. A plan for planning

ii. The campus plan agenda

iii. Site and environment analysis

iv. Progress report

v. Alternatives

vi. Synthesis

vii. Reviews and revisions

viii. Documentation and dissemination

ix. Implementation.

It's important to mention here that such a process is not a fixed mathematical formula, meaning that it is a flexible process that may be modified having in mind achieving the stated goals in a case by case manner in regard to each higher education institution. Also such a process emphasizes the role of campus facility managers who should be the leaders of applying such a process to ensure the superiority of their university campus knowing that it is not an easy task yet it is not impossible.

2.3 LEARNING COMMONS

2.3.1 Evolution From Information Commons to Learning Commons

The first Information Commons (IC) appeared in the United States in early 1990s; in 1992 the University of Iowa, constructed the information arcade in the main library, then in 1994 the University of Southern California, constructed the information commons in Leavey library. Somerville and Harlan (2008) elaborate that other universities adopted the commons concept and soon many similar information commons spread widely with each facility reflecting the unique context and the needs of each institution.

Beagle (2008) defines the information commons as a new model of service delivery in academic libraries; the term refers to two levels: on one hand it expresses the virtual environment where digital service can be accessed by any available networked station, on the other hand it refers to the physical environment designed to organize work spaces and service delivery related to this virtual environment. Here the books are supported by digital information resources to cope with the recent technological development in all aspects of life and the changing needs of a new generation of users; the aim is to create an integrated service.

Tramdack (1999) stresses the role of an information commons to emphasize the multi dimensional life of library; it is a center for all sorts of activities besides its pivotal role as a source of knowledge and information. He points out the important role the users play in order to identify the requirements of the information commons and service needs, considering users needs helps to develop working spaces that facilitate integrated activities including collaborative learning.

Halbert (1999) suggests that the way in which a library is used has changed; traditionally users gathered information then took it away to process it, now users use the library more frequently and for longer periods. He explains how information commons provide a one stop shopping mode of research and learning; users write papers, process data and collaborate in groups without leaving the library.

Beagle (2002) designates the information commons as a mechanism to realign the library with new learning pedagogies by functional integration of information and technology services; this caused a revolution that changed the previous negative aspects of library use such as empty reading rooms,

declining door counts and low book circulation into a new image of crowded information commons halls and more demands to expand such facilities. This new trend in libraries ended the speculations of the death of the academic libraries paving the way for a new service concept that would provide the base for libraries of the 21st century. Within this context Bennett (2001) compares the development of information technologies such as the networked personnel computer to other historical events such as Gutenberg's introduction of movable type to the world in 1450. He furthermore describes the current and coming years as the golden age of libraries; this is based on the huge investments in library renovation or new construction and growth of library staff.

Since its appearance in the 1990s, the information commons services and technology has changed over time. Milewicz (2009) underlines that the character and focus of information commons remained consistent; it strived to provide collaborative, conversational spaces that brings together technology, service, tools and resources to support innovative learning, yet new shifts in emphasis lead to the appearance of the Learning Commons (LC).

In relation to the concept of evolution from information commons to learning commons, two points of view will be introduced. Bennett (2003) tries to explain this evolution by referring to historical common rooms in higher education where all members of the academic community meet informally around shared interests after meals. He then points out that the information commons in the early 1990s only enabled knowledge seeking , it brought students together around shared learning tasks, the focus was put on the manipulation and mastery of information. While a learning commons referring to most commons in libraries today is optimized to enable knowledge creation, it brings students around shared learning tasks; the core activity is collaborative learning to turn information into knowledge. The learning commons is built around the social dimension of learning and knowledge, the space is user centered to provide feelings of ownership, it caters for various continuously changing learning purposes.

Beagle (2004) utilizes concepts of institutional alignment, strategic fit and functional integration to describe the change dynamics and service priorities that push the evolution of the commons; the

evolution from information commons to learning commons can be understood in terms of a continuum of phases: adjustment, isolated change, far reaching change and transformation. The early information commons soon after its appearance began to enter this evolution path by introducing many adjustments, those minor adjustments soon after accumulated to introduce isolated changes of the facility. By the end of this phase the learning commons appeared and in turn passed through other phases of far reaching change and transformation to introduce the learning commons as we know them today (Fig.2-3-1).

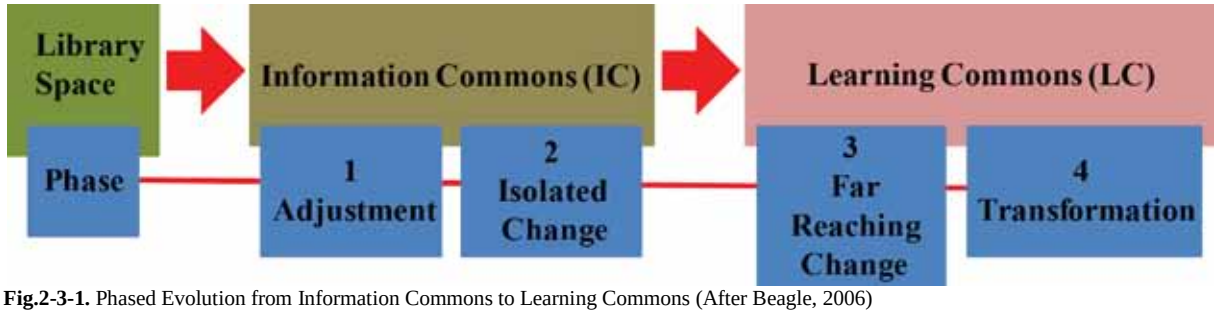


Fig.2-3-1. Phased Evolution from Information Commons to Learning Commons (After Beagle, 2006)

Beagle (2008) distinguishes the information commons from the learning commons by definition; the information commons is a cluster of networks and associated IT tools integrated with other appropriate physical, digital, human and social resources aiming to support learning (Fig.2-3-2).

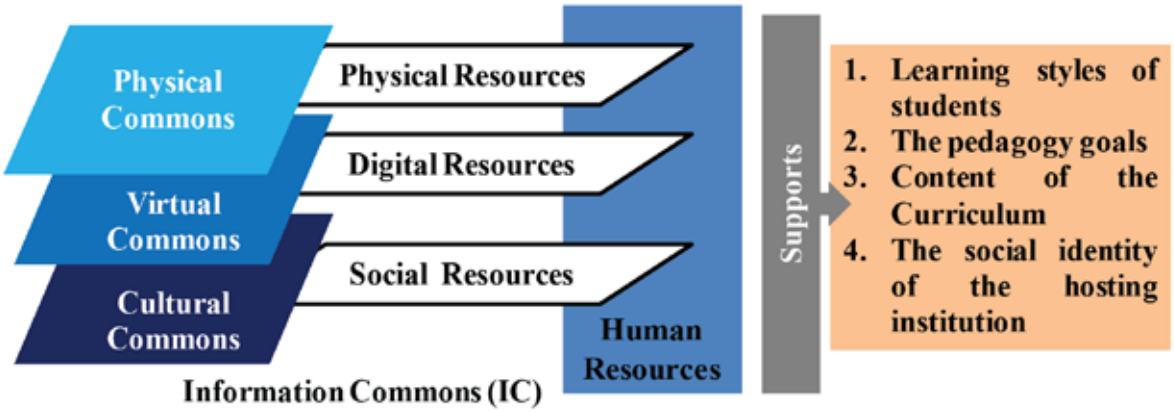


Fig.2-3-2. Levels of IC and Related Resources (After Beagle, 2006)

While the learning commons is an information commons which is developed so that the physical, digital, human and social resources supporting the IC are organized in collaboration with learning initiatives sponsored by other academic units, or aligned with learning outcomes defined through collaborative process. He furthermore points out that the commons is based on a continuum of service

philosophy that extends across three formerly separated services in the traditional library; the commons is to afford identification and retrieval of information, processing and interpretation leading to the last stage of packaging and presentation all at the same place (Fig.2-3-3). Generally speaking the information commons components would include: information and technological resources, production software and relevant support services. The learning commons would include the previous components as well as collaborative learning centers such as writing centers and faculty development centers or similar cooperation initiatives.

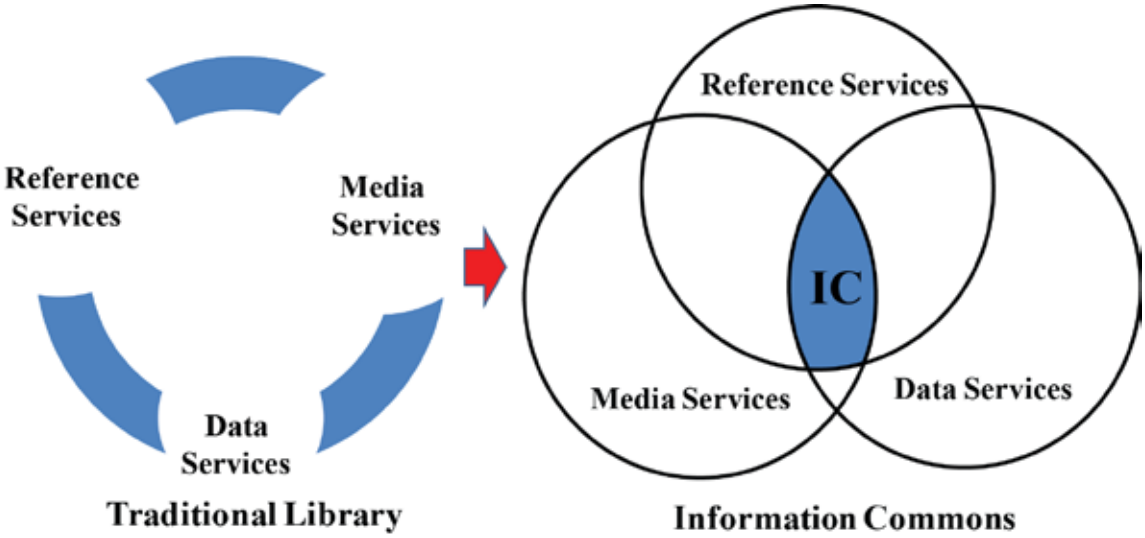


Fig.2-3-3. Change from Traditional Service Models to a Continuum of Service in IC (Beagle, 2006)

2.3.2 Net-Generation Preferences

Dewey (2008) attributes the wave of library transformations to the highly networked, digital, hyper technological environments nowadays and to the emergence of born digital students and faculty, the needs of the new generation of users must be considered .she promotes the circle of service model as a planning tool to create learning commons that incorporates partnerships. This model is composed of general planning issues and a set of accompanying customizable tools. It is a collaborative planning

process that aims to develop information commons that provide for the needs and the changing learning styles of the new generations.

Beagle (2006) elaborates that those born in the period 1981-1994 are referred to as the Net-generation; they are characterized by high dependency on technology since early age which made them develop a need for face to face interactions with peers and faculty. In relevance to this point Oblinger and Oblinger (2005) explain the Net-generation preferences which include: working in teams, tendency for engagement and interaction, fond of arguing and interested in what technology enables, use of technology for participatory learning to construct own meaning and enhance interaction of experiential learning and preference of learning modes that are visual and kinesthetic.

2.3.3 Features and Components of a Learning Commons

Recently developing a learning commons has gained more momentum as a new trend in university libraries here in Japan. Beagle (2008) defines the learning commons as a new model of service delivery in academic libraries which builds on the traditional library service models and integrates information technology besides learning initiatives in cooperation with other campus units to create a one stop shopping philosophy where the focus is on creating knowledge based on a continuum of service that starts with locating information, manipulating it and packaging it as desired by the user to be presented to others, further more the learning commons is promoted as a social, flexible and innovative environment. Bailey (2005) promotes the learning commons as an effective model of integrated library services; it combines the traditional library services with information technology and digital resources. Here catering for high level research needs and knowledge creation are the driving force to create such innovative facilities.

Lippincott (2010) points out that the learning commons seem to be popular among the new

generation of users mostly referred to as the Net-generation; such facilities cater for the new users learning preferences who prefer to work in groups, use technology extensively and tend to mix academic and social lives. Understanding the users' needs help to create better learning environments that engage students and lead to innovation and creativity. The library has been always considered to be the heart of an academic institution, and that is why many researchers expressed their concern when the libraries started to suffer from under use in the mid of the 1980s which appeared in lower door counts and less references use. Yet such phenomena was caused by many factors including the changes that affected all aspects of life influenced by the information technology, the appearance of a new generation of library users, the shift of learning pedagogies from teacher centered to be more student-centered and the insistence of library mangers to stick with the traditional service models that ignored the ever evolving surrounding. The early information commons and later on the learning commons is considered to be a response and a natural evolution in a library to bridge the gap between the user's needs and the library facilities, and this emphasizes the importance of considering the Net-generation needs in particular and users needs in general (Fig.2-3-4).

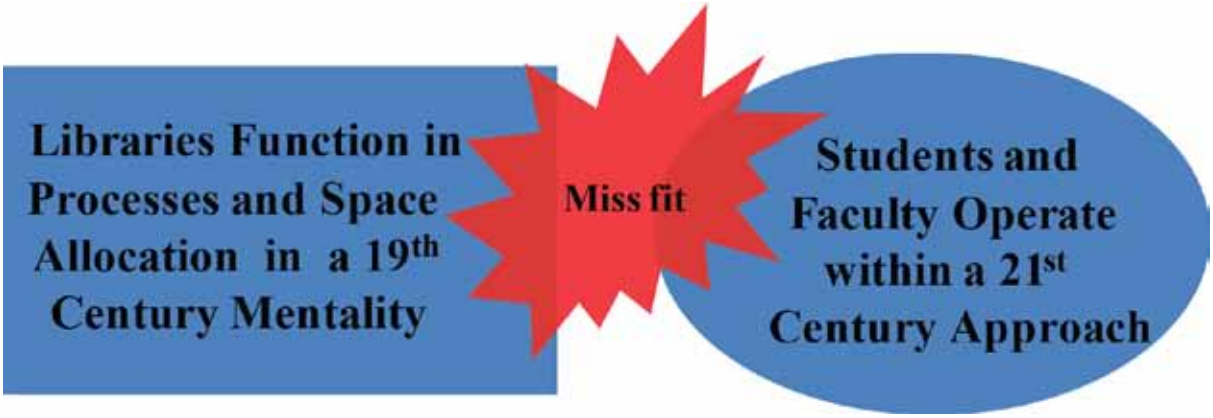


Fig.2-3-4. The Gap Between Users Needs and Traditional Library Facilities (After Beagle, 2006)

Brown (2005) stresses that a learning commons should be the product of integrating learning theory principles, information technology innovations, users' needs with flexible conversational physical spaces. Such a process would guarantee that such a facility would correspond to the needs, preferences and aspirations of the Net-generation who should have special skills to be successful. Within this context

the Association of College and Research Libraries (ACRL) (2000) within its information literacy standards emphasizes that information literacy requires an individual to have special abilities to recognize when information is needed and be proficient in locating, evaluating and manipulating the data using it effectively to solve problems and create knowledge.

Stuart (2008) urges designers of learning facilities and particularly those concerned with learning commons development to collect information on the actual needs of students and other facility users and not to depend solely on needs perceived by the librarians.

Sinclair (2007) tries to summarize the theoretical basis and service models of learning commons to embody a facility that incorporates the following features: the freedom of wireless communication, work space clusters that promote interaction and collaboration besides individualized work, comfortable furnishings and designs to make users feel relaxed, encourage creativity and support peer learning. He strongly urges designers of learning commons to make use of five guiding principles as their design's focal points:

i. ***Open***: unconfined nature of space, cross disciplinary exchange of ideas.
ii. ***Free***: downplays the fixed work stations concentrates on flexibility and mobility making use of wireless technology.
iii. ***Comfortable***: designed for many types of learners and learning types.
iv. ***Inspiring***: furnishing, layout and design present a uniform vision of functionality, sophistication and creativity.
v. ***Practical***: where real work and learning can take place.

2.4 PROBLEM BASED LEARNING

2.4.1 Definition and Core Components

Learning pedagogies are changing in higher education. These days, student-centered pedagogies -namely Problem Based Learning (PBL) - are being applied all over the world. PBL appeared for the first time by the end of 1960s in the field of medical education at McMaster University in Canada (Saven-Baden, 2003; Dutch, Groh & Allen, 2001). In line with such a trend, Mie University adopted PBL since the establishment of the Higher Education Development Center (HEDC) in 2005. Boud and Felletti (1997) define PBL as learning initiated by a posed problem to be solved by the learner. Barrows (1996) clarifies that PBL can be further explained by understanding its six core characteristics; it consists of student-centered learning, learning occurs in small groups, teachers act as facilitators, problems form the basis for focus, problems stimulate the development and use of problem solving skills and new knowledge is obtained by means of self directed learning. Students usually start with a problem rather than being exposed to abstract facts, and then they move to acquire knowledge and skills in a sequence of real world problems presented in context with associated learning materials and support from a teacher. Duch, Groh and Allen (2001) argue that complex real world problems motivate students to identify and research the concepts and principles they need to know to solve these problems. Students work in small learning teams, bringing together collective skills at acquiring, communicating and integrating information. PBL came as a response to the new desired qualities in an undergraduate including the ability to: think critically to analyze and solve real world complex problems, find and use appropriate learning resources, work cooperatively in small groups, communicate effectively and use acquired skills to be an effective learner. Traditional learning pedagogy has failed to equip students with such qualities. Saven-Baden (2003) stresses that PBL starts in a set of problem scenarios to prepare students to be independent inquirers, students work in groups to engage the scenario and decide what information and skills are needed to be learned to manage the problem successfully. Barkley, Cross and Major (2005) define collaboration as the work done by two or more students, who work together and

share the work load equitably as they progress toward intended learning. Smith, Sheppard, Johnson and Johnson (2005) claim that student-centered learning pedagogies increase engagement by encouraging student-faculty contact, collaboration behaviors and active learning. Engagement includes cognitive, emotional and behavioral aspects. Engagement is the amount of time students spend on work, the intensity of their concentration and effort, the tendency to stay on task, the level of difficulty of the tasks selected, the demonstration of flexible problem solving and the propensity to initiate action when given opportunity to do so (Klem, A. & Connell, J., 2004; Skinner, E., Wellborn, J. & Connell, J., 1990; Skinner, E. & Belmont, M., 1993; Connell, J., 1990). Skinner, E., Furrer, C., Marchand, G., and Kindermann, T. (2008) clarify that engagement refers to students' active participation in academic activities in classrooms, while disaffection refers to passivity and withdrawal from participation in learning activities. Furthermore, they argue that there are behavioral indicators of engagement and disaffection; behavioral indicators of engagement include: action initiation, effort, exertion, attempts, persistence, intensity, attention, concentration, absorption and involvement, while the behavioral indicators of disaffection include: passivity, giving up, withdrawal, inattentive, distracted, mentally disengaged and unprepared. Institute for Research and Reform in Education (1998) explains that a teacher can measure students' engagement in a class by assessing their behaviors during class; this can be done by answering three questions as part of the Research Assessment Package for Schools (RAPS) for each individual student.

2.4.2 Models of Instruction

Duch (2001) mentions that the process of learning in PBL resembles the process of learning in professional life, and that there are many instructional models to PBL according to:

i. Size of class

ii. Intellectual maturity of students

iii. Course objectives

iv. Preference of instructor

v. Availability of undergraduate peer tutors or graduate teaching assistants

The instructional models may include:

i. **Medical school model**: Boud and Feletti (1997) point out that this model is used to learn basic science concepts in the context of clinical cases. Students are assigned to groups of 8 to 10 members. Each group has a faculty member as tutor or discussion leader as students work through a case or problem. This method is student-centered, it does not have the form of formal classes; it is a number of scheduled meetings (Duch, 2001).

ii. **Floating facilitator**: used for multiple groups of students in large sized classes, when it is impossible to have a dedicated faculty for each group to serve as a tutor, leader of discussion, answer questions and monitor equal participation by students. Size of groups is limited to 4-5 students. Part of the class time is devoted to group discussion; the faculty moves between groups to ask questions and measure understanding. The rest of class time is for groups to present to the whole class results of a group's discussion. A variety of activities are used such as mini lectures, whole class discussions and debate presentations to cope with the diversified learning styles of students (Duch, 2001).

iii. **Peer tutor model**: uses undergraduate peer tutors who took the course previously to check the function of individual groups, they try to check that a group reaches desired levels of focus and understanding. This model is closer to medical school model. Peer tutors help to guarantee smooth group and problem solving process, give a role model for inexperienced students in PBL processes, check content of discussion, decide when to answer students' questions or throw the question back to them and serve as instructors' window. Here students can serve as facilitators to large groups of 6 to 8 members. But if the number of peer tutors is not enough they can serve as floating facilitators with 2 to 3 groups, such groups should not exceed 4 members each. A faculty needs to prepare questions and

dialogue for tutors to achieve instructional goals (Duch, 2001).

iv. **Large class model**: it is teacher centered. Use undergraduate peer tutors or graduate assistants as floating facilitators; who assist in group discussions and classroom management. Teachers need to design additional structure into group activities during class time, he plays a role similar to a discussion leader asking students to do the following: discuss the instructor generated questions, rank learning issues, report results, share resources, ask questions to measure understanding, also the faculty may use different learning strategies to develop critical thinking skills, communication skills and accept challenges of learning. The class may cycle through many activities including mini lectures, whole class discussion and small group discussion (Duch, 2001).

2.4.3 Spatial Needs of Student-Centered Pedagogies

Sommer (2007) states that in spite of recent developments in learning pedagogies, learning facilities planners and even those using them take the layout of a classroom as granted as they continue to use outdated spaces optimized for the two-thirds rule; two-thirds of the time the lecturer is talking and the students are passively listening. PBL as a pedagogy shifts the focus of learning as a process from teachers to learners, the learning space should be reconfigured to reflect such a change; traditional classrooms with hierarchical organizations that give the teacher a spacious area in the front of a classroom and squeeze the students in rows of tables in the remaining area is not acceptable anymore, also the space should be optimized for group work rather than passive learning by listening to lectures and memorizing information. Steelcase Inc. (2005) urge designers to consider the needs of the emerging generation of campus users who prefer to work together in small groups collaboratively. Herman Miller Inc. (2009) emphasize the divide found between the current learning environments and what is known about the learning experience; to overcome this contradiction more research needs to be done focusing

on four key elements forming the core of student faculty learning experience: human needs, teaching, learning and engagement, understanding these elements would pave the way to create innovative learning spaces. Keating and Gabb (2006) point out that the introduction of PBL into engineering and architecture faculties requires major changes in ways students learn. Learning institutions try to build better learning facilities by considering the needs of students, focusing on durability and quality. A better learning environment would be reflected positively on both students' outcome and faculty input.

Bell, Greene, Fisher and Baum (2001) stress that there is a growing need to create new classroom designs with inspiring furniture configurations to free students of traditional barriers and enable them to embrace innovative thinking, problem solving skills and healthy collaborative behaviors. Kolmos, Graaf and Du (2009) point out that new PBL classrooms need to cater for group work and collaboration. Augustin (2009) claims that classroom design can have profound effects on students; by affecting their learning outcomes and social or collaborative behaviors. Kiib (2004) argues that PBL optimized learning spaces need to be open environments to facilitate creating and transforming knowledge by means of group work and collaboration. Strange and Banning (2001) recommend educational environments to support formal and informal learning to succeed. Formal learning carried out in classrooms and laboratories is important to gain basic information- know what-, yet knowledge- know how- is gained by informal learning that can happen anywhere; in common places, learning commons in libraries and similar facilities. Cross (2007) elaborates that informal learning is effective because it is personal, while formal learning is imposed by someone else.

The traditional learning pedagogies were developed to function in an era where books were scarce and valuable; many of these pedagogies based on lecturing are still used by faculty nowadays. Yet recently the changes that affected all aspects of life resulted in the adoption of PBL widely in universities. This learning method stresses the importance of working in small groups, so that students may develop critical thinking, and be able to analyze and solve complex real world problems. The methodology of PBL is described as Searching-Solving-Creating-Sharing (SSCS); Houghton Mifflin (2005) associates

this SSCS model with Project-Based Learning. Within this context Beagle (2006) describes LC as an oasis of PBL and collaborative learning. The LC should provide for extending the PBL activities initiated in classrooms (Table.2-4-1).

In a learning commons all possible forms of collaboration need to be catered for supported by information technology innovations to facilitate processes related to PBL such as facilitating discussion and sharing knowledge. In addition openness is stressed; to create several service areas floating in an informal space where eye contact can be maintained. Furniture pieces must be organized to facilitate conversation especially in the social and collaboration areas. Mostly mobile pieces of furniture must be used to stress flexibility; also the comfortable and relaxed notion of space needs to be emphasized by the use of lounge like seating, lighting and color schemes that are lively avoiding traditional classroom arrangements and colors.

Table.2-4-1.LC Users Activities as a Continuity of PBL Activities in Classrooms

PBL Methodology	Class Activity Duch, Groh and Allen (2001)	LC Activity
Searching	· Problem Posed · Group work to define problem	· Group discussion to restate problem definition
Solving	· Discussion to formulate learning issues · Define what is known and what is not known	· Tackle learning issues · Use of whiteboards · Brain storming · Exchange ideas · Review what is known
Creating	· Rank issues according to importance · Assign group and single tasks · Resources investigation	· Follow a plan of action according to priorities · Perform specific tasks individually or collaboratively · Gather information from digital or print resources
Sharing	· Knowledge integration · Synthesis and summarize · Relate new concept to old ones · Propose solutions · Prepare presentations · Define new learning issues	· Analyze and classify according to relevance · Computer collaboration · Share knowledge with group members · Evaluate solution · Prepare and rehearse presentation

PBL as a place maker helps to create optimum learning environments to cater for the needs and learning styles of students that are becoming eager to find collaborative spaces within a university campus. The main theme of such spaces especially in the learning commons or classrooms is flexibility, openness and IT innovations that help to create zones that can be used by groups or individuals as desired (Khasawneh, F. A., Shibayama, Y. & Kato, A., 2010).

2.5 KOLB'S LEARNING STYLES

2.5.1 Experiential Learning Theory

Kolb (1984) explains that the Experiential Learning Theory (ELT) draws on the work of prominent 20th century scholars including: John Dewey, Jean Piaget, William James, Carl Jung, Paulo Freire, Carl Rogers, and others to develop a holistic model of the experiential learning process. David Kolb built his theory in 1984 on six propositions that are shared by the previous mentioned scholars:

i. ***Learning is best conceived as a process, not in terms of outcomes.***

ii. ***All learning is relearning. Learning is best facilitated by a process that draws out the student's beliefs and ideas about a topic so that it can be examined, tested, and integrated with new, more refined ideas.***

iii. ***Learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world. The process of learning calls us to go back and forth between opposing modes of reflection and action; and feeling and thinking.***

iv. ***Learning is a holistic process of adaptation to the world. It is not just the result of cognition but involves the integrated functioning of the total person and the environment-thinking, feeling, perceiving, and behaving.***

v. ***Learning results from synergetic transactions between the person and the environment. The learning process involves assimilating new experiences into existing concepts and accommodating existing concepts to new experience***

vi. ***Learning is the process of creating knowledge.***

Experiential learning is defined as the process whereby knowledge is created through the transformation of experience, where Knowledge results from the combination of grasping and

transforming experience (Kolb, 1984).

Kolb includes the cycle of learning as a central principle for his experiential learning theory, typically expressed as a four stage cycle of learning, in which learning is based on concrete experience, observation of and reflection of that experience, formation of abstract concepts based on the reflection, and testing the new concepts followed by repetition of theses four steps.

The ELT model portrays two dialectically related modes of grasping experience- Concrete Experience (Feeling) and Abstract Conceptualization (Thinking) - and two dialectically related modes of transforming experience; Reflective Observation (Watching) and Active Experimentation (Doing). Using both modes of taking experience and both modes of dealing with it expands the potential of learning. A learner may begin a learning process in any of the four phases of learning cycle according to his preference. The learner needs to cycle through all four phases to have an effective learning.

The ELT considers experience the core of learning (Kolb, 1984). Learning happens by retrieving information and processing it to create knowledge, learners differ in the way they go about this transformation; retrieving information can be done by means of Concrete Experience (Feeling) or Abstract Conceptualization (Thinking), while processing information can occur by Reflective Observation (Watching) or Active Experimentation (Doing) (Kolb, 1984).

2.5.2 Learning Styles

Kolb (1984) indentified four learning styles: Accommodating, Assimilating, Converging and Diverging. These styles are not a fixed trait but a manner in which the mind operates; they are indicators of dominant learning tendencies not a strict method to define an individual's learning style. Most people learn in more than one style, each of the four styles falls at one of the quadrants demonstrating a blind of a perceiving and a processing. Little (2004) claims that students belonging to each style are assumed to

show common traits in terms of learning method preference and task accomplishment.

i. **The Accommodating Style**: Combines the Active Experimentation and Concrete Experience modes. Indicates a preference for combining feeling or intuition with doing. People of this style prefer to participate in controlled situations, doers, people who can carry out plans and get involved with new projects (Kolb, 1984). Learn by feeling and doing and prefer tasks that require action, risk taking and exploring (Kolb, 2007; Schaller, Borun, Allison-Bunnell & Chambers, 2007). They like group work (De Jesus, Almeida & Watts, 2004). Skills: associated with action, initiative, leadership and relationship skills.

ii. **The Assimilating Style**: Combines the Reflective Observation and Abstract Conceptualization modes. People of this style prefer thinking and watching. They like to solve problems by indicative reasoning, tend towards theoretical professions and are less concerned with people than ideas (Kolb, 1984). Learn by thinking and watching and prefer tasks that require abstract thinking and inductive reasoning (Kolb, 2007; Schaller et al., 2007). They like to work alone (De Jesus et al., 2004).Skills: associated with quantitative, theory, information analysis and information gathering skills.

iii. **The Converging Style**: Combines the Abstract Conceptualization and Active Experimentation modes. Indicate a preference to combine thinking and doing. Excel at technical tasks. Greatest strengths are problem solving, decision making and practical application of ideas (Kolb, 1984). Learn by thinking and doing and prefer tasks that require problem solving, use of technological tools and practical application of ideas (Kolb, 2007; Schaller et al., 2007). They prefer to work alone (De Jesus et al., 2004). Skills: associated with action, goal setting, technology and quantitative skills.

iv. **The Diverging Style**: Combines the Concrete Experience and Reflective Observation modes. People of this style are people oriented and tend to rely on watching, feeling or intuition, they solve problems by taking risks and is best at generating alternative ideas and imaginative solutions (Kolb, 1984). Learn by feeling and watching and prefer tasks that require imagination and brain storming (Kolb, 2007; Schaller et al., 2007). They like group work (De Jesus et al., 2004). Skills: associated with

information gathering, sense making, help and relationships skills.

The Learning Style Inventory (LSI) was developed to assess individual orientations toward learning. It is a 12 item self description questionnaire. Each item asks the respondent to rank-order four words in a way that best describes the learning style of the respondent. It measures a person's relative emphasis on each of the four modes of learning process. In addition two combination scores indicate the extent to which the person emphasizes abstractness over concreteness and the extent to which the person emphasizes action over reflection (Kolb, 2007).

2.6 RELEVANT ENVIRONMENT-BEHAVIOR CONCEPTS

The aim of this section is to clarify the relationship between people and the built environment by providing a set of concepts that describe this relationship, a general understanding of such concepts leads to understanding the impacts of students and other users on the university campus design. Lang (1987) believes that changes in the landscaped and architectural elements of environment will result in changes in the social behavior of its users. It can be said that the relationship between campus-users behavior is a simple cause effect relationship, the aim of creating and building the campus environment is to provide for the existing and the potential set of its users activities. This implies that the campus components and places that have place making qualities and are designed to encourage interaction or attract users tend to affect campus use in general, social life and specially the informal learning taking part within these facilities and in campus in general.

Lang (1987) discusses some characteristics of the built environment that encourage interaction; according to him functional distance and functional centrality are major predictors of the interaction patterns of users of a certain facility whether residential, work or institutional, functional distance refers

to the degree of difficulty encountered in moving from one point to another, while functional centrality refers to the ease of access to common facilities for a group of people, the frequency with which people use them and the amount of time they spend in them. The opportunities to campus users to see and meet others are essential to promote interaction, this can be achieved by providing common place having in mind that such a place should provide functional centrality that is being placed in a way that ensures that it is accessible by users from all campus parts or by providing a network of such places in relation to campus design, also the issue of functional distance referring to the distance between campus buildings or certain rooms or facilities within a building should be considered wisely knowing that paths or corridors leading straight forward from one place to another reduce this distance and reduce chances of interaction while long distances, major traffic flows across paths and multiple opportunities for other activities increases the functional distance between two points but in the context of campus may lead to a richer informal learning environment. A campus having a central pedestrian mall may be an ideal solution; in such an organization outdoor common place and dining facilities would be placed to achieve functional centrality with a reasonable functional distance that balances issues of proximity, experience variety and encourages interaction among the campus community members.

Sommer (1969) ascertains that an architect usually designs any building or complex to cope with a wide range of its users' needs and activities, this should be based on knowledge about these needs and the nature of human behavior. In this regard this study aims to understand the specific needs and activities of the users of campus common place, learning commons and classrooms as a base to create better learning spaces in campus. Sommer (1969) argues that form should follow function an it must assist it in every way, functionalism should be based on users behaviors. This puts more emphasis on understanding the activities taking place within campus buildings and outdoor spaces and particularly the focus issue of learning spaces, the aim is to grasp the effects of built environment on human activities and behavior and vise versa to use such knowledge wisely in creating effective learning spaces in campus. Hall (1990) supports this point by claiming that even the perception of a space is dynamic in

nature because it is related to actions taking place or predicted to take place within that space rather than just passively understanding the physical settings without context, this adds to the importance of human behaviors in a given setting as a response to its physical and social qualities.

Hershberger (2002) recommends using behavioral-based programming as a base for designing complex buildings as in the case of university campuses, such a method helps to overcome the difficulties of having a total understanding of the values, goals and needs of the users of various divisions or departments of such complex facilities that are essential to create a successful design. He explains that this sort of programming would use the available behavioral research methods to fill this gap of knowledge to better understand the future user of a building, this would include interviewing key personals in various divisions of the intended facility to know more about their values and goals, it should also include an observation of the actual use of current similar environments that can provide feedback to generate better design solutions.

Many other researchers Deasy and Laswell (1990), Cherulnik (1993) and Scott-Webber (2004) stressed the importance of understanding the basic concepts of environment-behavior relationships to design. Such understanding should not focus only on the theoretical aspects of such concepts but the most important is deriving methods to apply that understanding and providing working reliable formulas to enhance the environment under concern otherwise such concepts would remain imprisoned only in books without real beneficial applications. This study aims to support such a notion; the following section would shed light on the aspects of proxemics theory, personal space, sociofugal and sociopetal space.

2.6.1 Proxemics Theory

The anthropologist Edward T. Hall is most associated with proxemics; proxemics is the study of

human use of space within the context of culture. Hall (1990) suggests that people handle space differently affected by the culture to which they belong. Each culture has developed its own norms that all people follow in dealing with space, being unable to follow such rules may give negative messages about a person's intentions, cause conflict and prevent an effective use of space. Proxemics is one of the most important aspects of nonverbal communication, Lang (1987) notes that proxemics brings the designer to an awareness of how people relate to each other in space and how the layout of rooms relates to perceptions of status, where people of higher status are given more space. Deasy and Laswell (1990) mention proxemics as being the distancing aspects of personal space, this concept is important in environmental design and its understanding is a must since it has many applications in the design field in relation to public seating arrangements, public toilets fixture spacing and many others. Scott-Webber (2004) argues that proxemics is a part of what she called situational behavior which refers to circumstances when a personal or social distance mechanism is triggered, considering situational behavior determines our feelings of comfort towards certain spaces and during interactions with others.

According to Hall (1990) culture gives structure and meaning to senses that are the physiological base shared by all human beings. He elaborates that there are three proxemics manifestations:

i. ***Infra-cultural***: is behavioral and is rooted in man's biological past
ii. ***Pre-cultural***: is physiological and very much in the present
iii. ***Micro-cultural***: is the one on which most proxemics observations are made

There are three fundamental areas related to proxemics: space, distance and territory, these would be discussed as follows:

Space: proxemics as a manifestation of micro-cultural level has three aspects:

i. ***Fixed-feature space***: it is one of the ways in which people organize activities. Housing, buildings, cities as well as rooms within a house are organized spatially, objects and activities are related to these spatial arrangements, if objects or activities are moved people react. The important point about fixed-feature space is that it forms the major shelter for a great deal of human behavior. It is related to

personality and culture, the aspects of fixed space are invisible they only may become visible by observing behaviors. Fixed-feature spaces include buildings and fixed seating.

ii. ***Semi fixed-feature space***: it is important to interpersonal communication, because it may be used in many different ways to convey meaning. Examples on this space includes movable furniture, people can move such elements until they get comfortable to engage in interaction. Whyte (2001) suggests that movable seats are one characteristic of well liked public places. Providing semi-fixed features in campus learning space ensure that the users would be more comfortable arranging themselves in the best way that prompts fruitful interaction and knowledge creation.

iii. ***Informal space***: it is the most significant for individuals because it includes the distances people unconsciously maintain when they interact. This space is observed yet it is not stated, informal spatial patterns are an essential part of any culture and form the framework for interaction distance within people.

Distance: People have certain patterns for delimiting the distance when they interact. This distance varies according to the nature of social interaction, personality and environment. Hall (1990) identifies four distance zones that have near and far phases, they include:

i. ***Intimate Distance***: ranges from body contact to around 45cm. At the intimate distance, the physical contact between two people happens, sight, olfaction, heat from the other person's body, smell and feel of the breath all combine to signal involvement with another body. The close phase up to 15cm includes intimate activities which require the extensive contact of the bodies while the far phase from 15 to 45cm does not allow for much if any body contact.

ii. ***Personal Distance***: Separates the members of the non-contact species, it may be described as a small protective sphere that a person maintains between himself and others, personal distance ranging from 45 to 120cm between people. The close phase 45 to 75cm permits one person to touch another, while the far phase of personal distance 75 to 120cm "an arm's length" does not permit this. Subjects and personal interest can be discussed at this distance.

iii. ***Social Distance***: The casual interaction distance between acquaintances and strangers. Its common in business meetings, classrooms and impersonal social affairs. Social distance ranges from 120 to 360cm. Its close phase 120 to 210cm is the characteristic of informal interaction, while more formal interaction requires the far phase 210 to 360cm, some physical barriers such as desks, tables and counters usually make people keep this distance and proxemics behavior of this sort is culturally conditioned and arbitrary.

iv. ***Public Distance***: Is outside the circle of involvement, several sensory shifts occurs in the transition from the personal and social distance to this distance. Public distance is at 360cm or more, its close phase 360 to 450cm provides the amount of space generally desired among strangers while its far phase 450cm or more is necessary for large audiences, in this case speech must be projected or amplified to be heard.

Territory: Humans and animals share the use of territoriality yet territoriality is more complex in people. Hall (1990) states that territoriality is a behavior by which an organism lays claim to an area and defends it against others, many functions are expressed in territoriality:

i. It ensures propagation of the species by regulating density

ii. It provides a framework in which things are done; places to learn, eat and work

iii. Coordinates the activities of the group and holds the group together

Accordingly Lang (1987) suggests some basic characteristics of territories:

i. The ownership of rights to a place

ii. The personalization or marking of an area

iii. The right to defend against intrusion

iv. The serving of several functions ranging from meeting of basic physiological needs to the satisfaction of cognitive and aesthetic needs.

He further more ascertains that human territories vary in size and locale; they include artifacts, ideas as well as place, territories are marked by symbolic and physical barriers. Sommer (1969) defines four

types of territories:

i. ***Public***: freedom of access but not action such as a park

ii. ***Home***: public areas taken over by groups or individuals leading to a sense of intimacy and control over area.

iii. ***Interactional***: areas where social gathering may occur.

iv. ***Body***: (personal space) most private spaces belonging to the individual.

He also assumes that the defense of a territory depends on visible boundaries and markers. Territory is a way to attain desired privacy which is a prerequisite of healthy interaction, taking this concept into consideration is important within the context of learning spaces in campus.

2.6.2 Personal Space

Sommer (1969) defines personal space as the area with invisible boundaries surrounding a person's body into which intruders may not come. He describes this space to be more like a bubble, it is not spherical and it does not extend equally in all directions, usually people would tolerate a person being too close to them but not in front of their face. This distance tends to differ from one culture to another. Sommer (1969) discriminates between personal space and individual distance, although they are similar yet the individual distance is the characteristic spacing of species members, it exists when two or more members of the same species are present, it is affected by population density and territorial behavior. Individual distance and personal space interact to affect the distribution of persons. He notes that the violation of individual distance is a violation of a society's expectations while the invasion of personal space is an intrusion into a person's self-boundaries, in many cases individual distance may be outside the personal space while in other cases it tends to be inside personal space and here people tend to be annoyed. He suggests that if one person only exists within a space, individual distance becomes infinite,

so it is useful to maintain the concept of personal space.

Sommer (1969) elaborates that individual distance is learnt during the early years and it varies according to relationship between individuals, the distance at which others in the situation are placed and the bodily orientation of individuals one to another. He stresses that personal space is a portable territory a person carries with him yet it disappears under certain conditions mainly at crowding, also strangers are affected differently than friends to the loss of personal space. He explains that the invasion of personal space is faced by the notion flight or fight.

Sommer (1969) shows that personal space is there but people do not talk about it, if invasion happens the following mechanisms are used accordingly:

i. Defensive gestures
ii. Shift in posture
iii. Attempts to move away
iv. If the above fails then a person would flight or move away.

He explains that people act differently to invasion due to variations in perception of expected distance and the ability to maintain concentration, he also points out that a non person cannot invade a person's space, invasion includes auditory assault, olfactory invasion and two person invasions that is being surrounded by two people. Sommer (1969) argues that within the context of public places, such as a library or a cafeteria, defense of personal space whose boundaries are invisible depends on gesture, posture and choosing a location that conveys a clear meaning to others; he concludes that an area that cannot be defended against intrusion is not a private territory. He suggests that the defense of personal space is closely related to the defense of territories; both form part of the process of defending privacy, in a cafeteria territory regulates density where moving chairs from one table to the other is common. Sommer (1969) described procedures applied by library users to defend privacy:

i. ***Offensive Display***: the best defense is a good offense; it includes both threat positions and postures. Positions refer to the location in the room; if some location is supported by eye contact and other posture

it indicates a desire to meet others. Posture describes a person's particular stance whether spreading belongings or pulling himself to take little room. Also gesture can be used to defend a given area by the use of expression. Offensive display can be most effective when a person can use landscape elements to reinforce dominance and control entrance and exit such as choosing an anchored table in a cafeteria.

ii. ***Avoidance***: this works when the environment has many places away from the view of others.

iii. ***Agonistic Display***: keep others away through threats of attack physically or verbally, yet real attack or insult is rare.

A person occupying a table in a cafeteria may defend it by offensive display in low and mid use periods but not under crowded conditions where users would show signs of respect before occupying the table. In this regard Sommer (1969) signifies that a person sitting in the middle of a small table may be able to control the whole table by developing procedures to keep shy invaders, yet the one who will actually invade would be aggressive with the risk that the invader would start to develop other procedures to control the table and drive the original occupant away. He also mentions that a person learns by experience the best method, in addition to that it is common to use territorial markers to reserve seats, sometimes territorial markers can be a serious management problem in public areas and it may cause friction between people.

There is another concept as discussed by sommer (1969) which is group ecology. He notes that a group is a face to face aggregation of individuals who have some shared purpose for being together. He mentions that social influence is related to the way the presence of one person affects others by social increment or social decrement. Beebe and Masterson (2012) state that a small group must have a minimum of 3 members and not more than 12, the larger the group the less influence each member has on the group and sub groups would develop. They also, ascertain that if a group has more than 20 members then it becomes more like a public setting; one member speaks and others listen passively. Forsyth (2010) describes a group as a complex social system and a small world of powerful interpersonal forces that shape members actions and thoughts. Young and Henquinet (2000) point out

that the use of group work increases students understanding and retention, and acquiring effective group work skills can help to link educational experience to work experience. Myers and Anderson (2008) mention that students make use of the collective resources of all members and the diversity of opinions which leads to creativity. Schultz, Wilson and Hess (2010) claim that students develop higher levels of critical thinking and gain many other skills that enhance their employability as university graduates and increase their productivity. Kolb (1984) emphasizes that learning styles of students is also another important aspect to consider in any small group, as it may predict how members may listen to and present information. Colbeck, Campbell and Bjorklund (2000) debate that sometimes a faculty should assign students to groups based on several criteria including prior group work experience; to increase the possibility of working with individuals with diverse perspectives and backgrounds. Sommer (1969) conducted studies in relation to groups in cafeteria, he found that most groups where formed of two and three people group or more were rare, he also was concerned with the point that large groups would break into smaller ones. His study has many implications to the design of lounges and informal meeting places, since there is no point for having conversational areas for groups of eight or ten unless some structured activities would take place. He concluded that certain arrangements of people are more suitable to some activities than others. He shows that spacing of individuals in small groups is not random it depends on:

i. ***Personality***: the personality and cultural background of individuals
ii. ***Task***: what are they doing
iii. ***Environment***: the nature of the physical setting

Mehrabian (2010) clarifies that there are three elements in any face to face communication: words, tone of voice and non verbal behaviors, non verbal behaviors of a group member are important to express attitudes and feelings. Sommer (1969) elaborates that the knowledge of how groups arrange themselves can assist in fostering or discouraging relationships, these days we find ourselves arranged by impersonal environments due to ease of maintenance, efficient cleaning and no attention to social

function, such principles would be important in institutional settings where people have no control over their surroundings, the aim should be to design and maintain functional spaces where human relationships can develop.

2.6.3 Sociofugal and Sociopetal Space

Certain spaces and the arrangements of fixtures within them encourage more interaction among its users while others seem to keep people away from each others. Lang (1987) explains that the terms sociopetal and sociofugal were used to describe spaces that bring people together and force them apart by Humphrey Osmond. Scott-Webber (2004) shows that understanding this concept provides designers and planners with better opportunities to come up with certain functional solutions that may be applied especially within the context of learning environments.

Hall (1990) mentioned sociopetal and sociofugal spaces as being types of semi-fixed feature space; sociopetal space are those which bring people together and stimulate involvement, while sociofugal space keeps people apart and promote withdrawal. Furniture arrangement in public places had a distinctive relationship to the degree of conversation according to Hall (1990), some spaces such as railway waiting rooms in which the seating provisions are formally arranged in fixed rows tend to discourage conversation being sociofugal, others such as the tables in an European side walk café tend to bring people together being sociopetal.

Lang (1987) mentions that the same concept have been applied to site plan layouts, those plans in which there are public or quasi-public places where people easily meet are referred to as sociopetal ones and those in which there are no gathering places are sociofugal, each type of these spaces is appropriate in particular conditions. Scott-Webber (2004) stresses that in sociopetal spaces direct eye contact is maximized, eye contact is deemed important and necessary in order to maintain engagement, in such

arrangements eye contact is easy to maintain without body movement while sociofugal spaces make maintaining direct eye contact difficult without body movement and so make avoiding interaction easier.

Yet having any of these types of spaces is not a guarantee to the outcome, that is sociopetal space will not make people interact unless if they want to in the first place, but providing such spaces plays the role of facilitating a tendency to interact.

2.7 RELATING LITERATURE REVIEW TO RESEARCH FOCUS

Facility management helps complex facilities such as a university to achieve its intended goals. The creation of effective learning spaces that take into consideration formal and informal learning is a major goal for higher education institutions. The understanding of campus users' actual learning behaviors is the first step in creating effective learning. Facility management integrates people, place, process and technology to ensure functionality of the built environment. This study explored those four aspects in relation to creating learning spaces to cope with student-centered learning pedagogies - namely Problem Based Learning (PBL).

This study adopts the place making concept put forward by Dober. Place making use in universities can be a key to create opportunities of formal and informal learning spaces necessary to facilitate creating knowledge. Student-centered learning pedagogies stresses group work and independent learning as the most effective process to create knowledge. The concept of place making was merged with the core principles of student-centered learning pedagogies - namely PBL - to explore the possibility of using it as an innovative place maker in Japanese campus planning and design. The primary research question creating focus within this study was formulated:

Within the context of facility management what are the social and the physical qualities that

encourage the campus users to use the campus learning spaces including common place, learning commons and PBL classrooms systematically with consistent and diverse patterns of activities in a manner that promotes adopting student-centered learning pedagogies within campus and in that context do these places exhibit place making elements influenced by these innovative learning pedagogies?

Universities are composed of buildings and spaces between them. This study adopts a comprehensive point of view; several learning spaces were explored including outdoor common place, dining facilities common place, learning commons in libraries and PBL classrooms. Common place was chosen for study because it is where most informal learning happens in campus, in many previous studies common place importance was sometimes neglected and considered insignificant, but from a facility management point of view -which is adopted in this study- having under designed and unmanaged common place is a waste of university assets which contributes to decreased effectiveness of campus learning spaces. Learning commons in libraries is another learning space studied in this dissertation; learning commons is a new type of space that is recently starting to appear in Japanese campus libraries, although it appeared at the USA in the 1990s. This study explored the Japanese interpretation of this kind of learning spaces which was influenced by the adoption of student-centered learning pedagogy, the change of students' needs and the high dependence on information technology tools. More universities in Japan are adopting student-centered learning pedagogies - namely PBL - that focus on group work, problem solving and independent learning. The misfit between this innovative pedagogy and current learning spaces - especially classrooms - is becoming evident; this study tackled several PBL courses to understand students learning behaviors and obstacles to applying PBL. This research feedback aims to provide solid recommendations to create innovative learning spaces that cope with student-centered learning pedagogies - namely PBL in Japanese universities.

To answer the primary research question several supporting questions were posed, these questions provide more focus to the quest of research, and create a framework of research (Fig.2-7-1).

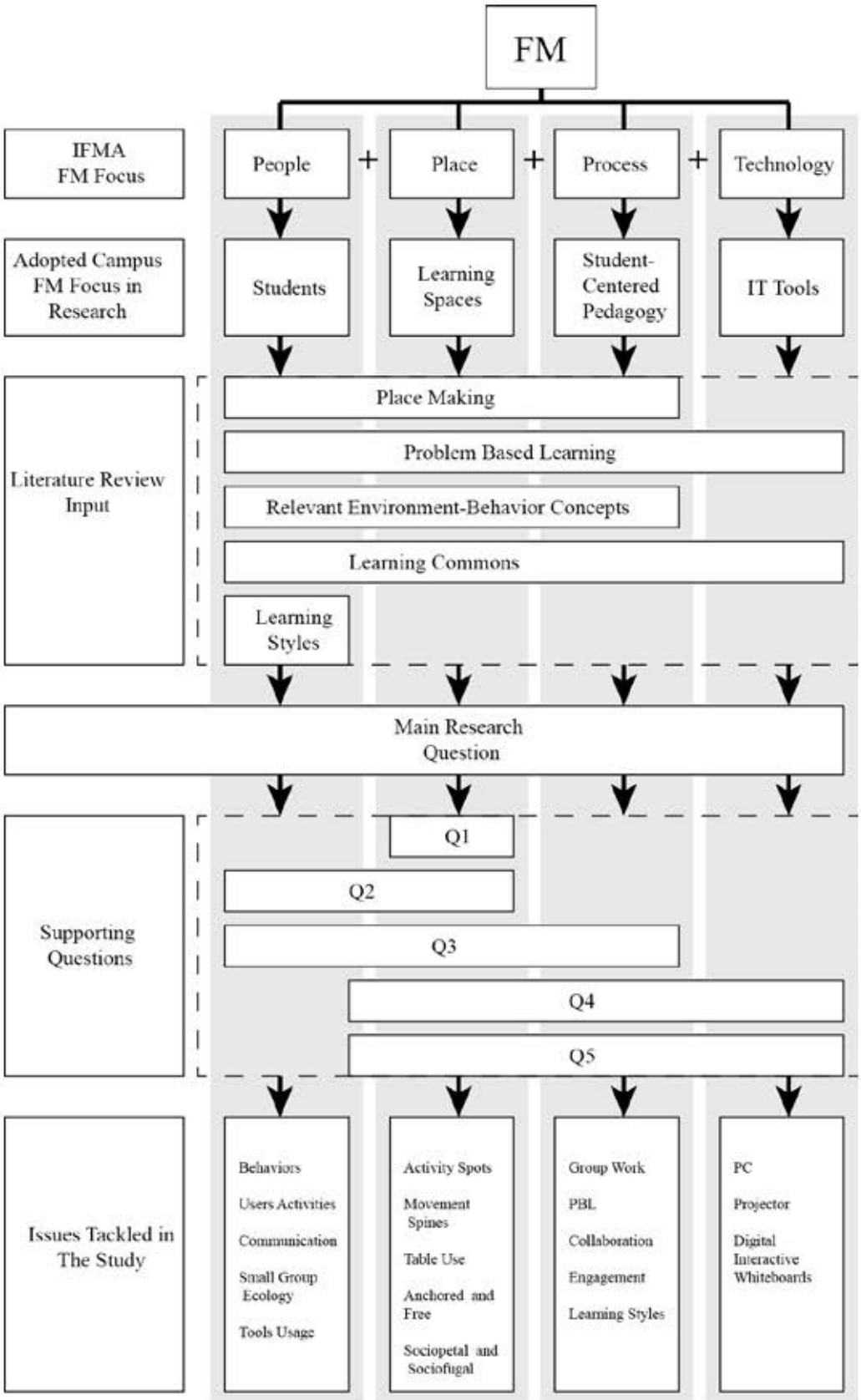


Fig.2-7-1. Research Framework

The supporting research questions are:

i. Where can learning happen in campus beside in classrooms and supportive specialized learning spaces?

ii. What are the patterns of use and the range of activities observed within common place, learning commons and PBL classrooms?

iii. How can environmental behavior principles interpret the current patterns of use?

iv. What are the prominent place making elements of effective learning spaces influenced by student-centered learning pedagogies?

v. How future learning spaces could be designed to induce collaboration?

2.8 SUMMARY

The campus is a complex facility, it is where a wide range of issues influence the final outcome and help in creating a successful higher education institution. This review showed the importance of having a solid base of knowledge including issues related to campus planning and design, human-environment relationship to design, and facilities management that is considered to be the link into which these different topics are poured to contribute in understanding, promoting and developing the effective campus environments of tomorrow.

The literature review showed that more research is needed in the area of campus learning space use and their social and physical components as a part of understanding the aspects of all campus facilities within the context of facility management. In addition understanding the place making elements that form the base of the physical design attributes of common place, learning commons and PBL classrooms is essential to create student-centered learning spaces, also the knowledge of actual

behaviors taking part in all these learning spaces would give feedback on the possibilities of use of such places and the range of activities that would specify the needs of campus users to be satisfied.

CHAPTER THREE 3

LEARNING IN CAMPUS CAN HAPPEN EVERYWHERE

Learning in campus does not happen only in classrooms and laboratories. Informal learning happens all around campus. This chapter tries to shed light on students' prominent activities and learning that can occur in common place which includes all non specialized spaces in campus. The findings of two case studies will be shown; the first case is a study of outdoor common place actual use in Toyohashi University. This is a unique place; it is the essence of campus design, where the central pedestrian mall forms the core of campus life and a rich place full of place making elements that are worth studying. The second case is a study of actual behaviors and patterns of use of Forest restaurant at Nagoya University. This is also a unique dining facility in terms of its layout and environment, more detailed analysis was done for this case including small group ecology based analysis of its users' behaviors.

3.1 CASE STUDY 1:TOYOHASHI UNIVERSITY OF TECHNOLOGY OUTDOOR COMMON PLACE

3.1.1 Introduction

Any space within campus should have its own image and unique characters that imply a certain pattern of use by its frequent users, within time the users of campus outdoor common place develop their own rituals of using such spaces. This includes knowing the best time in a day or in the year to use

outdoor common place in relation to climate, the relaxed and crowded times of use, what parts of it are the best to be in and what are the possibilities of use of such places. A good outdoor place design should try to tackle all the concerns and needs of outdoor common place to create a successful place. This study tries to understand the actual needs of students and other campus users by observing the actual behavioral patterns in the outdoor common place found in Toyohashi University of Technology (TUT).

A structured observation survey was done on the 24th of April 2006; the central pedestrian mall in Toyohashi University was observed focusing on grasping the users' behaviors and actions as well as their movement within this space. Due to its centrality this space is frequently used by students all around the clock, yet for this survey the time between 11:30am and 1:30pm was chosen; this time is related to the university lunch hour, so more students as well as staff and faculty would have their break hour and meals around this period. Primary observation indicated that this period would be the most congested in relation to outdoor common place use making it the most appropriate for this study.

The study area includes the central pedestrian mall, due to practical reasons it was divided into three parts including blocks A, B and C as can be seen in the following figure (Fig.3-1-1).

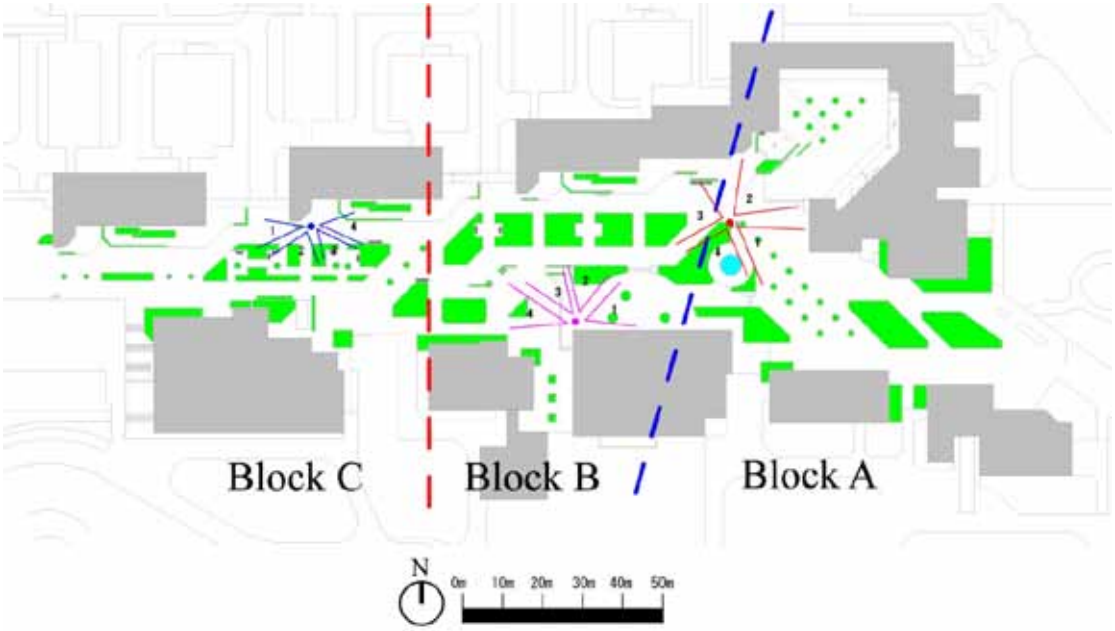


Fig.3-1-1. Toyohashi University Outdoor Common Place Study Area Specification

Block A is the most important, due to its location near the main lecture hall complex (the main gathering place of students), the place making elements include the strong definition of space by the surrounding buildings, its location, clear circulation systems through and around the space and the different sitting zones available, while place marking elements include the use of white color for external surfaces of the buildings and landscape elements, transparent glass to guarantee visual continuity between internal and external common space and the nearby fountain as a distinguished land mark.

Block B is the central part of the external common place, place making elements stem from its designation as a vital circulation path between the restaurant, the lecture hall and the library. The space edges are defined by the surrounding two rows of buildings, while the place marking elements include the clear use of materials especially in the paving and the landscape elements and tree species in addition to a clock considered to be a landmark in the campus mall.

Block C is found in front of the students' service complex (the main destination of students), place making elements include its location and the sitting zones in front of the restaurant. The edges definition is made by the surrounding buildings yet the space becomes less enclosed and more open to the view in the area in front of the D building, while the space marking elements include the distinguished use of plants with beautiful flowers to define the sitting spaces and paving materials.

3.1.2 Observation Methodology

The survey was based on applying the structured observation methodologies using time-lapse photography as the primary tool of observation. This method was thought to be the most appropriate since the central mall is an open vast area that is heavily used by campus users, it would be impossible to observe such a space by single eye or using other means. Each zone of the three zones of the central mall

was assigned an observer (Fig.3-1-1), the total survey was carried out by three researchers. Each researcher was placed in an appropriate location equipped with a digital camera, the observation was conducted for a period of two hours, and each observer took four consecutive shots every five minutes. This process made it possible to observe the actual patterns of use, activities taking place within the outdoor common place as well as students movements within this space in relation to time. It was important within this process to provide a consistent flow of shots while keeping the same point for the whole period of study, also the time of capturing each photo was recorded to make it easier to interpret and understand the collected data later, the observers were able to rest after taking each group of shots to avoid fatigue effects. The location and number of shots were meant to give the most comprehensive record of the central mall environment and its use as can be seen in the example shots below (Fig.3-1-2).

Shot 2 Taken by Block A Observer During Survey

Shot 1 Taken by Block C Observer During Survey

Fig. 3-1-2. Photos Taken During The Survey From The Designated Observation Points, Toyohashi University

3.1.3 Basic Statistical Data

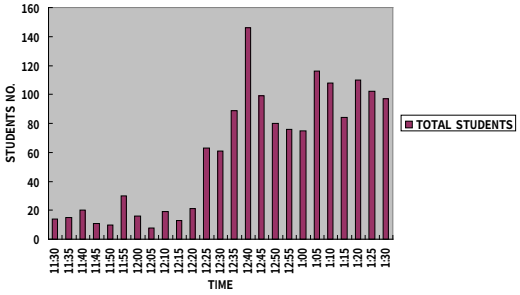
Studying the collected data focused on plotting the users of outdoor common place on plans of this space to produce behavioral maps using a special legend to be discussed later on. The collected data provided information about the number of users, the statistical analysis distinguished among three manners of outdoor place use; this includes passing, standing and sitting users. Passing users are those

who pass through the space under study while moving from one building to another or within campus outdoor place, standing users are those who are observed to be standing in the outdoor place whether engaged in interactions or just stand there for one reason or another during the study period, while the sitting users which are the most important are those who are sitting on the seats or other sitting fixtures within the central mall area, these users are mostly engaged in activities and interactions. All the previously mentioned manner of use may appear in individual users or formations of groups of users. Mostly spaces with more sitting users would show its success as an outdoor common place since the aim of such space generally can be stated as attracting campus users and inducing them to sit and interact with each others.

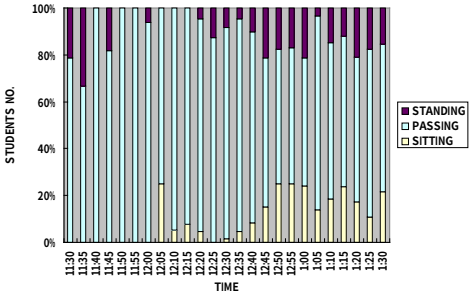
The observation was based on time-lapse photography; this means that acquiring statistical information requires a photo by photo analysis to be accurate. However the following statistical data was based on the plotting of users or the produced behavioral maps based on photos instead of photo by photo analysis due to time constraints, it is important to point out that the number of students and space users as used indicate the cumulative numbers of users in relation to time which do not necessarily represent the real number of users, it indicates the number of users that were found at each zone every five minutes, also this means that a single user may be counted several times according to his duration in a designated zone in respect to time, but since this process was applied to the whole sample and in all zones it can be highly reliable to indicate the frequency of use of each zone. It is also necessary to mention that the data of block C was not complete due to a technical problem leading to having a group of missing photos of this zone observation in the period between 12:05-12:35pm, yet this missing data did not affect the understanding of the general trend of use within this block.

I will start by commenting on the whole outdoor common place. The entire mall was used by a cumulative total number of students of (1484), this number includes the passing, standing and sitting users during the two hours survey; this cumulative number was composed of (201) sitting students forming 13.6%, (1088) passing students forming 73.4% and (194) standing students forming 13%.

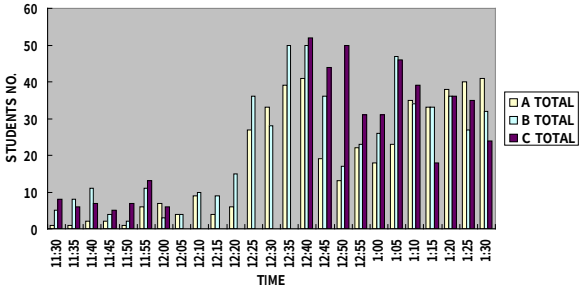
Students number increased between 12:25-12:40pm, it reached the peak with (146) students. Although the lectures usually end by 12:35pm yet the students were sent out 5 to 10 minutes early as a means to avoid congestion in the university restaurant, as can be seen in Graph.1 and Graph.2 in the figure below (Fig.3-1-3). Also the number of students increased in the mall by 1:30pm resulting from students moving back to resume lectures after having lunch or spending their break period.



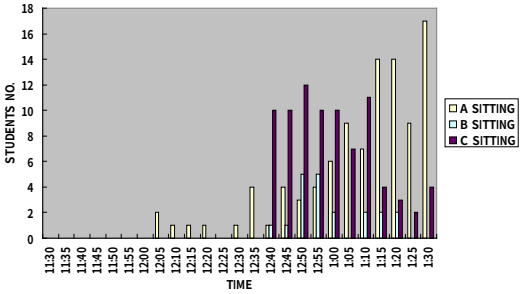
Graph.1.Cumulative Total Students Number in Outdoor Common Place



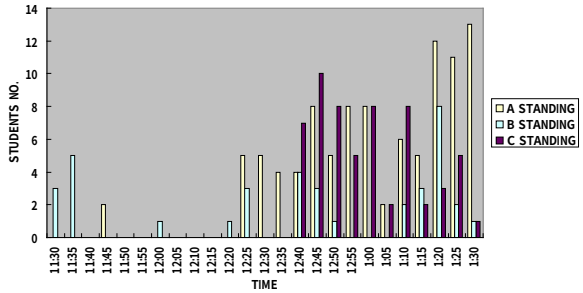
Graph.2.Activity Manner in Outdoor Common Place



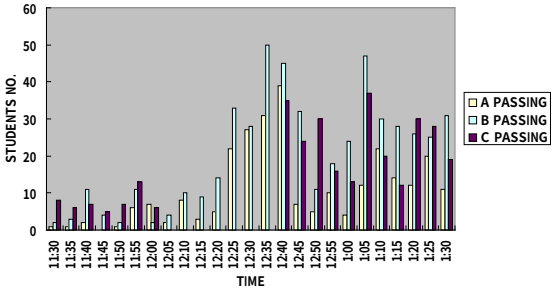
Graph.3.Comparison of Total Students Number



Graph.4.Comparison of Sitting Students Number



Graph.5.Comparison of Standing Students Number



Graph.6.Comparison of Passing Students Number

Fig. 3-1-3. Total Outdoor Common Place Statistical Data, Toyohashi University

In all blocks few students were present between 11:30am-12:20pm with slightly more students in block B, this can be related to the fact that most students at this period were still found in lectures, it is around 12:35pm that students finish their pre-break lectures, the students leaving lectures effect can be

seen in the sharp increase of students numbers between 12:25-12:50pm, this also may be attributed to more experienced students that head early for the restaurant to avoid congestion (Graph.3, Fig.3-1-3). In relation to the sitting students' number, it can be seen generally that no sitting happened before 12:00pm, while dense sitting activity happened after 12:35pm, since it is when the majority of students would finish their pre-break lectures and head to have lunch, at this time many students would sit outside to have their lunch.

On the other hand many other students would prefer to have lunch in restaurant then find a place to sit outdoors and engage in different interactions. It can be seen also that block C had more students sitting in it between 12:40-1:00pm, it can be assumed that most of these were having their meals in outdoor common place knowing that the university shop is found in this block, while block A had more students sitting in it between 1:10-1:30pm, when most students finished their meals and tend to wait for their post-break lectures within outdoor common place, here students engage in many activities and fruitful interactions (Graph.4, Fig.3-1-3).

Standing happened at smoking areas especially in block B, also many students were standing near occupied benches and sitting students which mostly was noticed in blocks C and A, in addition spontaneous meetings provided for the rest of standing incidents. There were more standing students in block C between 12:40-1:00pm, this period is the time when most students head for the restaurant and university shop found at this block, this movement causes many spontaneous meetings and interactions between groups of students and other campus users, as well as the fact that many students heading for the restaurant end up queued in a long line outside the restaurant especially at the congestion period. In block A more students were standing between 1:20-1:30pm, as they were waiting for their post-break time lectures and passing the time in multiple interactions (Graph.5, Fig.3-1-3).

Passing students generally increased in all blocks around 12:40pm as more students were leaving many buildings to have their break and meal, also more students were seen to be passing through block B more than through blocks A and C, this sounds reasonable since block B forms the center of mall area

where students would pass through this part while moving around campus parts especially between block A and university restaurant and vice versa (Graph.6, Fig.3-1-3).

3.1.4 Activity Spots

Behavioral maps were created by interpreting the collection of observation photos, a photo by photo study was conducted, all users locations, activities and manners of activities were plotted on the outdoor common place plan making use of a special legend that includes symbols to express the different observed activities and the manner in which a certain activity was carried out whether sitting, standing or squatting and so on (Fig.3-1-4). This process included a deep analysis of users' behaviors trying to read the photos as accurate as possible in terms of location, activity and groups of users who seemed to be together, taking into account reviewing several consecutive photos in relation to the groups or individuals under consideration (Fig.3-1-5).

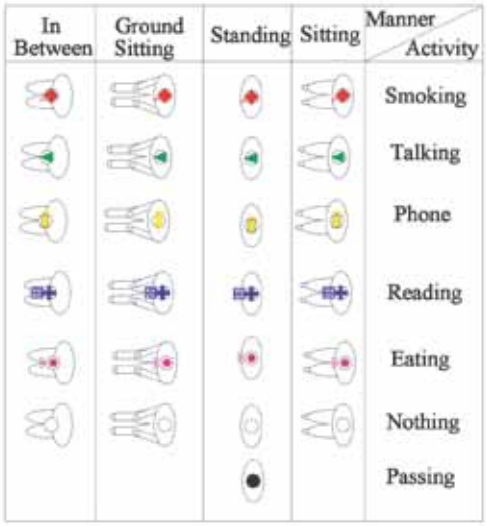


Fig.3-1-4. Activity Legend, Toyohashi University

Many activities take place within the outdoor common area in a campus; such activities depend on many factors including: the appropriateness of the climate, the nature of campus landscape and overall

pattern of design as well as factors related to the students themselves in terms of their preferences, autonomy and needs. The parts of outdoor common place which witnessed the heaviest concentration of users engaged in activities were considered to be activity spots; these activity spots were used as a method to compare the three blocks in Toyohashi University outdoor common place.

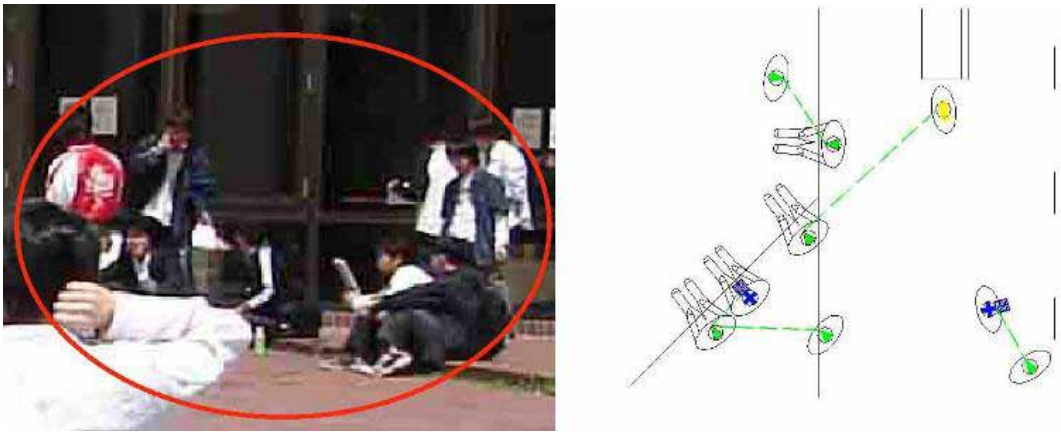


Fig.3-1-5. Interpretation of Students 'Activities from Photos Using The Special Legend, Toyohashi University

In TUT campus zone C had 20 activity spots, while both zones A and B had 13 activity spots. C block came first in terms of activity spots since it is the major attraction in TUT campus because it includes the students' service complex including the book store, shop, cafeteria and the most important space which is the restaurant, but a close look at these activity spots shows that the majority of them were formed by spontaneous meetings where students and other campus users would meet each other while moving around the central mall especially at lunch hour and engage into interactions while standing, yet some students were sitting on the available benches and other sitting fixtures while having their lunch (Fig.3-1-8).

A block was seen to have more dense activity spots than block B and C; mainly because it is related to more extensive use by students around the clock who are found there to attend the lectures in the main lecture hall complex, as well as the fact that students consider this block to be theirs which gives them more freedom to perform a wide pattern of activities, many activity spots were found around sitting fixtures where many students would group; some standing and others sitting as they engage in many activities (Fig.3-1-6).

B block came third in terms of activity spots, mainly because it is the main passage spine between the different parts of the outdoor common area, one of the dense activity spots here was a designated smoking area; this area witnessed many users whether in groups or individuals who besides smoking were engaged in interactions.

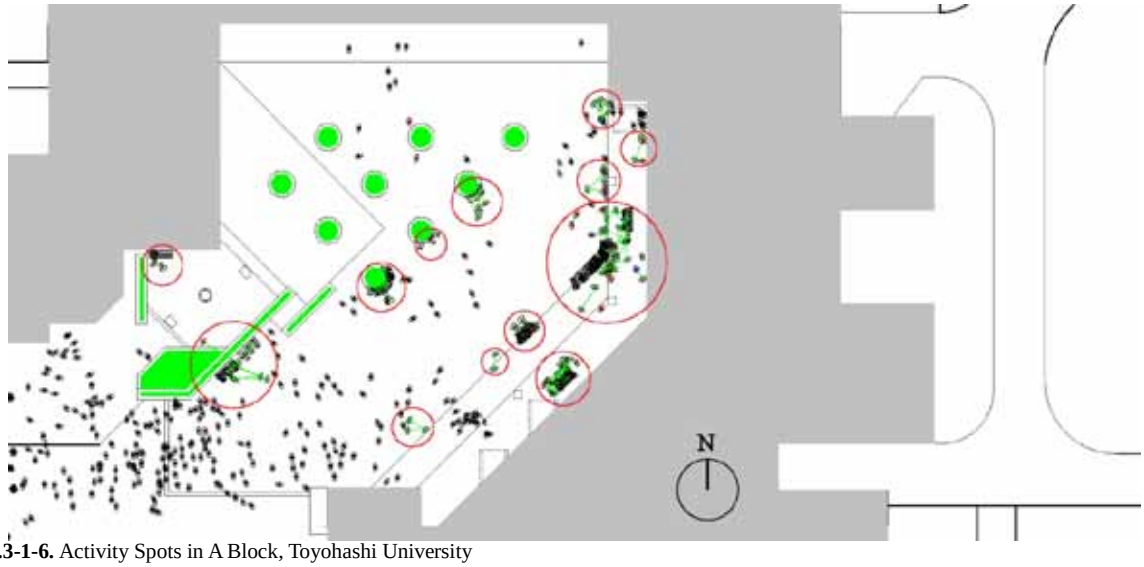


Fig.3-1-6. Activity Spots in A Block, Toyohashi University

Also many activity spots were caused by standing users interacting after meeting each other by coincidence while passing through this central part of the mall, furthermore some sitting fixtures and landscape elements were occupied frequently (Fig.3-1-7).

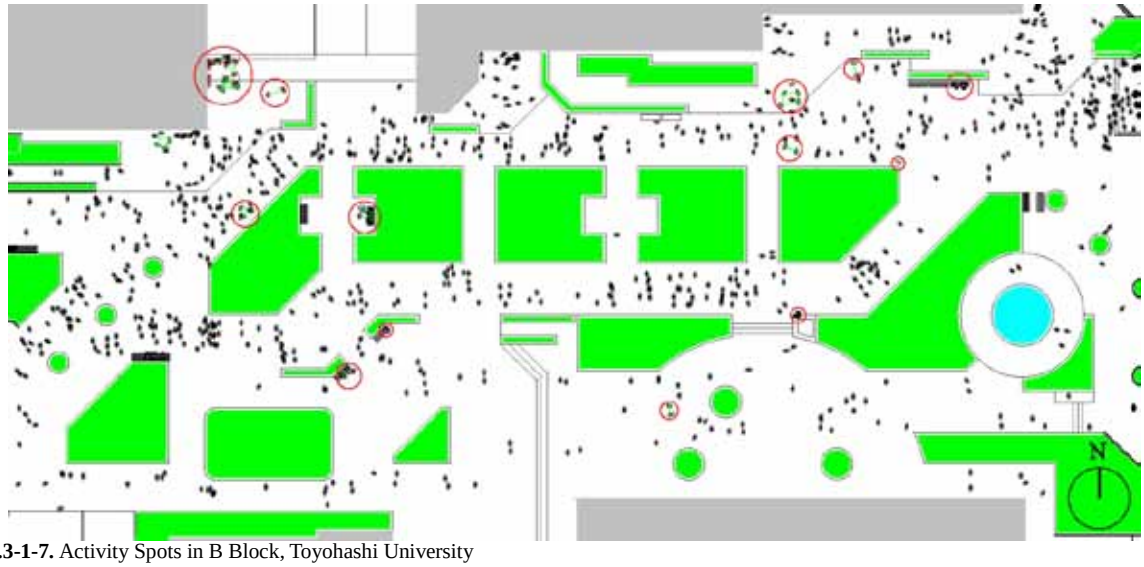


Fig.3-1-7. Activity Spots in B Block, Toyohashi University

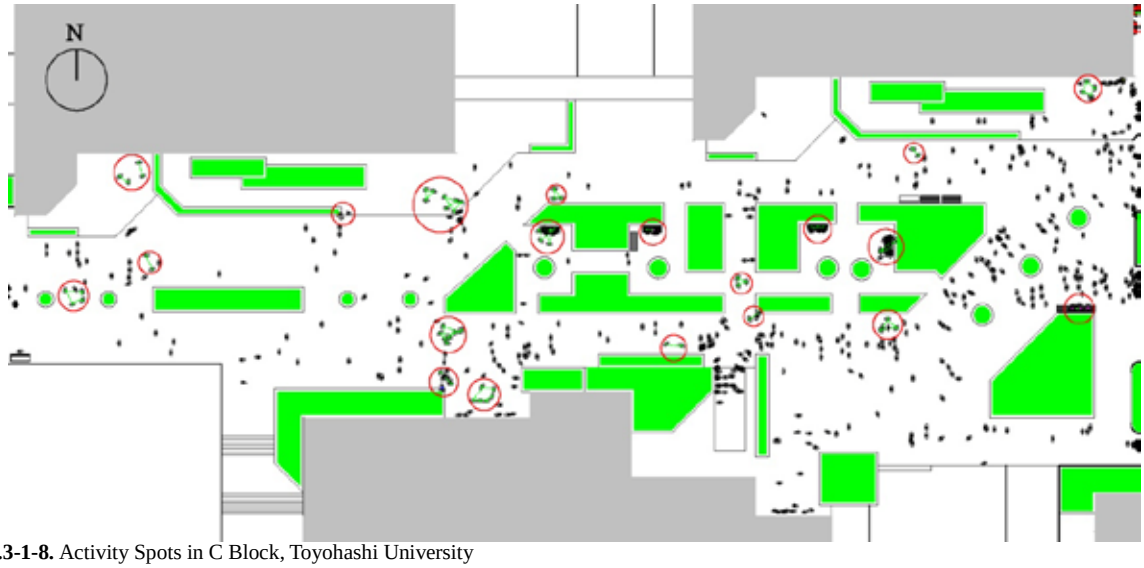


Fig.3-1-8. Activity Spots in C Block, Toyohashi University

3.1.5 Prominent Activities

The use of outdoor common place differed from one block to another; each block will be discussed briefly. Block A witnessed a wide range of use and a variety of activities. The users performed such activities while standing or sitting, standing mostly happened around the main lecture hall entrances and around students sitting on benches or other landscape elements. Students sat on benches, landscape elements and many others sat on the ground near an edge with a height of 12-20 cm, the density of use differed within time as discussed earlier. Also it is worth to mention that many of those interacting students were at a certain point in time smoking, in this regard the whole outdoor space was seen by those students as a smoking area although it was obvious that a certain portion of this space was the only area designated as a smoking area.

Generally speaking students showed a high level of comfort and freedom of action, this freedom was apparent by seeing many students leaning freely on benches while interacting with others whether in relaxed or crowded conditions. Also the same group included a combination of students who are

sitting on benches, sitting on ground or even standing. As for the students sitting on the plant boxes, it also included many members who were squatting on the ground to face other group members to facilitate interaction; this indicates that groups composed of more than two users would seek a sitting organization that enables the group to maintain eye contact which is essential for a prolonged interaction (Fig.3-1-9).

Photo.1. Leaning on Bench

Photo.2. Standing Near Entrance and Squatting near a Group Sitting on a Plant Box

Photo.3. Leaving an Empty Bench with Belongings While Sitting on Ground or Standing Near by

Photo.4. Sitting on Ground in Somewhat Circular Layout to Ease Interaction

Photo.5. A Female Group where Two Members are Standing One to The Front and The Other Behind the Group

Fig.3-1-9. Activities and Patterns of Use in Block A, Toyohashi University

It was observed that at certain times students left some benches empty, their belongings such as bags

and jackets were left behind as territorial markers, while many students were either standing nearby or sitting on the ground, students did not mind sitting on the ground, in fact many of them seemed to be enjoying it as they sat directly under the warmth of sun of a fine spring day. Many students were joined by others who seemed to be coming back after finishing lunch, this was noticed even for those students sitting on the ground, soon many previous students groups were reformed into somewhat circular shapes especially when the group's number exceeded two, the group members were facing each others to ease interaction (Khasawneh, F. A., Kato, A. & Mori, S., 2011).

The interacting students included males and females, mostly groups were divided based on gender, one of those groups was a female group sitting on two adjacent benches in the sun, it included some members sitting on the bench, others standing around, at a certain point in time there were users standing in front of and behind the sitting members, the one behind the group members was found at the edge of the smoking area, so she was smoking yet she tried to keep interacting with the group by moving as close as possible to them.

Block B had many standing students who stood mostly in an area designated for smokers and near the surrounding buildings entrances, those sitting students sat at the provided benches, sitting on other landscape fixtures and plant boxes was rare, in one case a student was observed to sit beneath the campus clock, he seemed to be waiting for someone.

Many smoking students were observed to stay for a long time around the smoking area even after finishing smoking, they mostly engaged in interactions with other smokers or with other passing by students, sometimes smokers were observed to arrive in groups to the smoking area where they would sit or stand while smoking and interacting. Other sitting users included students from both genders in groups or as individuals, also some staff and faculty were seen to be sitting on some benches to interact while enjoying the sun or just to relax. Students were mostly eating their meals, after meal those in groups would stay for a while interacting or just to watch the passersby (Fig.3-1-10).

Photo.1. Standing in Groups Around Smoking Area

Photo.2. Sitting Beneath The Campus Clock Waiting for Friends

Photo.3. A Female Group Have Lunch while Sitting on a Bench Found Besides a Major Movement Spine

Photo.4. A Male Group Interacting as They Finished Eating, Here Sitting in a Central Position Provides for Many Spontaneous Meetings

Photo.5. A Single User Having Lunch in The Front while a Faculty Group Sit on a Bench Enjoying The Sun and Interacting

Fig.3-1-10. Activities and Patterns of Use in Block B, Toyohashi University

Block C also included many standing students but unlike Block B, most of those users were observed to be standing around other students who were seated on benches, near the surrounding buildings entrances and at edges of movement spines or intersecting nodes of landscape leading to and from the restaurant and the students' service complex. Students sat mostly on benches, yet few students were observed to sit on plant boxes or other landscape fixtures temporarily. Students who sat on benches included separate male and female groups who were seen to have their lunch, as such groups finish eating they would engage in interactions or just stay enjoying the weather and the surrounding greenery

before leaving. As noticed before some students were standing around those occupying seats, those are passersby who met their friends by coincidence and decided to join their groups (Fig.3-1-11).

Photo.1. A Male Group Sitting On a Bench to Have Lunch

Photo.2. Temporarily Sitting on a Plant Box to Use Mobile

Photo.3. A Female Group Eating Bento Boxes Surrounded by Shrubs

Photo.4.Two Standing Users Interacting with a Student Sitting on a Bench

Fig.3-1-11. Activities and Patterns of Use in Block C, Toyohashi University

The major patterns of activities observed in TUT outdoor common place includes:

i. ***Time Killing Activity***: such an activity takes place informally with many students taking part in it, these students may be seated at the fixed seats or landscape elements found or even at a step on the ground, during such an activity students gather to talk between lectures or after eating lunch for no particular reason except that of time killing (Fig.3-1-12).

ii. ***Knowledge Sharing Activity:*** such an activity takes place in a formal or informal way, many students take part in a discussion about a certain topic with some of them possibly writing or reading a book while talking to each others. It is a purposeful activity aiming to share knowledge gained by one or more of the students with others which is one of the main aims of universities, this activity is considered to be a continuity to the process of learning inside lecture rooms and other facilities in the university. Mostly it involves one or more students reading a book or a newspaper while others seem to be listening

(Fig.3-1-13).

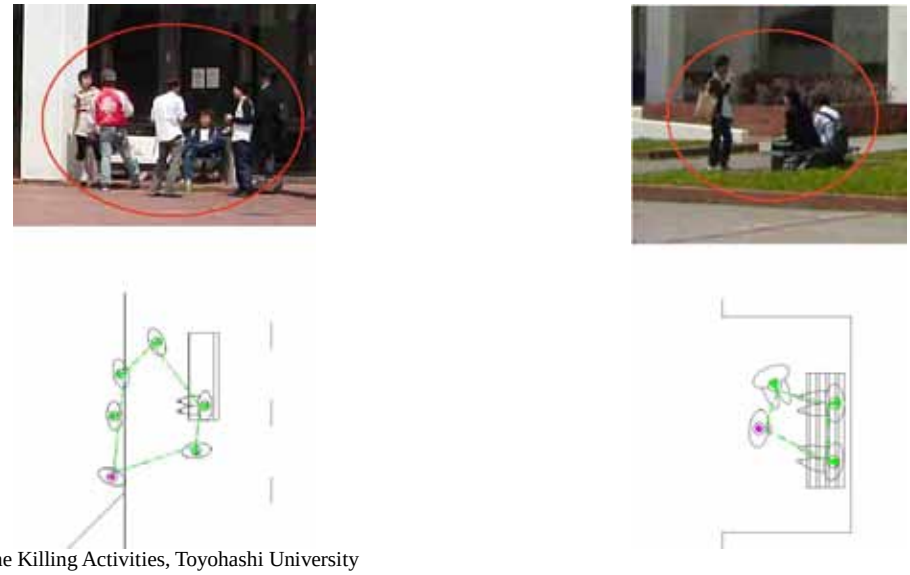


Fig. 3-1-12. Time Killing Activities, Toyohashi University

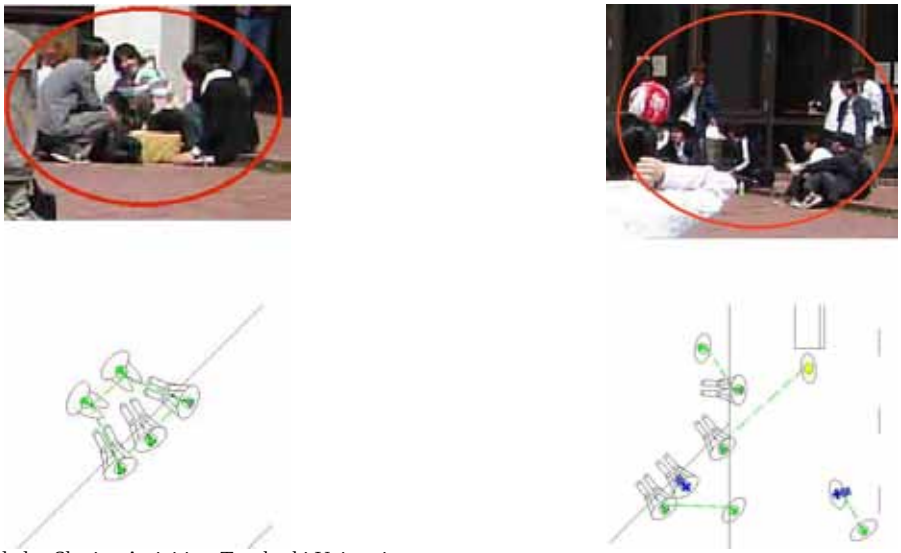


Fig. 3-1-13. Knowledge Sharing Activities, Toyohashi University

iii. ***Basic Needs Satisfying Activity :*** this activity includes a wide range of actions including smoking, eating, reading, phone using and other actions that may be performed in groups or individually but usually it is performed informally. Some of these activities such as eating become a sort of an event within the context of university (Fig.3-1-14).

iv. Spontaneous Meetings: such meetings are informal interactions that usually happen while standing, such meetings occur at the entrances of many faculty buildings, lecture hall complex, restaurant and

some pedestrian spines. The number of participants may range from two to several students, the frequency of spontaneous meetings was seen to intensify when the individual has finished his main task of being in the outdoor common place and is going to resume learning activities after lunch hour. Sometimes it may seem that some of the students went into the outdoor common place as a means to relax and bump into someone to talk with (Fig.3-1-15).

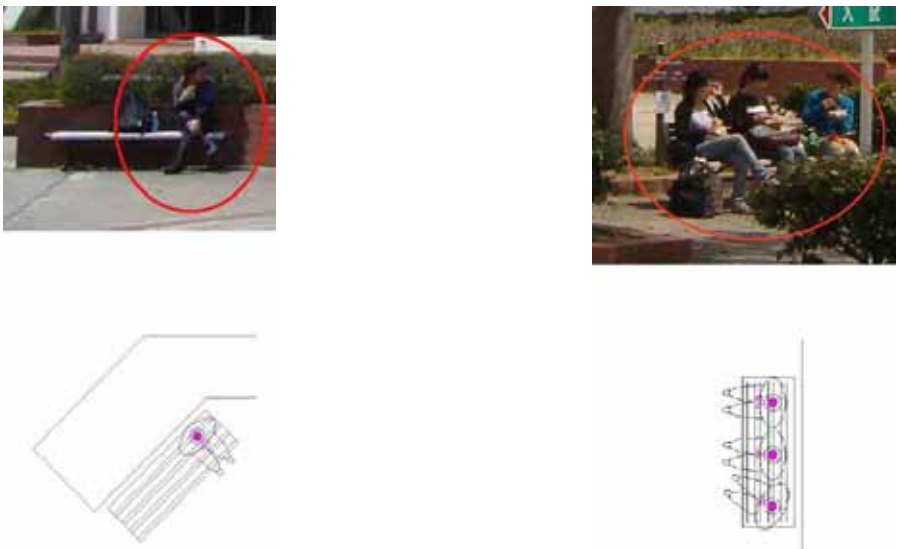


Fig. 3-1-14. Basic Needs Satisfying Activities, Toyohashi University

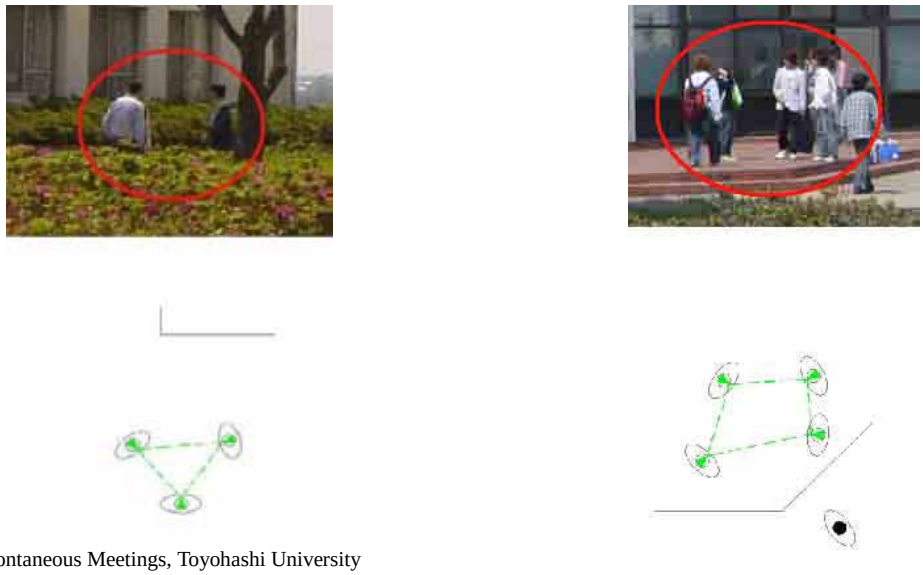


Fig. 3-1-15. Spontaneous Meetings, Toyohashi University

v. People Watching Activity: an informal activity done by a single student or several students, it usually happens while sitting at a place which overlooks a major movement spine or a space that includes

several individuals whether moving or performing certain activities (Fig.3-1-16).

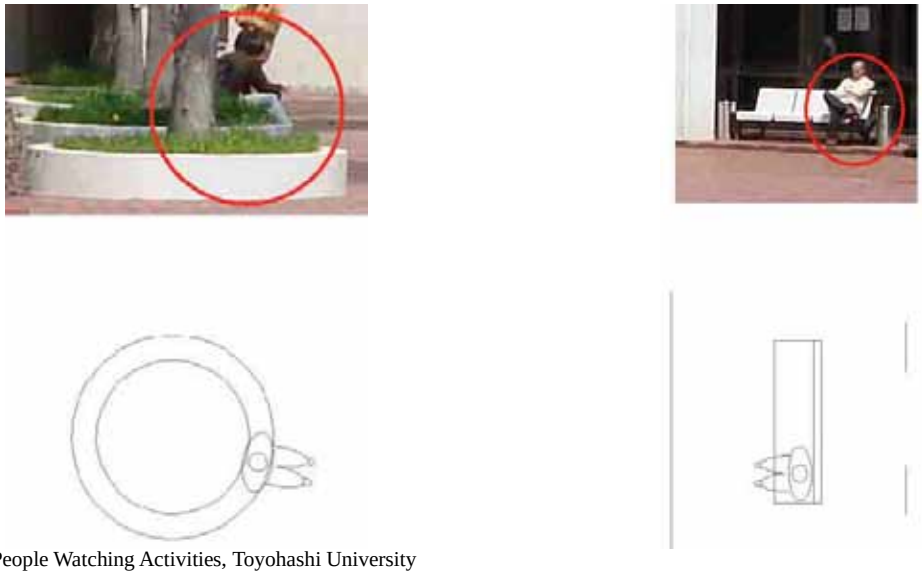


Fig. 3-1-16. People Watching Activities, Toyohashi University

vi. ***Waiting (Appointment) Activity :*** such an activity includes an individual or a group of individuals who are waiting for other individuals at a certain place usually near a major landmark or a pedestrian movement spine, this activity includes waiting for a certain time, then grouping and moving on to a new destination (Fig.3-1-17).

Fig. 3-1-17. Waiting (Appointment) Activities, Toyohashi University

vii. ***Moving Around (Passing) Activity:*** includes all the individuals passing in the space while moving from one point to another destination, this may be performed individually or within a group. Such activity varies from one hour to another, in certain times large groups of students move around specially at the

lecture rush hours and in the lunch and break time, this activity is the most common one in the outdoor common area that forms the major movement spine connecting the different facilities at campus (Fig.3-1-18) (Khasawneh, F. A., Kato, A., 2010).

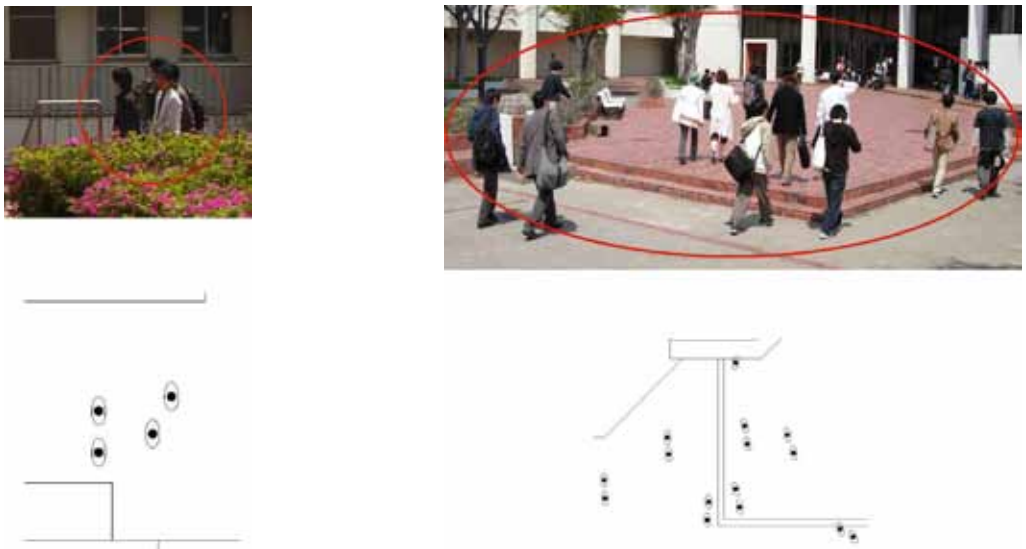


Fig. 3-1-18. Moving Around (Passing) Activities, Toyohashi University

3.1.6 Conclusion

This study provided better understanding of TUT outdoor common place and the prominent patterns of use and the wide range of activities observed to be taking place there. A clear connection was found between the physical qualities of the overall outdoor common place and its place making qualities, block A with its unique enclosure and location showed more place making qualities, its extensive use by many campus users and freedom of activity were explicit signs of its success as a unique outdoor common place. It was clear that the central pedestrian mall concept adds to the overall quality of campus, such an idea should be widely imitated (see Appendix A). The activities of users, their groups layout and way of using each zone were affected by the users' group size, yet it was clear that there should be more sitting fixtures in terms of quantity and quality, although students were willing to sit on the ground, such seating

fixtures design and configuration should take into account the prevalent patterns of activities observed.

3.2 CASE STUDY 2: FOREST RESTAURANT DINING COMMON PLACE

3.2.1 Introduction

The Forest restaurant is the newest dining facility in Nagoya University at Higashiyama campus, any person visiting this facility would feel that it looks different from its counterpart facilities within campus; the environment here is unique, more care is put in the different design elements including the variety of table layouts, multiplicity of configurations, location of tables in respect to other elements, colors and décor elements and lighting scheme. Any dining facility within campus is considered to be the place where most informal interactions usually happen, it is a hub of activity and a pleasant place to be in not only during the meal hours. In this regard the Forest restaurant seems to have all the previously listed qualities, its distinguished features are clearly expressed in the patterns of use and activities taking place within the dining hall. This place is considered to be a special case that is why it was chosen to conduct more in depth analysis of the data collected during the observation sessions.

This survey aims to understand the actual behaviors and needs of the campus users observed in the dining facility, such understanding would pave the way for creating a better environment that promotes optimum use of such facilities in terms of quantity and quality. An observation study was conducted by holding two video recording sessions at the dining facility, the sessions were held on two consecutive days in May of 2007, the first took place on the 17th and the second on the 18th. Video recording was used in this case study, digital camcorders were fixed in selected locations to record the habitual diners' behaviors, this was assumed to enable grasping the patterns of use and activities prevalent in the dining

facility. Although the dining facility serves three meals per day, the lunch meal was chosen for the survey since this time is considered to be the most congested, the survey took place for two hours at each observation session between 11:30am-1:30pm. The Forest restaurant is found in the east north part of campus, it is a part of a new students' service complex which includes besides the restaurant, a book store, a cafe and other facilities (Fig.3-2-1).

Fig.3-2-1. Location of Forest Restaurant Within Nagoya University

The Forest restaurant is also found in the 1st floor of a students' service complex, its main entrance can be reached through a two flight straight stair while the exit leads to a gentle slope. The dining hall is rectangular in shape, the entrance is found at the corner of the short edge of the hall yet a partition wall forms a barrier that prevents going directly to the hall, the users should pass by the meal service counter and the cashier to enter the hall. The exit is linked to the dining hall through a long corridor found at the opposite far edge of the hall. The restaurant service method depends on serving hot meals; usually it contains many dishes and pre-set menus among which the users may choose their meals. The strict circulation system is respected by most users, using the entrance to go in and the exit to leave

(Fig.3-2-2).

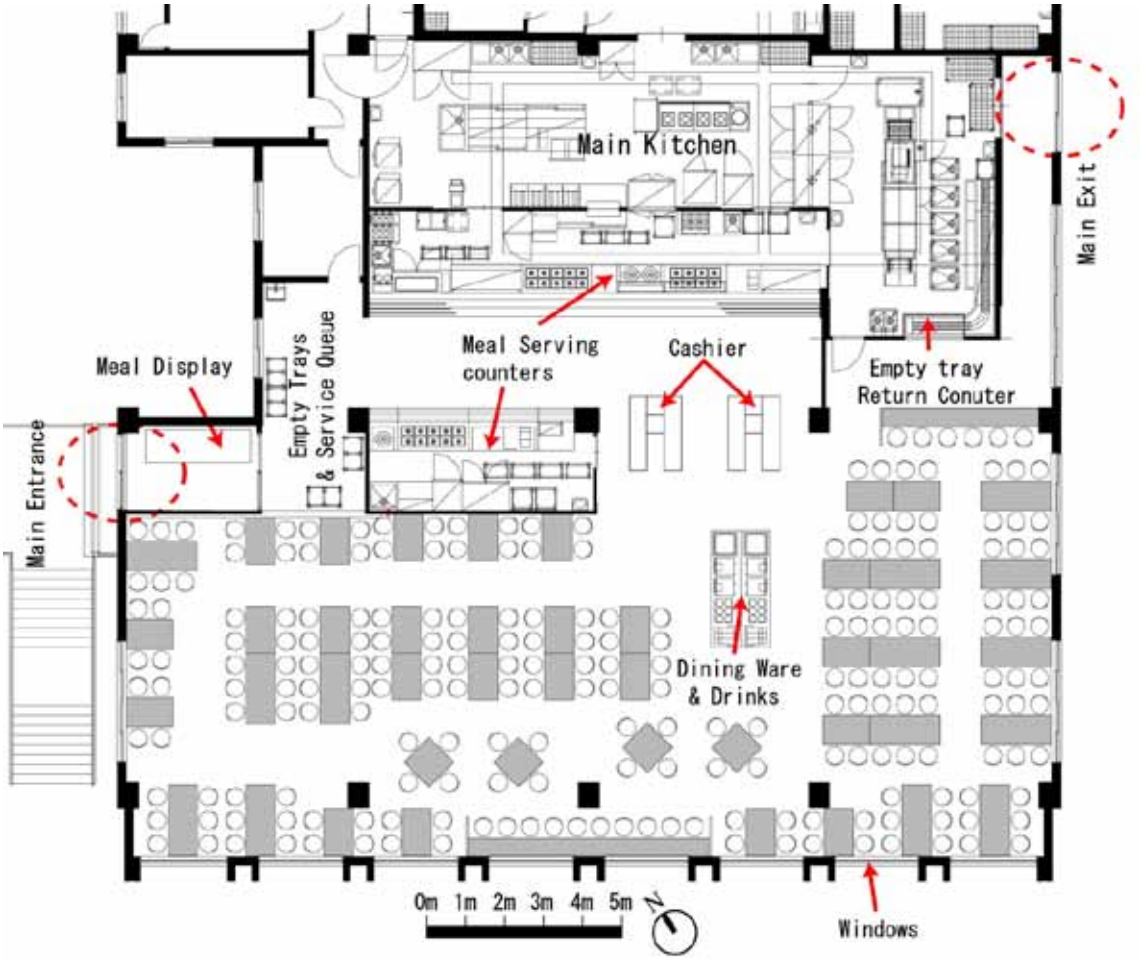


Fig.3-2-2. Layout of Forest Restaurant in Nagoya University

Table organization stresses multiplicity of choices, it provides a wide range of tables locations, capacities and configurations to choose among; single tables include 4 seat tables,6 seat tables and bar like sittings, while a combination of 4 seat and 6 seat tables are used as the basic unit to form shared tables of 8 seats and 10 seats. The location of tables includes windows anchored tables, wall anchored, partition anchored and unanchored free tables, as for the process of meal purchase, it is mostly as in the following scenario: the user enters from the main entrance as he decides what to eat by looking at the meal display, he picks an empty tray then moves to the meal service counter area where he selects the desired dishes forming his meal. As he passes by the cashier he heads for the drinks station then moves to find a seat. When he finishes he drops the tray in the empty tray counter before leaving through the

exit. At peak hours, the area around the main entrance and service counter gets very crowded; frequently the queue of students at the entrance extends down the stairs and along the side walk outside the complex (Khasawneh, F. A., Kato, A. & Taniwaki, Y., 2008).

3.2.2 Observation Methodology

The survey was based on using video recording as a research tool, the dining facility at the meal time would be mostly crowded which makes using such an electronic apparatus dependent method more suitable to grasp the enormous amount of data. The survey was done by fixing three digital camcorders in previously selected locations (Fig.3-2-3). The effort was made to select locations that would cover the whole dining facility, the selected locations proved to be successful in providing a high coverage of tables in terms of number and clarity of details of the recorded behaviors, these locations were implied by the shape and layout of dining facility and the location of necessary electricity plug in points. Another two tiny cameras were fixed on the entrance door and at the ceiling of the corridor leading to the exit of the dining hall; the aim here was to provide a record of the users at both doors, enabling head counting to clarify their numbers in relation to time (Fig.3-2-4). Many issues were taken into consideration to ensure the reliability of the method during the two surveys; this included trying to keep the cameras at almost the same location to get the same comparable views of the same covered area and the more important issue was the need to record the real time within the footage so it may be used for reference later while interpreting the uses and activities observed in the dining facility in respect to the real time not the footage time. A regular wall clock was used for this purpose, at the start of the recording session this clock would be held for a moment in front of all the camcorders including those found at the doors of the facility, the same process was conducted when more than one DV cassette was used at the beginning of the new recording after replacing the cassette.

Fig.3-2-3. Distribution of Cameras Used During The Survey in Forest Restaurant, Nagoya University

Photo.1. The Location of Middle Camera

Photo.2. The Small Camera Fixed on The Main Entrance Door

Fig. 3-2-4. Location and View as Seen in Some Camcorders Used in The Survey of Forest Restaurant at Nagoya University

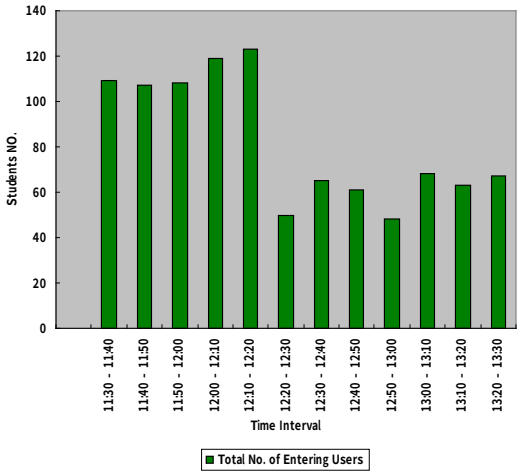
In addition behavioral mapping was conducted at the same time of the recording sessions focusing on tables uncovered by camcorders; the left over tables were observed for the two hours survey period

taking notes on pre-set mapping sheets, three observers participated in this observation, yet the mapping data was only used as a reference.

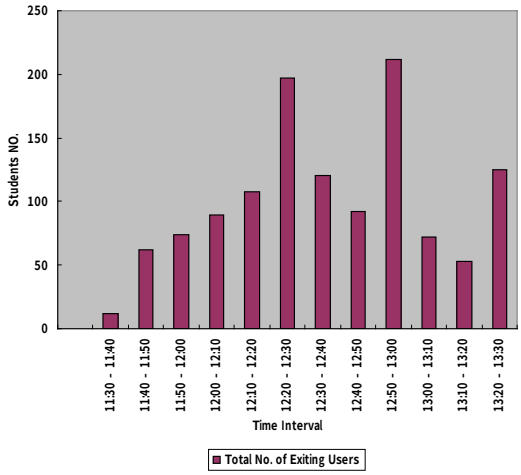
3.2.3 Basic Statistical Data

The data collected on the two doors were used to find the number of users who used it during the survey of the 18th of May; such a number would indicate roughly the total number of diners within that period. During the survey the total number of users who entered the dining hall was (988), while those who exited were (942). The restaurant dining hall has an area of (316.42) m² providing seats for (214) users at once, so assuming that the number of those exiting represents the number of those who had their meals during the two hours period, this means that the restaurant served a little bit more than four times as its capacity during this period.

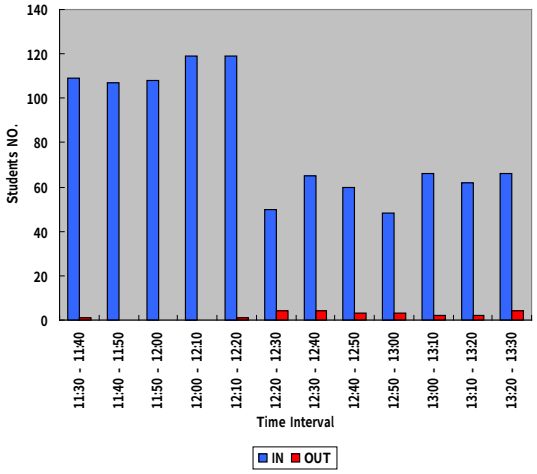
The peak time caused by more users entering together was found in the period between 12:00pm-12:20pm, a trend of dining facility use was noticed; most users came to the Forest restaurant in the beginning of the meal block time, generally there were more users coming to the dining hall between 11:30am-12:20pm then the number of users dropped and kept at a constant rate until the end of the meal block time, this may be related to the schedule of lectures in campus and also it refers to that students would prefer to come to the dining hall as early as possible to avoid the extreme crowded conditions usually found at peak hour, furthermore those coming by the end of the survey seemed to be experienced students as well as faculty members who came late as a measure to avoid the congestion (Graph.1 & 2, Fig.3-2-5). In addition, the data collected proved that most users confirmed strictly to the designed movement system in relation to the designated entrance and exit of the dining hall; violations to this rule as noticed were very rare during the observation period (Graph.3 & 4, Fig.3-2-5).



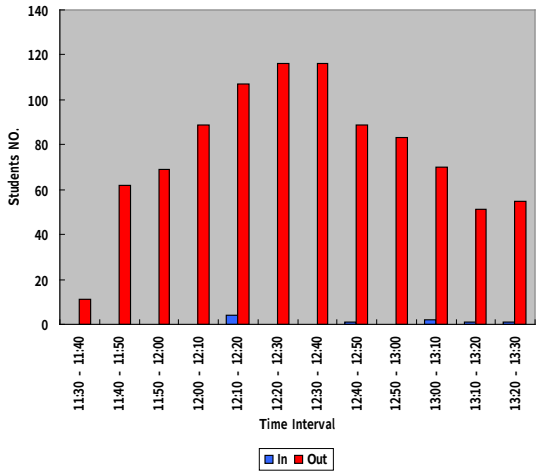
Graph.1. Total Number of Entering Users Within Time



Graph.2. Total Number of Exiting Users Within Time



Graph.3. Users at The Main Entrance



Graph.4. Users at The Main Exit

Fig. 3-2-5. The Total Number of Dining Facility Users During The Survey Period in Forest Restaurant, Nagoya University

3.2.4 Plotting of Diners

The video recording was analyzed using unstructured viewing of the footage as the first stage, the whole survey recording was viewed, impressions or other significant happenings observed during the survey session were recorded on a special log prepared for this purpose. The survey of 18th of May was chosen for further analysis, the selection was based on that the second survey was conducted in a more professional manner making use of the lessons and mistakes of the first survey and that the frequent

users would behave more naturally being accustomed to the presence of cameras and observers. The users of dining hall within the second survey were plotted every five minutes; the video recording was stopped every five minutes, then each user appearing to be sitting on a designated table was plotted on the plan of the dining facility. The aim was to understand the patterns of use and how the different tables were occupied by users within time.

Studying the resulting plotted data, it was clear that the use of the dining hall could be understood by dividing the patterns of use into three phases in relation to time and the congestion seen in the hall, those phases included the pre-peak, peak and post-peak periods. Each phase would show certain common aspects of use, this includes the preference of certain seat locations within the dining hall, the table choice mode, the number of users in general and the number of users sharing tables as well as differences in procedures to attain privacy and preserve own personal space.

In the pre-peak phase the use of the dining hall in general is stress free especially during the first stages of this phase, there is more empty tables than the number of users entering into the facility, the choice of table is based on own personal preferences, it was seen that in the early stage users would prefer to sit in the west south edge of the dining hall this may be due to the ease of access to this part as it is found closer to the cashiers, mainly priority was given for sitting at anchored tables; in choosing the anchored tables the high value tables found near the window were occupied first then came the wall and partition anchored tables. As the time passes more tend to sit in the other parts and at shared tables. As for the table choice mode, users at this phase whether individuals or in groups would try to place themselves at different tables trying to avoid sharing tables with others and picking the edges of tables mostly, single tables are preferred by small groups and single users prefer to sit on the bar like sittings especially those found near the window, as time gets closer to the peak time more would start sharing tables keeping the farthest possible distance from other groups by sitting at either edge of table, the tables near the window were almost full by the end of this phase indicating their preference over other tables as mentioned earlier (Fig.3-2-6).

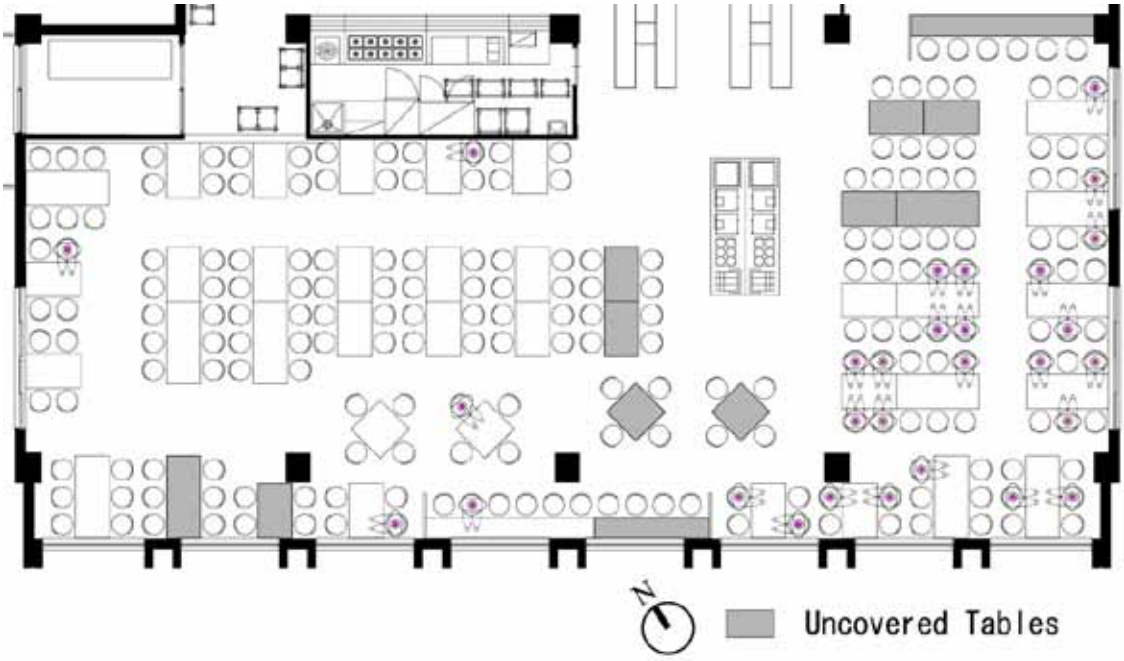


Fig. 3-2-6. The Pre-peak Phase as Seen in The Dining Hall at 11:35am, Forest Restaurant in Nagoya University

In the peak period the number of users in the dining hall in general increased, the users spread on almost all tables found in the hall, the table preference and table mode choice were more stress influenced, seek and hunt strategies were used and given priority over own preferences. Seek and hunt here means looking for empty seats then moving to occupy them, the first concern here is to find a place to sit and eat rather than other concerns. Sharing was noticed even on small size tables especially at 6 seat tables which were mostly shared by two groups at the same time. Proximity to others was tolerated especially on large shared tables and the bar like sittings mostly occupied by single users, although the extreme crowdedness forced some small size groups to use this type of tables as a demonstration of the seek and hunt strategy. Some large sized groups were seen to sit in the middle of table to keep potential users away, it is worth to mention here that even in the most crowded situation the shared tables were only fully occupied in several cases, and at any table there would be many empty seats. It was noticed that many groups respected the borders of small tables used to form the shared tables as being territorial markers that guarantee the integrity of their personal zones, users who sat adjacent to each other yet on different tables would express more comfort by gesture and posture (Fig.3-2-7).

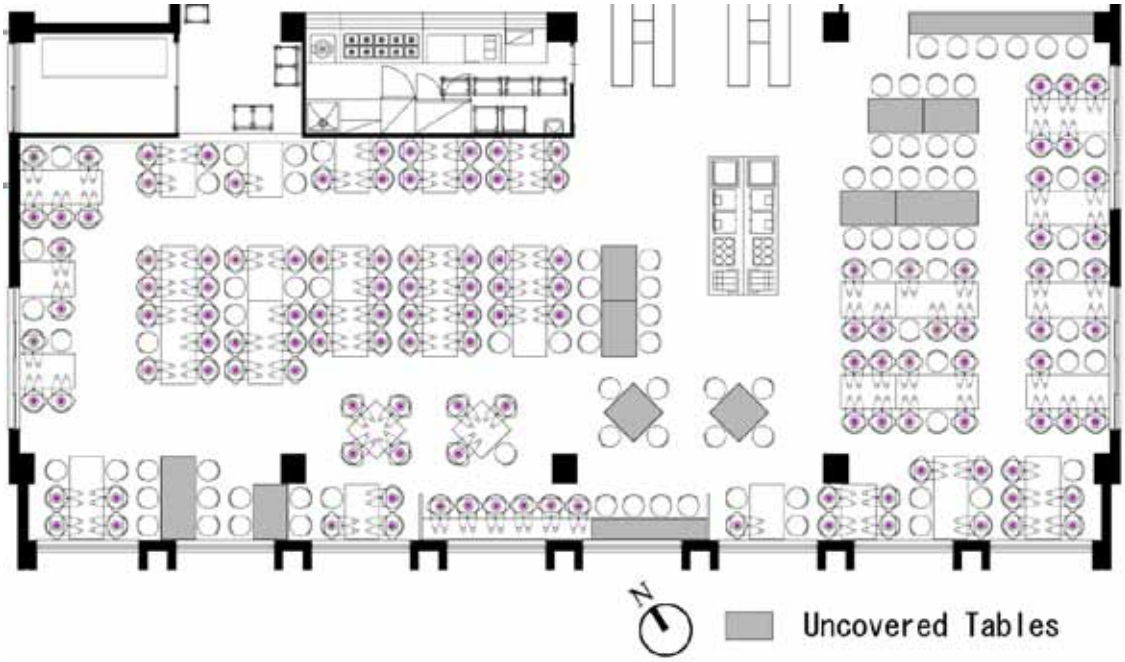


Fig.3-2-7. The Peak Phase as Seen in The Dining Hall at 12:35pm, Forest Restaurant in Nagoya University

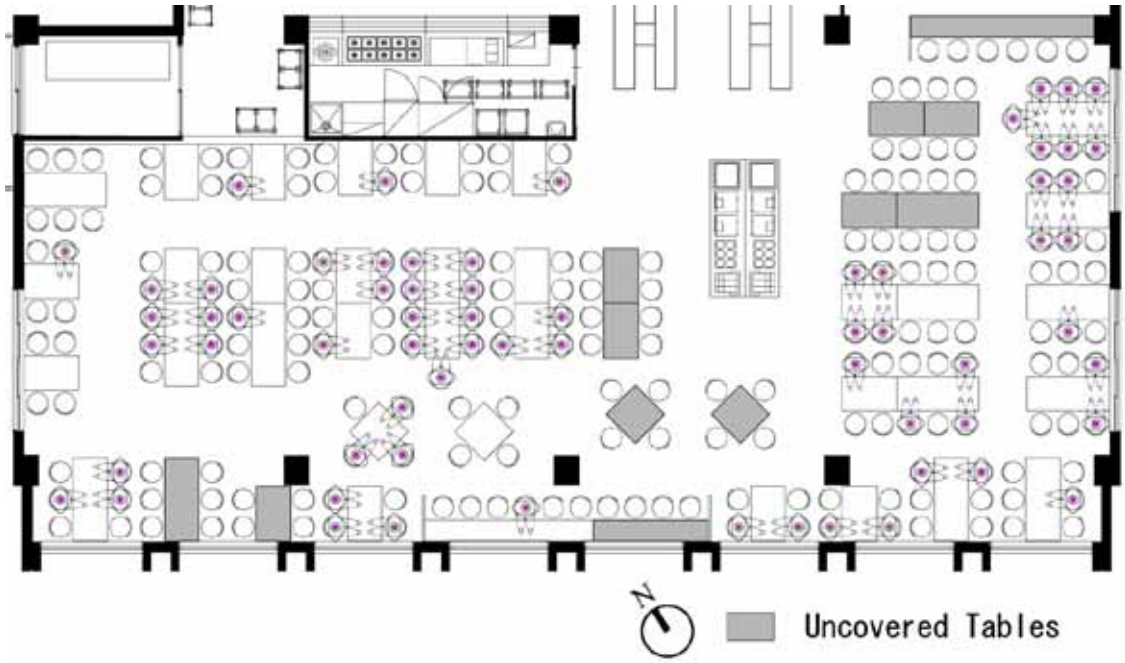


Fig.3-2-8. The Post-peak Phase as Seen in The Dining Hall at 1:15pm, Forest Restaurant in Nagoya University

In the post-peak phase, there were fewer students than the peak phase but generally more than the case of the pre-peak phase. More users were sitting on anchored tables, and students are still spreading on a large portion of the dining hall tables. As for table choice mode, there was a return to the stress free

table choice mode, tables were selected according to own preferences and to the perceived value of tables favoring anchored tables near windows. Groups of users were selecting different tables occupying either edge of table first. Users were seen to avoid sharing tables with others when possible; if such sharing happens then the different groups would place themselves on either edge of table away from each other or leave blank seats apart (Fig.3-2-8) (Khasawneh, F. A., Kato, A. & Taniguchi, G., 2012).

3.2.5 Prominent Activities

The Forest restaurant witnessed various patterns of use and activities besides eating, such activities support the notion of common place in the dining facilities; such facilities should be designed to support the actual observed behaviors and activities besides eating. Many activities as such were observed by analyzing the video recordings of the dining facility survey. Eating and lunch hour within the context of campus is thought of as being spontaneous meetings generation event. The university system is organized to provide break hours between the consecutive lectures and other formal learning procedures, users of the campus within time program their food breaks according to the pre-set academic schedules. The majority of users at lunch hour would be heading for the restaurant of their choice to have their meals, mostly they would be moving in groups with friends but sometimes due to schedule differences they go separately, without planning they bump into friends and take advantage of the occasion to engage in interactions. A female student as she moves to table spots a male friend, so she moves close to him and tends to use here umbrella to touch his shoulder several times to draw his attention, then as he sees her he moves tray to sit beside her and eat as a group (Photo.1, Fig.3-2-9).

The dining activity is seen by many campus users as a social event, meeting colleagues and friends is the main event while eating is seen as the sub activity. The issue is not just satisfying the basic need for food, users give the priority to dine in groups and follow many procedures to provide for this activity. A

group of six users moves to a 4 seat table, since the dining hall is crowded they move some empty chairs from the nearby tables to modify the capacity of table so it may accommodate the whole group. Here they preferred to dine as a group rather than splitting into two groups, this stresses the social nature of dining within the campus environment (Photo.2, Fig.3-2-9).

Photo.1. Drawing Attention of a Friend After a Spontaneous Meeting to Invite Him to The Adjacent Seat

Photo.2. Modifying Table Capacity Stressing The Social Nature of Dining

Photo.3. Reading While Waiting for Group Members

Photo.4. Hanging Out in The Dining Hall After Meal

Photo.5. Fruitful Meetings and Discussions in The Dining Hall

Photo.6. Habitual Dining Rituals

Fig.3-2-9. Activities and Patterns of Use Denoting Common Place in The Forest Restaurant, Nagoya University

Multiplicity of activity in dining facilities embodies the common place effect in its clearest demonstration; many users are seen to be engaged in a wide range of activities besides eating. Sometimes this might be done temporarily or for a long time especially after finishing the meal. A student sitting on an unanchored free table is seen to read a book as he sits waiting for his group

members, when they join him he puts the book away and starts the meal (Photo.3, Fig.3-2-9).

The dining place serves some times as a lounge, users would be sitting there enjoying a drink while interacting or holding an informal meeting with others. It is also used as a place to hang out without any particular purpose of sitting there other than passing the time especially after finishing the meal, a four user group is seen to stay for a long time after finishing their meal. The users show a high degree of freedom as they talk and seem to be planning future events, at a certain point in time one of the users seems to be reading a notebook or looking into an agenda. They were seen to use their mobiles frequently before leaving (Photo.4, Fig.3-2-9).

The dining hall in campus is used as a meeting place between students and faculty, prefixed meetings would be arranged, and many times the meal time is the most suitable due to the campus lectures system that provides for a meal break at noon. A professor arrives at dining hall with some papers and picks a 4 seat anchored table near the window, he is seen to put his tray on the table as he leaves for a while, he comes back followed by two female students who join him sitting on the opposite side of table, they eat and talk frequently, as the professor finishes his meal he pulls a pen and grips the papers and seems to be reading through them and writing some notes, he passes one of the papers to one of the students and points to certain comments, she looks at the papers and engages into more discussions. The professor continues reading another paper while the other student waits. After the meal they talk for a while then leave (Photo.5, Fig.3-2-9).

Dining facilities in an institutional organization such as the case in a university imply certain habitual dining rituals in relation to the meal time and eating habits, within time it becomes natural for certain groups of users to gather on a daily basis at almost the same time to dine together, as a part of this event they develop certain measures to make the event more interesting. The most prominent case was that related to a group of students dining together, as the group users finished eating they arranged all the empty trays and dining ware into one tray, the group then played the rock, paper and scissors game to see who would carry the trays to the empty tray drop area, after several rounds the looser expressed

disappointment as the group left and he had the task of moving the empty tray. Such events show how users make use of a habit to add an atmosphere of relaxation and enjoyment (Photo.6, Fig.3-2-9).

3.2.6 Structural Analysis

This phase of analysis tried to make use of the data collected in a more complete way. This additional analysis uses the data collected in the video survey which was conducted at Forest restaurant in Nagoya University campus on the 18th of May 2007, this process was motivated by the unique environment found at this dining facility. As mentioned before the video recording was done using three cameras, the coverage included most of the tables yet some tables were left out of the focus of this analysis since they were either out of the cameras shooting angle or obscured by physical barriers. The process of analysis was based on studying the tables covered by each camcorder; each table was given a code in reference to the camera that recorded the behaviors taking place on it, the codes aimed to provide a means of organization due to practical reasons. A table by table analysis was conducted recording relevant information on a pre-set log (Fig.3.2.10). Video recording was analyzed focusing on the following points:

i. ***The group formation of diners:*** this focused on group members' numbers, gender and the total number of users in general; the aim is to understand how the size of the group would affect the table mode choice and patterns of use.

ii. ***Table profile:*** mainly focusing on the concept of anchored and free tables; anchored tables are those tables found fixed beside an architectural element, in Forest restaurant there were window anchored tables and wall or partition anchored tables, while unanchored or free tables are those found freely in the space. Each table within the study area was given a code to ease tracking and retrieving related information from the collected data during the analysis phase.

iii. ***Activities:*** mainly concerning the total stay time, a distinction was made between the meal duration as being the time of food eating and interaction duration as being the sustained interaction (more than two minutes) between members of a group after finishing meal. The total duration of dining would be the sum of the previous periods. A group of primary assumptions were necessary here to make extracting relevant information possible; the beginning of the dining time was calculated based on the first member of a group to reach the table, the end of the meal is the time when half of the group would finish eating and this would be the start of interaction time if there is any. The end of the dining time would be when the last member of a group leaves table. A group is a formation of users who act in a unified way, gathering at the table and behaving as a unit.

iv. ***Patterns of diners:*** in terms of belonging to eat and go or eat and stay patterns. The users who stayed after finishing eating were considered to belong to the eat and stay pattern while those who left the table directly were considered to belong to eat and go pattern.

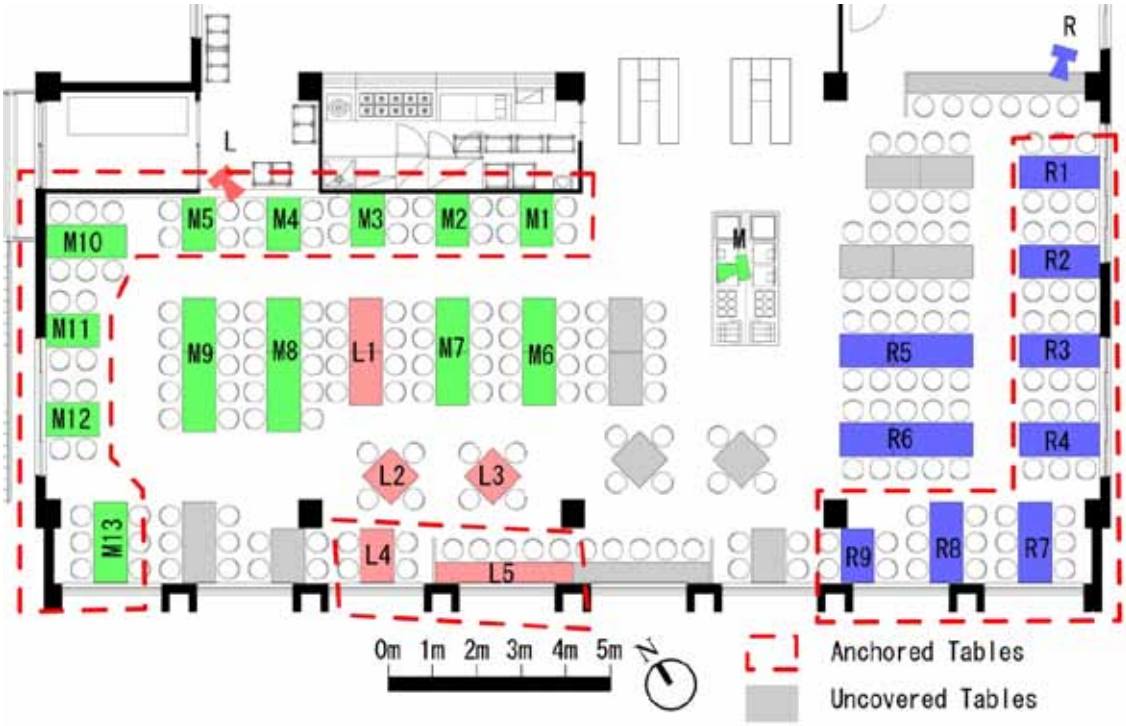


Fig.3-2-10. Tables Codes Used During Additional Analysis, Forest Restaurant in Nagoya University

The analysis was done for a period of two hours (11:30am-13:30pm). The total students number included in the study based on analysis results was 702 (forming 71.6% of those who entered assuming

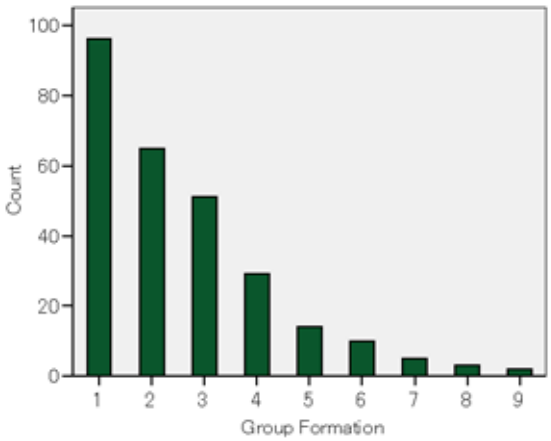
that all those who entered were among the students who were seated within the study period) distributed into 275 groups. The analysis covered (161) seats out of (214) forming 75.23% of the total seats available in the dining hall.

In relation to the groups observed to occupy the selected tables, the groups composed of three individuals formed the majority of users' numbers although such groups were ranked third in terms of group formation frequency. While groups of single users ranked first in terms of frequency yet it came fourth in terms of the total number of users. Generally small sized groups including single users formed the majority of diners while large sized groups were very few, this gives a clue to base the layout of the dining hall tables in terms of capacity and configuration. Based on this information it seems that the current table capacities in the Forest restaurant are appropriate, yet it should be noticed that since the two-user groups formed a considerable number of the users it should be modified to provide a better comfortable sitting for such users (Graph 1 & 2, Fig.3.2.11).

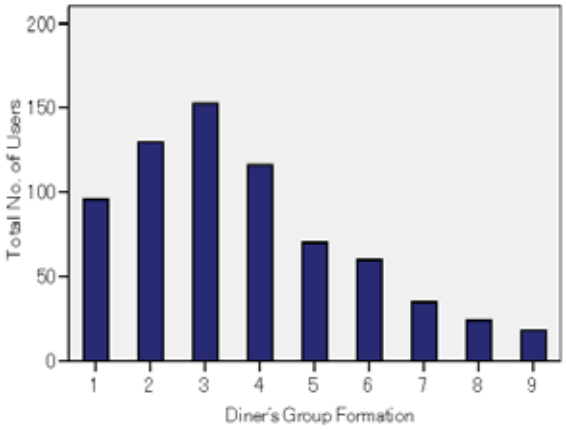
The groups' composition in terms of gender was studied, the male groups generally formed the majority of users groups, male groups formed 72.36% of the number of groups, and shared groups formed 18.55% and finally came the female groups forming only 9.09%. The small sized groups including single, two, three and four user groups as well as the seven-user groups were dominated by male users, while mixed users from both genders were mostly found in five, six, eight and nine-user groups (Graph 3, Fig.3.2.11).

Anchored tables had more Groups dining on them indicating their preference as can be seen, even eat and go groups who did not stay after meal chose anchored tables more (yet the table selection was important to them), this indicates the importance of providing such tables that provide its users a feeling of comfort since it helps them to control interactions with other groups, controlling their territory more easily catering for their needs of privacy necessary to engage in fruitful interactions. Also this may be considered to be a reflection of the current table layout where such tables form the majority among the dining hall tables. Furthermore the eat and stay pattern of eating was prominent indicating the use of

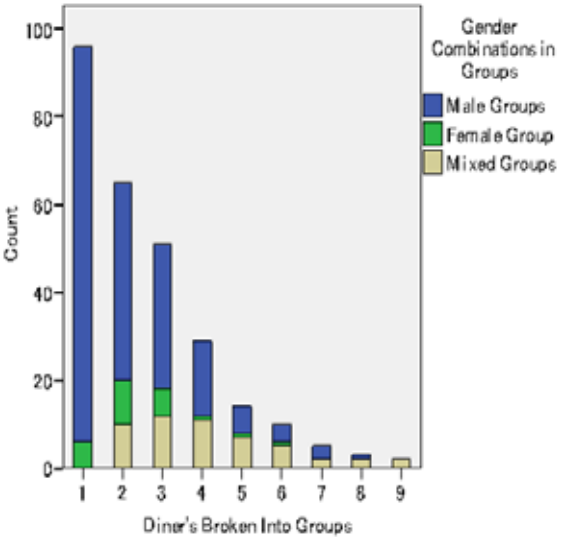
dinging facilities as a common place, most groups would tend to stay for a while after eating, this also stresses the importance of providing table layouts that make the users feel comfortable such as the case of anchored tables (Graph 4, Fig.3.2.11).



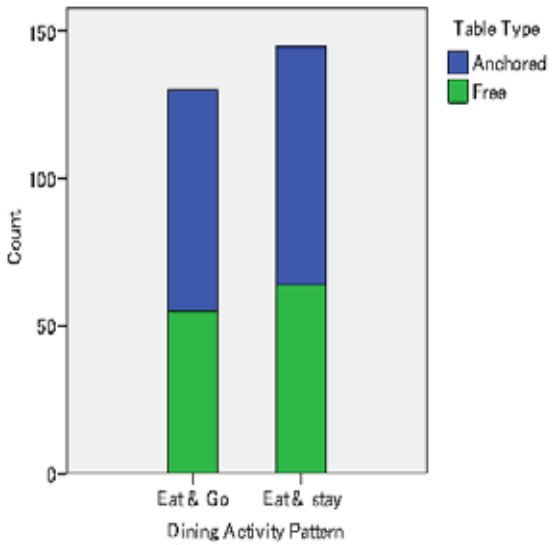
Graph.1. Frequency of Groups of Users



Graph.2. Diners Numbers Broken Into Groups



Graph.3. Frequency of Groups According to Gender



Graph.4. Groups of Users According to Dining Patterns and Table Type

Fig. 3-2-11. Profile of Dining Facility Users and Activity Patterns

More groups ranging in size from single users to five-user groups preferred to sit on anchored tables, this was mostly apparent for single users and two-user groups, single users mostly sat on bar like tables ate quickly and left giving space to more single users to select such a type of tables, while for the latter many two-user groups sat on four seat and six seat anchored tables denying other larger groups especially those of four-user and six-user groups to make use of such tables as intended by the dining

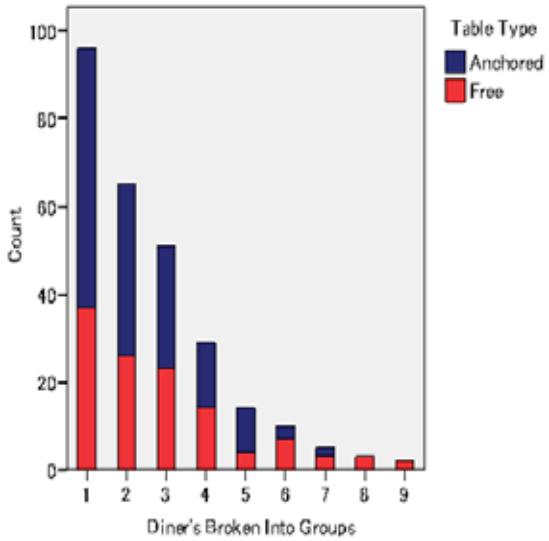
hall designers. The previous point can be supported by the fact that the differences in groups numbers selecting anchored or free tables decreased as the group size increased, in fact more six-user groups selected free tables although many six seat anchored tables were made especially to accommodate such groups, also it was noticed that for large sized groups more users chose free tables which corresponds to the nature of table sizes and layouts (Graph.1, Fig.3.2.12).

Generally all groups of users regardless of gender combinations preferred to sit on anchored tables, this may be related to the high value of such tables and the comfort it provides its users. Yet gender effect was somewhat clear especially for female groups; female groups chose anchored tables twice as much as choosing free tables. Also the difference of table type selection was noticed to be less apparent for mixed groups (Graph.2, Fig.3.2.12).

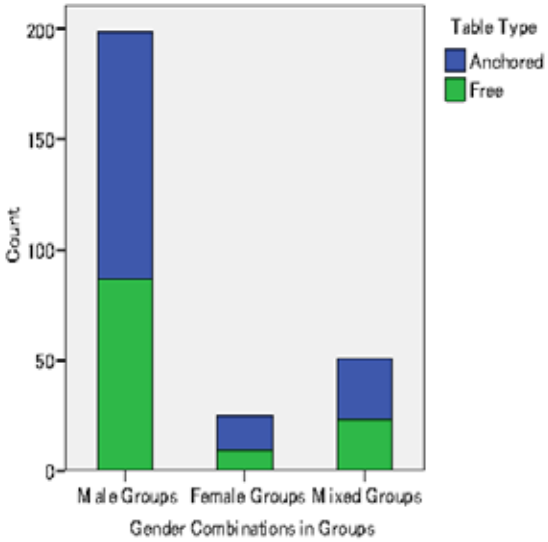
Eat and go pattern was more dominant in single users, most single users ate quickly and left, those who stayed mostly were passing time by looking frequently outside through the window using phone or just people watching after finishing the meal, this also supports the need to provide more specialized seats to accommodate single users. In all other groups the activity pattern was eat and stay, this was most noticed for two-user and three-user groups; for the first there should be a specialized table type to accommodate two-user groups, in the current table configurations two-user groups would be sitting more on four seat and six seat anchored tables, here especially for the first case such groups would be occupying the whole table driving other potential users away which is considered to be a waste of space especially at peak hours where any empty seat is important (Graph.3, Fig.3.2.12).

In relation to activity patterns, most of male groups belonged to the eat and go pattern, in fact eat and go male groups were one and a half times as much as eat and stay male groups, this may be attributed to the fact that most diners were males and many of these were single users who dined alone. Female groups mostly belonged to eat and stay pattern, more female groups stayed after meal and engaged in interactions, almost twice as much as those who belonged to eat and go pattern. The most prominent issue here was that the majority of mixed groups belonged to the eat and stay pattern, this

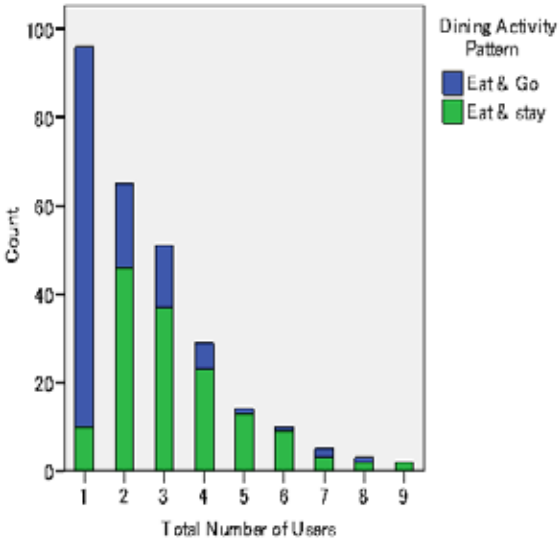
may lead to the assumption that groups containing females tend more to stay after meal to interact (Graph.4, Fig.3.2.12).



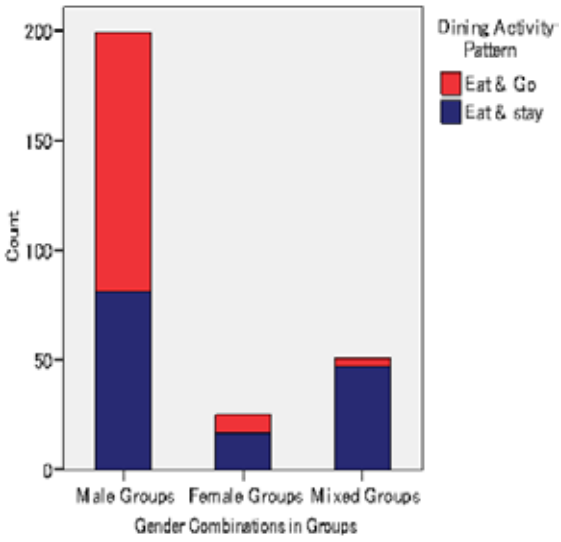
Graph.1. Frequency of Diners Groups in Relevance to Selected Type of Table



Graph.2. Relationship of Groups' Gender to Table Type Selection



Graph.3. Frequency of Diners Groups in Relevance to Dining Activity Pattern

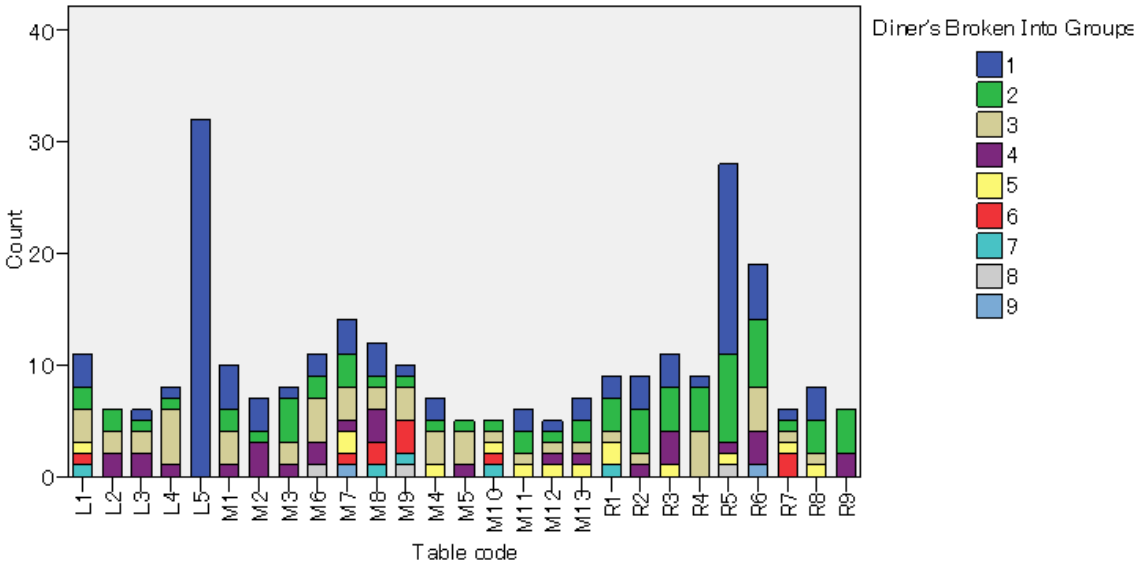


Graph.4. Relationship of Groups' Gender to Dining Activity Pattern

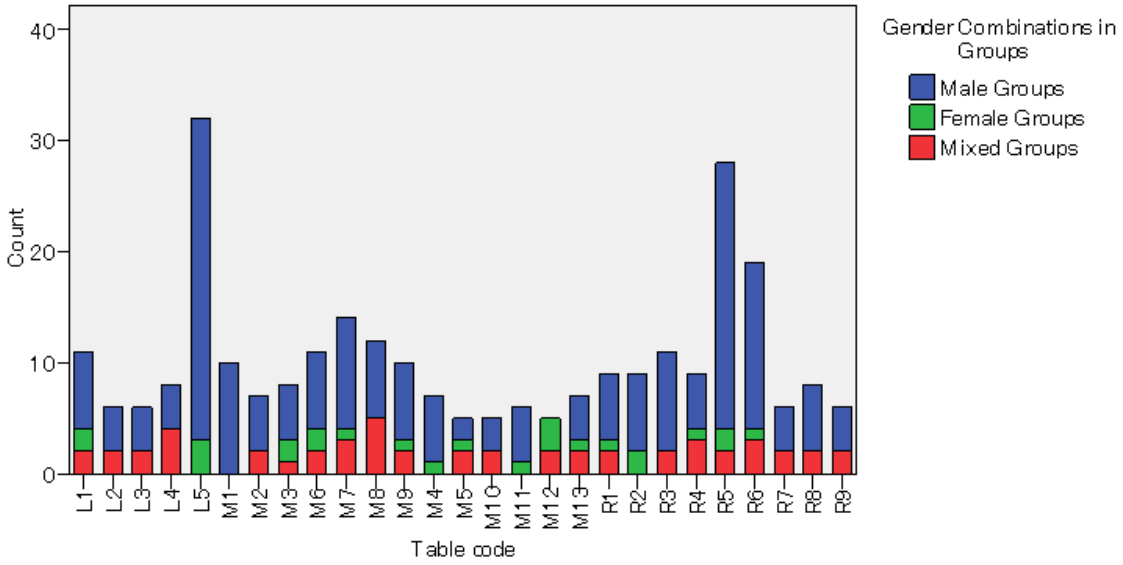
Fig. 3-2-12. Table Type Selection and Pattern of Use

Some tables were used more extensively than others, the bar like table (L5) came first in terms of frequency of use by diners, yet it was mostly occupied by single users. Table R5 came second in terms of frequency of use, here a wide range of groups used this table; the majority was formed by single users and two-user groups, then came four-user and five-user groups followed by eight-user groups, although this table was intended to serve large groups its pattern of use shows its preference by smaller groups,

this may be related to its proximity to the cashier and drinks corner, users would be looking its way first if they spot a vacant place they would occupy it especially in peak hour (Graph.1, Fig.3.2.13).



Graph.1. Groups of Diners Distribution on Dining Hall Tables



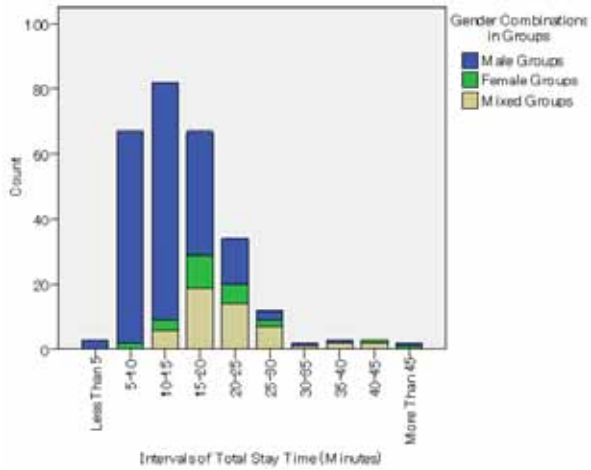
Graph.2. Groups of Diners Distribution on Dining Hall Tables According to Gender

Fig. 3-2-13. Tables Users Profile According to Groups Size and Gender

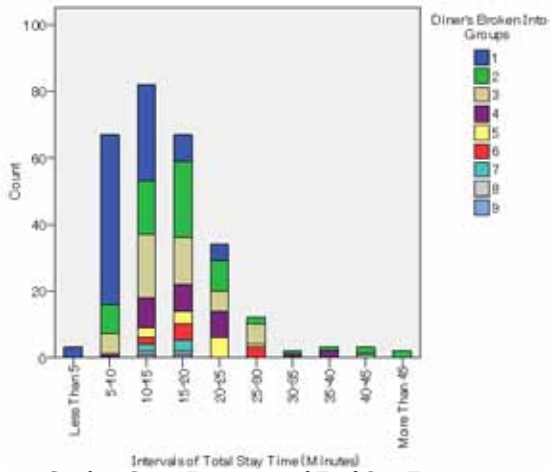
Generally all tables had more male groups using them except for table M12 which was never used by male groups yet it was used by female groups forming the majority of its users followed by mixed groups. On the other hand, many tables were never used by female or mixed groups, although no clear pattern was noticed in relation to groups distribution of tables taking the gender formation into account,

yet the differences in numbers of groups distribution in relation to gender formation may be attributed to the differences in users number; as males form the majority there would be more male users picking tables whether in purely male groups or in mixed groups (Graph.2, Fig.3.2.13).

Male groups generally tend to stay less time compared to female and mixed groups; the majority of male groups stayed 10-15 minutes, while female groups and mixed groups stayed 15-20 minutes, this is related to the groups formation effect as users in female groups tend to talk more while eating leading to a longer time to finish the meal besides staying more to interact after the end of meal, on the other hand most male users tend to interact less while eating and many do not interact at all. The groups which stayed 25-30 minutes were mostly mixed groups, also mixed groups dominated most of the long stay periods, this may be related to the gender differences between group members in terms of talking while eating, in such groups all group members who finished eating would engage in interactions until the last member finishes eating and this is affected by the going on interactions (Graph.1, Fig.3.2.14).



Graph.1. Gender of Groups and Total Stay Time



Graph.2. Group Formation and Total Stay Time

Fig. 3-2-14. Total Stay Time Affected by Group Number and Gender

As for the effect of group members' number, it was seen that two-user groups dominate other groups in terms of total stay time especially for more than 45minutes, yet most of two-user groups stayed 15-20 minutes. More single users stayed 5-10 minutes; single users mostly tend to belong to eat and go activity pattern, while two-user groups would be eat and stay, such groups tend to stay more as in many cases; they consider dining to be a social event especially in the case of couples who tend to stay far more than

two-user groups (Graph.2, Fig.3.2.14).

3.2.7 Small Group Ecology

This phase of analysis tried to make use of the data collected during the Forest restaurant survey of the 18th of May. This additional analysis uses knowledge based on small group ecology according to Sommer (1969) to analyze the behaviors of groups of users observed within the dining hall. The aim is to understand the mechanisms and dynamics of users behaviors while selecting seats and interacting with the physical and social qualities and other users. The study divided the groups of users into: single users, two-user, three-users, four-user, five-user and more than five users groups as a means to ease the task of analysis, each group of users was tracked and studied in relation to the available table layout recording and illustrating the important happenings as will be discussed in the following paragraphs. Only three examples will be shown.

Single users avoided sitting directly across other single users, while proximity to the side was accepted in crowded conditions. In one case a single user had no choice but to sit across other users as the other side was fully occupied, he chose a seat in front of a two-user group avoiding sitting across other single users (Fig.3.2.15).

Users would try to keep their personal zone intact and react to any invasion. A single user was sitting on a 4-seat table, his position on an external seat conveyed his desire to control table and keep intruders away. Due to crowded conditions, a two-user group decided to share table with him. A female user sat on the seat beside the single user and moved her seat towards him, she seemed as if she was trying to force him to leave table. The single user’s posture and gesture and moving his seat to the edge of table showed his annoyance and discomfort; he finished quickly and left (Fig.3.2.16).

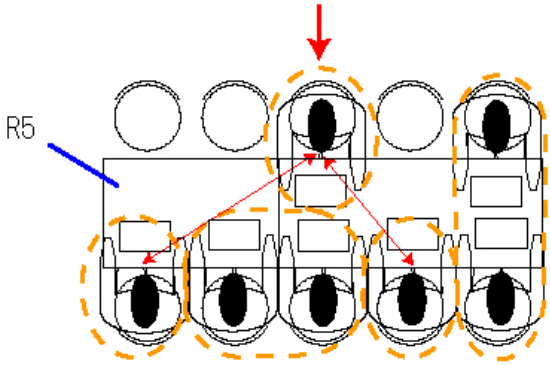


Fig.3-2-15. Avoiding Sitting Across Others Unless There is No Other Alternative

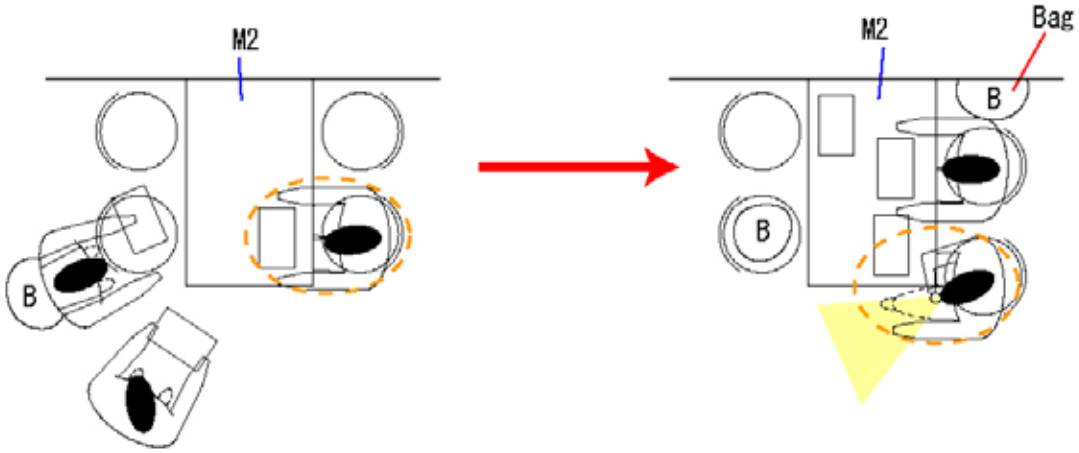


Fig.3-2-16.A Single User Territory Invasion and Reaction

Competing for empty tables was noticed, although it was not an aggressive competition. Two female students were standing at peak time waiting for a table to be empty, they seemed to be waiting for a specific table near the window to be vacant, but as they saw a table becoming vacant at the other side near the internal wall, they rushed quickly towards the table, one female led the way followed by her colleague. Another male student spotted the same table and rushed to it from the other side but he turned away laughing as he was beaten by the other female group who reached table and quickly sat on internal

seats putting their bags on empty external seats to drive other potential users away (Fig.3.2.17).

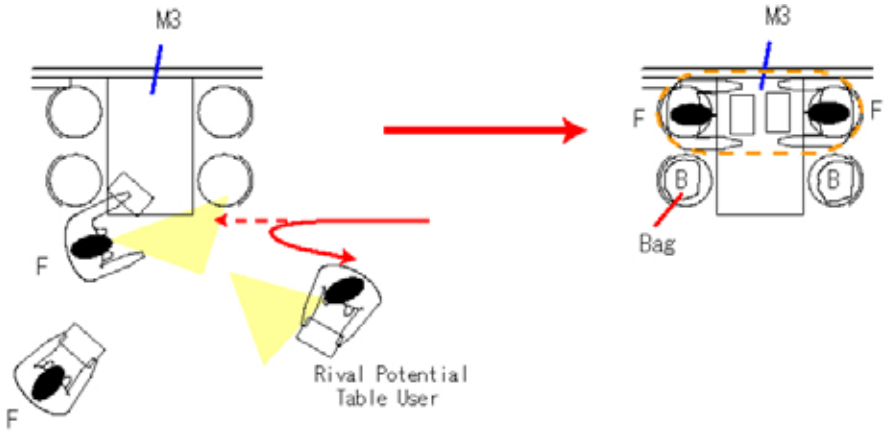


Fig.3-2-17. Competing for Empty Table in Peak Time

3.2.8 Conclusion

The Forest restaurant is considered to be a unique dining facility; this stems from the fact that it focuses on the multiplicity of table layouts, its unique physical features and high quality environment. The survey revealed that this facility faces a problem of congestion, during the survey conducted on the 18th of May it served more than four times as much as its capacity, nevertheless it was observed that many activities of its frequent users denoted common place, to reinforce the notion of common place a solution should be sought to ease congestion, one of the possible solutions is to make the meal block time more flexible providing the users more freedom in selecting the dining time that suits their own schedule.

Through analysis the layout of dining facility proved to be successful, the anchored tables' preference by different users regardless of gender showed that all dining facilities should try to design its layouts to include the largest possible alternatives of anchored tables. As observed the two-user groups formed the majority of users, to make more effective use of the tables' current configurations it should

be modified to include a reasonable number of two seat tables. The analysis of users based on small group ecology revealed many important issues concerning the patterns of use of certain tables in relation to group size and in relation to other groups. It also showed how the environment of the dining hall affected its users and provided them with comfort or stress in respect to time.

3.3 SUMMARY

This chapter tried to show that learning and particularly informal learning can happen anywhere in campus even in outdoors and in dining facilities. Two case studies were given. The first was a study of outdoor common place in Toyohashi University of Technology (TUT) and the second was a study of dining facilities common place in Forest restaurant in Nagoya University. The methodology of survey was based on using time-lapse photography and video recording to capture the behaviors of outdoor place users and diners; the aim was to study the patterns of use and activities in relation to place making qualities. Learning activities were emphasized.

The outdoor common place in TUT was selected since it has a unique central pedestrian mall which serves as an outdoor common place. The survey was held in April 2006, it showed that block C was the most used place compared to other spaces, followed by blocks A and B. Yet Block A was seen to have more dense activity spots and a wider range of activities due to its unique features, including its location and proximity to the main lecture hall, its overwhelming greenery and others. It was noticed that students were sitting on the ground and showing more freedom of action since they considered this space to be theirs. It showed the importance of many elements including the location of the outdoor place, the availability of greenery and other natural elements, having many seating alternatives as well as the importance of having a major students' attraction near any common place represented mainly by

food facilities.

Forest restaurant is a unique place, the surveys were held on the 17th and 18th of May 2007. The cameras positions covered 75.23% of the number of seats which is (214), this enabled further analysis to be conducted including more structural analysis and small group ecology based analysis of users' behaviors. Those who used the facility on the 18th of May were (942) users, the restaurant served more than four times as its capacity during the two hours survey. Here the layout of dining facility stresses the multiplicity of choices, the plotted data showed that during the pre-peak phase, users choices were stress free, they preferred to sit in the west-south edge due to the ease of access, also priority was given for anchored tables near windows, users sat on different empty tables if possible and avoided sharing tables with others. In the peak phase, seek and hunt strategy and sharing tables with others seemed to be the norm, even on small sized tables, proximity was tolerated yet tables were not fully occupied. In post-peak phase, more relaxed choices were seen; users go back to selecting different tables and if sharing happens they place themselves on either edge of table. The behaviors denoting common place included conducting many activities besides eating, using the dining hall as a place to hang out, or to conduct informal meetings with professors and friends, also many habitual rituals for dining stressed the notion of considering the dining activity to be a social event. Analysis of Forest restaurant based on small group ecology was based on studying the tables covered by cameras focusing on groups behaviors and formation, for example it was noticed for single users who are forced to share tables with others, that they would avoid sitting directly across other single users, in one case the user sat in front of a two-user group to avoid this situation.

Understanding both case studies helps better to predict the potential behaviors of users of space and offer a means to provide a more effective common place that takes the basic needs of its users into account leading to innovation. Effective common place design increases chances of informal learning behaviors to occur all around campus.

CHAPTER FOUR 4

LEARNING COMMONS AS THE ESSENCE OF EMERGING HYBRID LIBRARIES

Since the 1990s the introduction of Information Commons (IC) and later the Learning Commons (LC) into libraries has renovated the library to be a learning space. This brought about major changes into library planning and design. Within the context of Japan, this chapter tries to understand the main physical components of a learning commons, prominent students learning behaviors and patterns of space use. The findings of three case studies will be shown; the first is a study of Nagoya University main library learning commons, this learning commons was the first learning commons to be opened in a national university in Japan. The second case is the study of Osaka University main library learning commons, which was carried out as part of renovation of library to make it earthquake resistant. The third is the study of Mie University experimental learning commons "Group Study Room", this room was designed based on the feedback of the first case study and as a stepping stone to test ideas and inform the design of a new learning commons in Mie University in the future.

4.1 CASE STUDY 1: NAGOYA UNIVERSITY LEARNING COMMONS

4.1.1 Introduction and Basic Data

The central library learning commons in Nagoya University Higashiyama campus was selected as a case study, because it was the first learning commons to be introduced in a national university in Japan

(Table.4-1-1). The main floor was renovated into a learning commons during a two year plan that focused on creating two main areas: a group study area and a learning area. The group study area, which is located mainly in the southern part of library, was installed in 2008, while the learning area and related support services were opened on the 31st of December 2009 (Fig.4-1-1 & Fig.4-1-2).

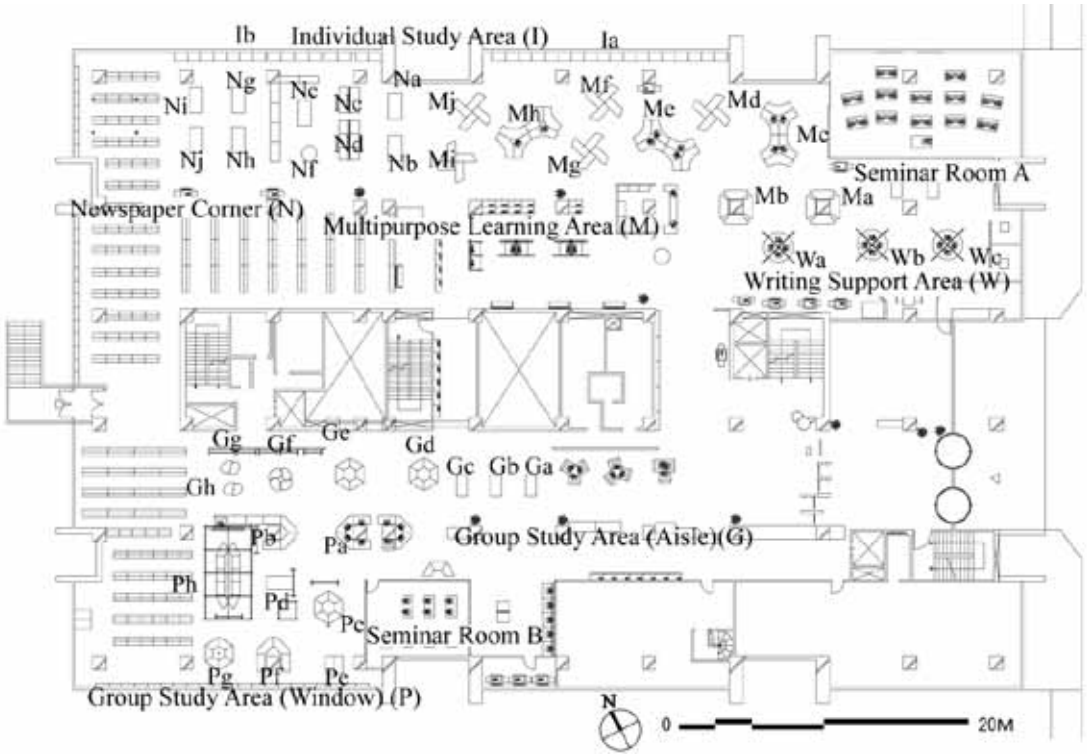


Fig.4-1-1. The Central Library Learning Commons, Nagoya University Higashiyama Campus

Table.4-1-1. Facts About Nagoya University Central Library

Completion year	1981 (Extension 1994)
Building Area (m^2)	5,507
Total Floor Area (m^2)	15,577
No. of Stories	5 Stories + a Basement
Structure	RC Building
Annual New Titles Purchased	16,672 Copies
No. of Seats	1,880 Seats
Collection No.	1,078,948 Books
Annual No. of Visitors	710,463

A. The Group Study Area

B. The Learning Area

Fig.4-1-2. Main Areas in The Learning Commons, Nagoya University

The philosophy behind the development of the commons was that the university wanted to implement an integrated environment that merges human resources, Information Technology (IT) and a variety of printed and digital resources. Such a vision was adopted in 2008 with an aim to meet the diverse student learning objectives and learning styles. The focus was to stimulate the creation of qualified students that are IT proficient, talented and innovative.

The learning commons would provide the following support services through qualified staff and in cooperation with other departments on campus:

i. ***IT support***: trouble shooting problems in relation to PC usage, networking and printing.
ii. ***Learning support***: research tips, clues and help for students and faculty support services.
iii. ***Writing support***: technical tips on academic writing skills.
iv. ***Peer (tutor) support***: covering a wide range of topics including student academic life or selected university courses.

4.1.2 Methodology and Purpose

The main objectives of this study are two-fold; firstly, it tries to shed light on the application of the learning commons concept in the context of Japanese academic libraries, where the prominent physical

features are highlighted with reference to the service philosophy adopted and major characteristics of space. The second goal is to tackle the actual patterns of learning commons use with particular focus on users learning behaviors, space occupation and interactions. As a methodology, behavioral mapping was used to collect data.

A survey was conducted over two consecutive days on the 20th and 21st of January 2010, covering an interval of seven hours from 12:00-19:00. Data analysis focused on the intervals between 15:00-18:00, which witnessed the densest use of the learning commons. Behavioral mapping was used in 15 minute sessions with 5 minute breaks to collect data regarding where (location of activity), who (person male –female), and what (activity and tools used). Each table area was later given a code to ease analysis of data. Four mapping techniques were used to collect data covering the following aspects:

i. ***Activity type***: location, type of activity and tools used.
ii. ***Duration of action***: time spent on each task and seat occupation rate.
iii. ***Movement spines***: users route selection and frequency.
iv. ***Communication***: parties involved, frequency and prominent locations of interaction points.

4.1.3 Learning Space Use

4.1.3.1 Movement Spines

Having two zones separated by a service core influenced the choice of routes; the multipurpose learning area and the newspaper corner had more dense movement as more visitors went toward the northern part of the learning commons. Two major longitudinal movement spines were observed; the most congested was in the learning area, and another vertical spine was noticed leading from the main

entrance to the northern part of the learning commons (Fig.4-1- 3). The users tended to use spaces closer to these spines if available. The line of sight is obscured by the service core, which leads to visual separation between the main two parts of the learning commons, yet within each area different components of space are in view, which easily provides chances for spontaneous meetings of users.

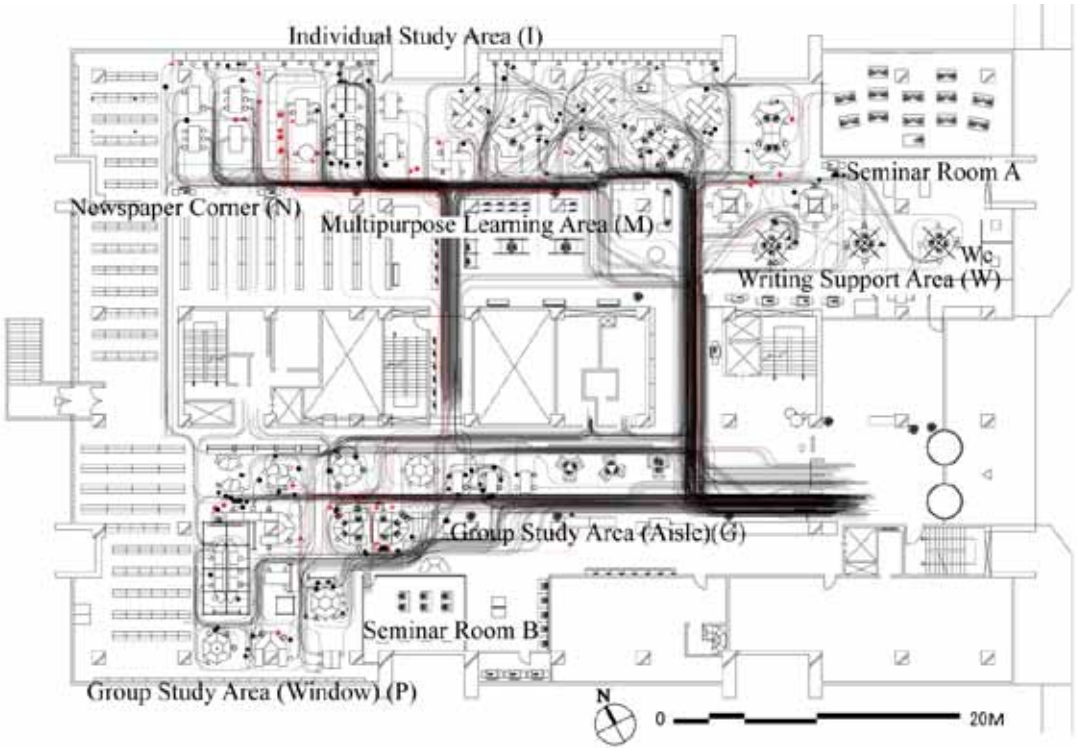


Fig.4-1-3. Cumulative Users Routes Choice and Movement Spines, Nagoya University

4.1.3.2 Seat Occupation Ratio

The overall seat occupancy ratio within time was 66%, which indicates consistent use of the learning commons facilities. Many tables in the writing support area, such as Wa, were continuously occupied by users to yield an occupation ratio close to 100%; this may be attributed to the proximity of this table to the movement spine and support counter besides the nature of tasks performed here. While other tables, especially in the newspaper corner, such as Nc, Nh and Ni had a seat occupancy ratio of less than 50%;

here this corner had many visitors that mostly stayed for short periods.

4.1.3.3 Table Occupation Duration

The table occupation duration varied widely according to the task performed and tools used within the different parts of the learning commons and even within the same area, for instance some tables in the group study area were occupied for longer time while others were occupied for shorter continuous time (Fig.4-1-4).

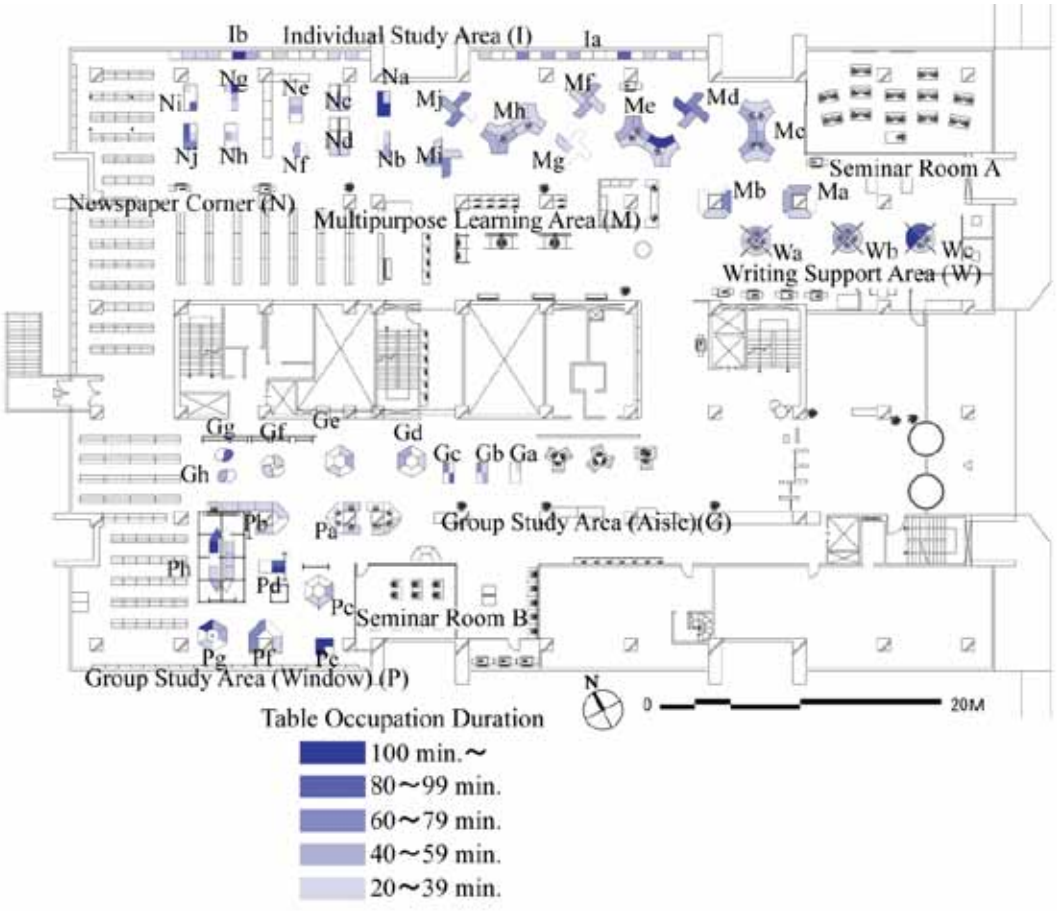


Fig.4-1-4. Table Occupation Duration, Nagoya University Learning Commons

The minimum table occupation duration was 20 minutes, taking into consideration the growing popularity of the commons in Nagoya University this means that some kind of waiting would happen if

students find the tables to be occupied, this also calls for renovating other parts of library to accommodate more users and also creating a lounge or a social area to afford for informal learning activities besides waiting.

Tables in the writing support area had relatively longer table occupation duration especially table Wc. Users here would use desktop PCs to manipulate collected data and transform it into a presentable form, they would get feedback or tips from tutors then spend more time to apply such tips to enhance their papers or power point presentations which consumes more time. Tables that witnessed presentation rehearsals in the group study area like table Pd had long occupation duration, as users would do such rehearsals then get feedback from other group members or engage in long discussions. While table Pa that provided desktop PCs had relatively short table occupation duration, as most users used PCs briefly and then left to go to other parts of the learning commons

4.1.3.4 Table Turnover

The table turnover in all parts of the learning commons was generally low (Fig.4-1-5); many users occupied tables for longer time which reflects a strong comeback of library users after a period of decline in terms of library facilities use. This corresponds to the philosophy of creating such a facility and indicates its success in attracting users and providing appropriate services, environment and table layouts, enabling them to complete most of their learning tasks without leaving the library, this success would require further development of other floors in the library to cope with high students usage rates that is expected to increase in the future. Tables in the individual study area and writing support area had low turnover, while others in the multipurpose area had high turnover, particularly those tables supplied with PCs that mostly attracted users who worked individually with minimal collaborations if any.

In the group study area two patterns of table turnover were seen: first tables that witnessed group

collaboration or presentation rehearsals witnessed low table turnover; users occupied tables for longer time especially for tables Gd and Pd. Collaboration was composed of periods of desk work or computer work interrupted by communication, such a pattern consumes time and elongates the stay time of users which leads to low table turnover. Second tables that provided desktop PCs like table Pa had high table turnover; reflecting that many users stopped by the PCs only to check on their emails or to perform quick search tasks and then moved quickly to other parts of the facility.

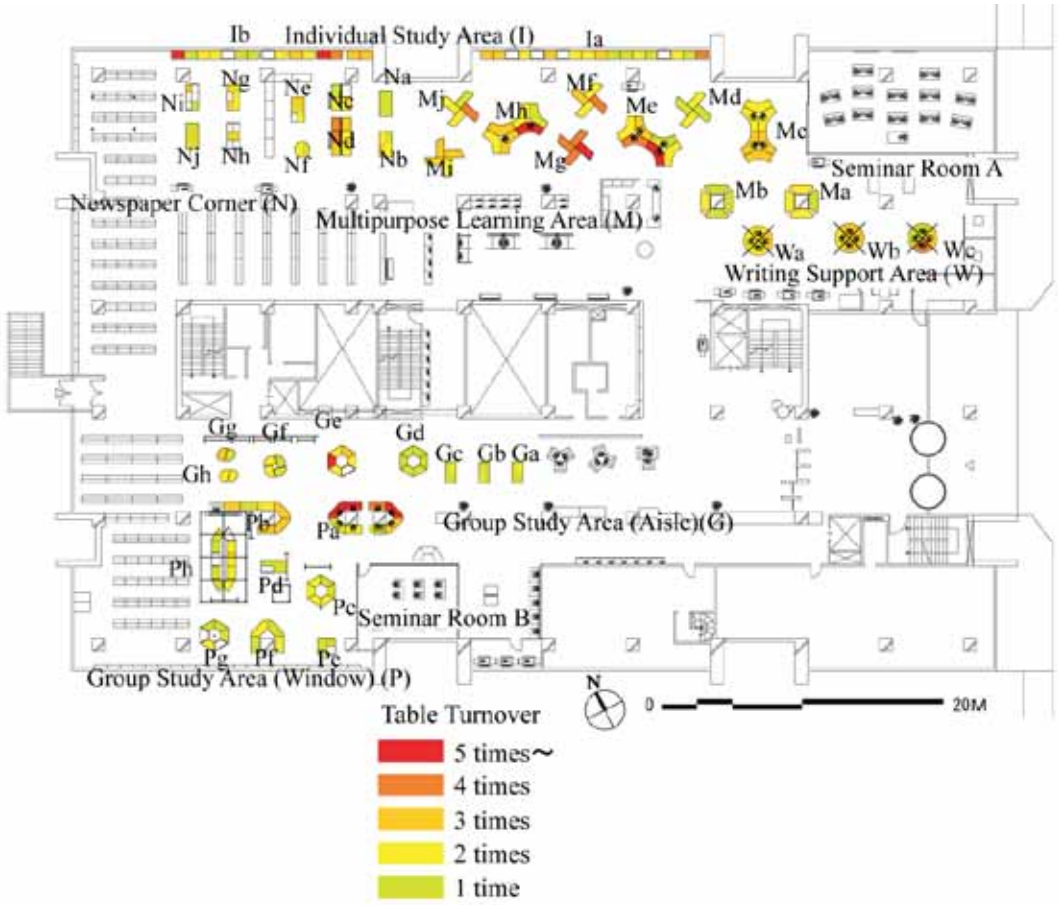


Fig.4-1-5. Table Turnover, Nagoya University Learning Commons

Providing a screen that gives information about empty tables or occupied ones besides showing whether such tables are supplied with PCs near the main entrance to the learning commons would facilitate things for students as they can know where to go rather than walking around the space to look for empty tables that may not be available, although this trip in the commons might be useful as they might end up meeting other students and eventually engage in spontaneous interactions and informal

learning activities.

4.1.4 Learning Behaviors

4.1.4.1 Users Activities

A wide range of activities were noted (Fig.4-1-6). The group study areas had a high percentage of communication and learning activities, especially table Gd, which had around 50% communication compared to other activities. Table Ph, which provides a seminar-like Configuration, and tables Pc and Pd that provide whiteboards, witnessed presentation rehearsals. Tables found in the multipurpose learning area, such as Mc and Mh, and tables including Wa and Wc in the writing support area were used in collaborative computer work.

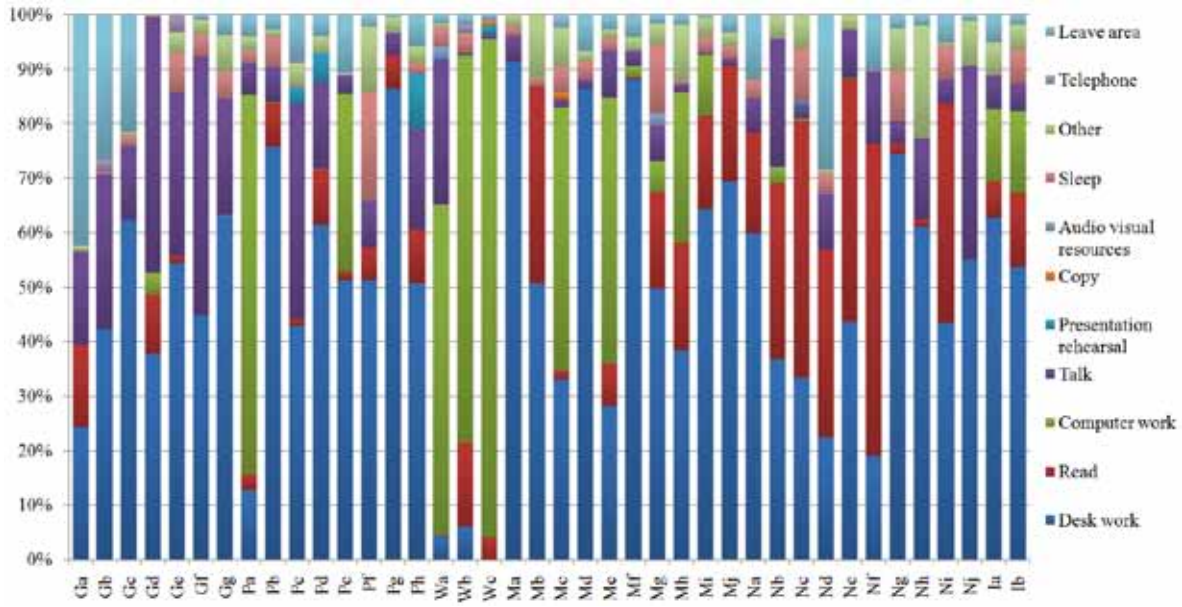


Fig.4-1-6. Users Activities By Table, Nagoya University Learning Commons

Two users were frequently noticed sharing the same section of table using the PC and debating in a productive manner. It is noteworthy that tables supplied with desktop PCs, such as Pa, Wa, Wb, Mc, Me,

and Mh, witnessed excessive computer assisted work, although many users also used books and laptop PCs. The writing support area tables had generally more PC work activities with lower rates of desk work, while the multipurpose learning area witnessed a combination of computer work, reading, and desk work more frequently; here computer work was more prevalent on tables provided with desktop PCs (Khasawneh, F. A., Shibayama, Y., Kato, A., Mori, S. & Taniguchi, G., 2011).

Communication and talking were more frequent in the group study areas, due to the table layouts, proximity of users and continuous uninterrupted eye lines. Studying is a series of activities and breaks, where a few moments are taken to refresh; therefore, provision of snacks and drinks in a café with nearby lounges are recommended to create a more relaxed atmosphere.

The multipurpose learning area (Me-Mj) had less conversation and a higher percentage of learning activities assisted by reading, computer work and desk work. Users made use of the available work space by spreading their belongings and books all over the desks.

In the newspaper corner (Na-Nj), the dominant activity was reading and desk work, with the latter slightly prevalent. Talking was noticed, although it was a less dominant activity compared with the group study area, which witnessed lengthy conversations more frequently. Many visitors to the north area went to the newspaper corner to read magazines and newspapers for a while, after which some would leave to go to other learning commons sections, while many would leave the library, which suggests the need for a refresh space.

4.1.4.2 Tools Usage

The Group study area showed a mixture of tools usage compared to other areas. The use of laptop PCs was highest in the individual study area, where users would work for long hours while using books, papers and laptop PCs in a concentrated manner to produce reports or similar tasks. Book usage was

noted in all areas with similar percentage except for the tutor dependent writing support area (Fig.4-1-7). This shows the success of the facility to create a balance of PC and printed materials use as promoted by learning commons service models.

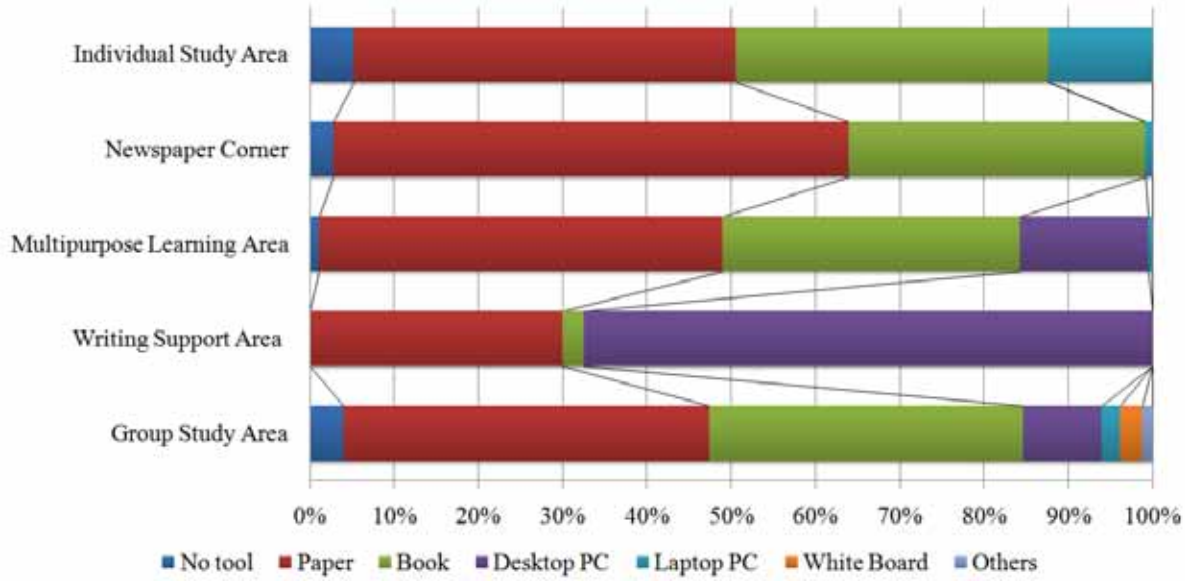


Fig.4-1-7. Tool Usage, Nagoya University Learning Commons

4.1.4.3 Communication Patterns

The library was known to be a quiet place, yet as the learning commons emerged, such spaces became lively places customized for socializing and interaction to facilitate learning. This facility attempted to provide a balance between quiet study areas and other spaces with accepted levels of noise.

The highest rate of communication between users was generally observed in the group study area (aisle) including tables (Ga, Gb, Gc, Gd, Ge, Gf, Gg) followed by the group study area (window) including tables (Pc, Pd, Ph), the writing support area such as table (Wa), and newspaper corner including tables (Nb, Nd, Ne, Nf, Nh, Nj). This shows that the group study area was successful in attracting groups of users who made use of this environment that facilitates collaboration by providing

appropriate table sizes and configurations with continuous lines of sight; in particular tables Gd and Gf provided a 1:1 ratio of work to communication, which indicates the constructive nature of communication that provides for collaboration. Conversely, the multipurpose learning area including tables (Ma, Mb, Mc, Md, Mf, Mh, Mi, Mj) was less successful in terms of facilitating collaboration with reasonable intervals of communication, which indicates that this configuration hinders collaboration and attracts mostly users that complete their tasks individually.

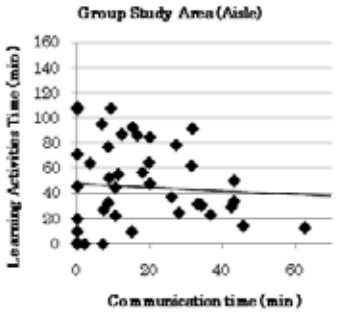
Less time was spent talking compared to being engaged in other activities (Table.4-1-2). For the group study area (aisle) including tables (Gel-Gh, Pa, Pb), the users of this area had the highest average of communication (17.5 min) and the lowest average learning activity time. Users tend to work and have longer conversations frequently as required during a collaboration process that requires participation of all parties, which results in shorter continuous learning activity times and more time dedicated to communication to ensure smooth performance. This may also be attributed to the nature of the table layouts in this zone, which is sociopetal to enable more eye contact to enhance and encourage communication (Khasawneh, F. A., Kato, A. & Mori, S., 2012).

Table.4-1-2. Average Communication and Learning Activity Time by Zone, Nagoya University Learning Commons

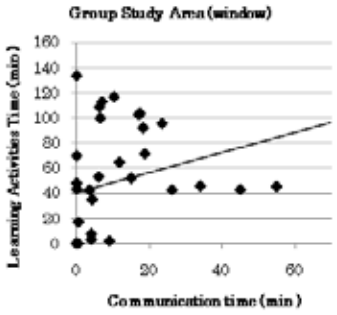
Zone	Average Communication Time (min)	Average Learning Activity Time (min)
Group Study Area (Aisle)	17.5	47.8
Group Study Area (Window)	12.7	61.2
Writing Support Area	11.9	101.8
Multipurpose Learning Area	3.5	96.1
Newspaper Corner	12.9	61.7
Individual Study Area	4.1	59.6

The group study area (window) including tables (Pc-Ph) had an average communication time of 12.7 min and an average learning activity time of 61.2 min. Compared to the group study area (aisle), this area had less communication and longer learning activity times, which may be attributed to the staging of several presentation rehearsals where users would listen to a presentation and then provide some comments, an activity that was considered to be a learning activity. Therefore, many users had long

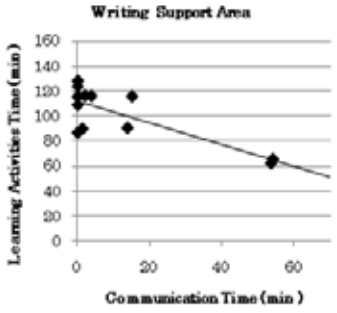
working times and less communication times, while others had long communication times and less learning activity time (Fig.4-1-8).



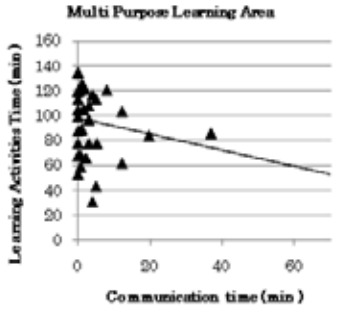
A. Group Study Area (Aisle)



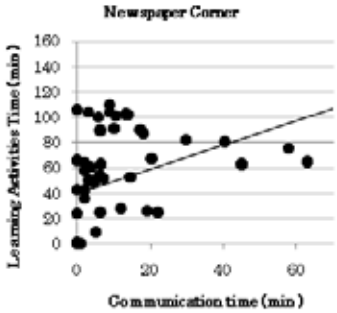
B. Group Study Area (Window)



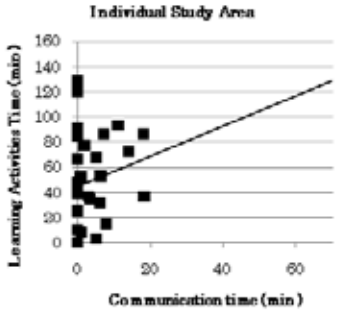
C. Writing Support Area



D. Multipurpose Learning Area



E. Newspaper Corner



F. Individual Study Area

Fig.4-1-8. Relationship Between Learning Activities and Communication Duration , Nagoya University Learning Commons

The writing support area including tables (Wa-Wc) had moderate communication time of 11.9 min and the longest average learning activity time, which corresponds to the nature of the area task; users would obtain brief advice and spend more time applying the advice and preparing papers or presentations. This area was preferred by those who wanted to use a PC to finish their concentrated work, which lead to lower seat turnover.

The multipurpose learning area including tables (Ma-Mj) had the shortest average communication

time of 3.5 min, although the average learning activity time was relatively long at 96.1 min. It seems that individual learning activities contributed to these results; users conducted concentrated individual work that made use of available PCs. Some tables with PCs witnessed high table turnover, which indicates that such PCs were used for short term functions such as checking E-mails, rather than being used for group collaborations supported by PCs.

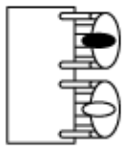
The newspaper corner including tables (Na-Nj) had an average communication time of 12.9 min and an average 61.7 min of learning activity time. It seems to resemble the group study area (window), although this area was more static in terms of layout and configuration, and attracted more single users that arrived particularly to read newspapers, providing for somewhat long stay time and few communication incidents. However, some users arrived at this area in groups and were engaged in interactions more frequently.

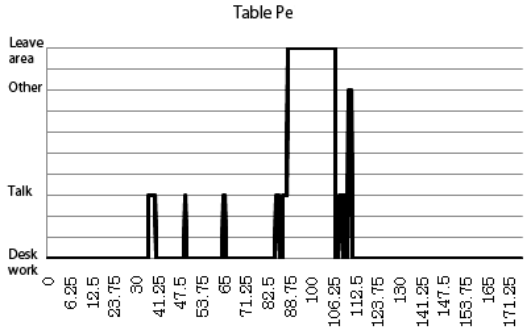
The individual study area including tables (Ia, Ib) had a low average communication time of 4.1 min and a relatively moderate average learning activity time of 59.6 min, which corresponds to the nature of the activity. Many single users stayed for a long time, while others occupied seats for a few minutes, although the seat turnover was generally low.

4.1.4.4 Work Flow Profiles

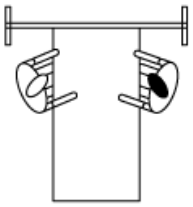
Three examples are discussed with respect to understanding and interpreting the work flow profiles of selected users (Fig.4-1-9). The first case is for a user in the group study area (window) table (Pe); this table was occupied by two users who sat beside each other. Desk work was predominant with fruitful communication, where collaboration was observed in the form of short intervals of communication followed by desk work periods. Such a configuration is ideal for collaboration by groups of two users; sitting beside each other and in close proximity enables viewing of each other's work, sharing materials

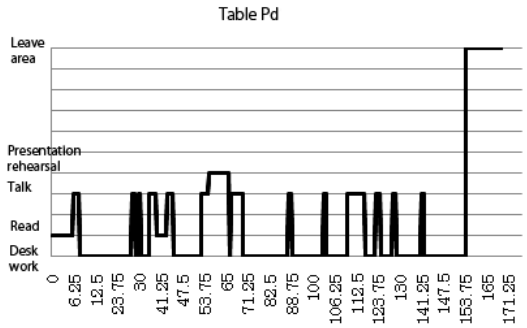
and facilitates communication. The user leaves the table once, performs other activities briefly, then engages in concentrated individual desk work again, taking short breaks every once in a while, which confirms the need for a refresh space in the commons.



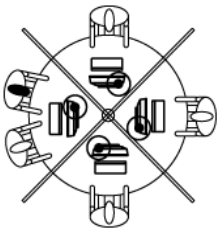


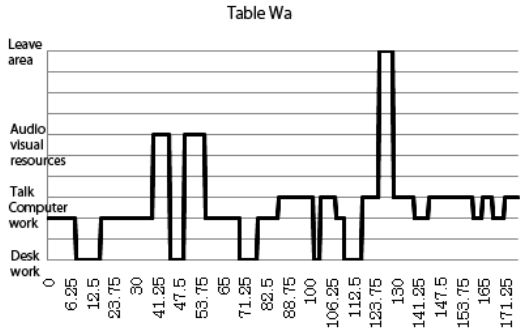
A. Table Pe in The Group Study Area (Window)





B. Table Pd in The Group Study Area (Window)





C. Table Wa in The Writing Support Area

Fig.4-1-9. Activity Profiles of Selected Users, Nagoya University Learning Commons

The second case is for a user in the group study area (window) table (Pd), where the user made use of the available whiteboard. The work flow profile is separated into two parts; the first includes preparing slides using books and conducting desk work interrupted by communication, and the second part begins with a presentation rehearsal followed by more communication and desk work. Communication was important in this profile, because the users placed themselves closer to the whiteboard selecting to face

each others to ease conversation and use the whiteboard. This demonstrates the importance of table layout to provide continuous eye contact and clear view of the whiteboard to encourage collaboration.

The third case is for a user in the writing support area table (Wa), where two students used the table in close proximity. Such close proximity would indicate a tendency for more frequent communication and collaboration. The work flow profile for one of the users can be divided into two parts; the first part was mostly individual work that included longer periods of computer work, desk work and audio visual usage while preparing a presentation or a report. The second part was mostly composed of long periods of communication in a repetitive manner with desk work and much computer work, which represents a collaborative type of work related to tutoring and accepting advice to acquire better skills. The layout dedicated for tutoring in the writing support area requires considerably more privacy compared to areas with other functions; this was provided for here by using table partitions that provided each section with more privacy and screened unwanted noise or even eye contact between users who shared the same table.

4.1.5 Conclusion

The patterns of communication and activities for users varied significantly according to the tasks performed, tools used and configuration of space layout. The group study area had more communication incidents and users here showed more freedom in actions; talking, using phones and hanging out. These findings demonstrate that the new type of library users are multitasked and have more diversified needs. Flexible and refreshing areas encouraged collaboration. Also, the layouts that enabled users' proximity, a reasonable degree of privacy and sociopetal organizations were successful in encouraging conversation and collaboration.

Collaboration consisted mostly of desk and computer work interrupted by interaction among group

members. There is a need for more soft furniture such as lounges and refresh spaces where users may have short breaks between their learning activity sessions; many users continuously left their tables or posed to chat with others. The learning commons service hours should be extended to cope with the high seat occupancy rate, which is expected to increase in the future.

Overcoming the visual separation between the two main zones of the learning commons needs to be addressed; wide screen panels could be fixed near the main entrance of space to present different views of available space, especially from the northern part, and PCs available for use within the facility. Providing a combination of table layouts is necessary to provide for the potential users work flow profiles; the group study area provides a mixture of table layouts that attract users who seek collaboration. Such users included those who used the space briefly or those who stayed for many hours; the space planners should cater for the needs of both users in a balanced way. Finally, the learning commons has definitely changed the image of the library at Nagoya University from a quiet space into a lively learning space where students feel welcomed, although further development is required to emphasize the informal nature of the space.

4.2 CASE STUDY 2: OSAKA UNIVERSITY LEARNING COMMONS

4.2.1 Introduction and Basic Data

Osaka University has two main campuses; the first campus in Toyonaka includes faculties of literature, law, economics, science and the graduate school of engineering sciences, this campus has one large library; Osaka University library, while the second campus in Suita includes the faculties of medicine, pharmaceutical sciences, engineering, graduate school of life sciences, and graduate school of

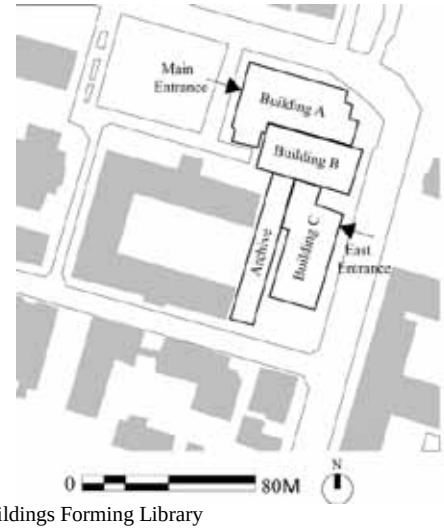
informatics. This campus has two libraries; the science and engineering library and the life sciences library.

New learning commons were opened in the spring of 2009 at both the main library in Toyonaka campus and the science and engineering library in Suita campus. Both learning commons were created as part of renovation projects that aimed primarily to make both buildings earthquake resistant. The learning commons establishment in Osaka University came as a response to the growing needs of students and faculty alike; as learning pedagogies are shifting away from lecturing to more student-centered pedagogies; spaces that provide collaborative learning with information technology support are needed. The learning commons has a mixture of learning spaces, and tries to merge between the traditional function of library as a place to store information available in various forms including paper media and electronic media materials, and the innovative vision of a library as a place to create knowledge through a process that starts with retrieving information, processing it, analyzing it and creating knowledge by means of group work and collaboration among students. The new learning commons tries to create a place to facilitate interaction among the community of learners, encourage critical thinking and develop higher levels of problem solving skills. It is a place to learn independently with support from peers, teaching assistants and other necessary learning tools.

The main library in Toyonaka campus consists of three adjacent buildings built in different phases; building A is the newest building and has the main entrance of library, building B and building C (Fig.4-2-1). It has a total floor area of 18,920 m^2, its collection has 2,277,688 books, provides 1,500 seats, and the daily service hours is 8:00-22:00. The learning commons is found on the 2nd floor, 3rd floor and 4th floor of building B, each floor has a particular distinguished function.

The main part of the learning commons is located on the second floor; it has an area of 756 square meters. The learning commons on this floor consists of four zones; collaboration zone, computer terminal zone, free zone and the lounge zone (Fig.4-2-2 & Fig.4-2-3). The learning commons on this floor provides 6 iMac, 12 PCs, a printer, number of seats is 94 seats, with an additional 28 seats at the

lounge zone. Also it provides some lendable items including 24 PCs and 3 projectors. This floor is an open area that focuses on flexibility and variety of learning resources.



A. Buildings Forming Library

B. View of Building A

Fig.4-2-1. General Location of Osaka University Main Library

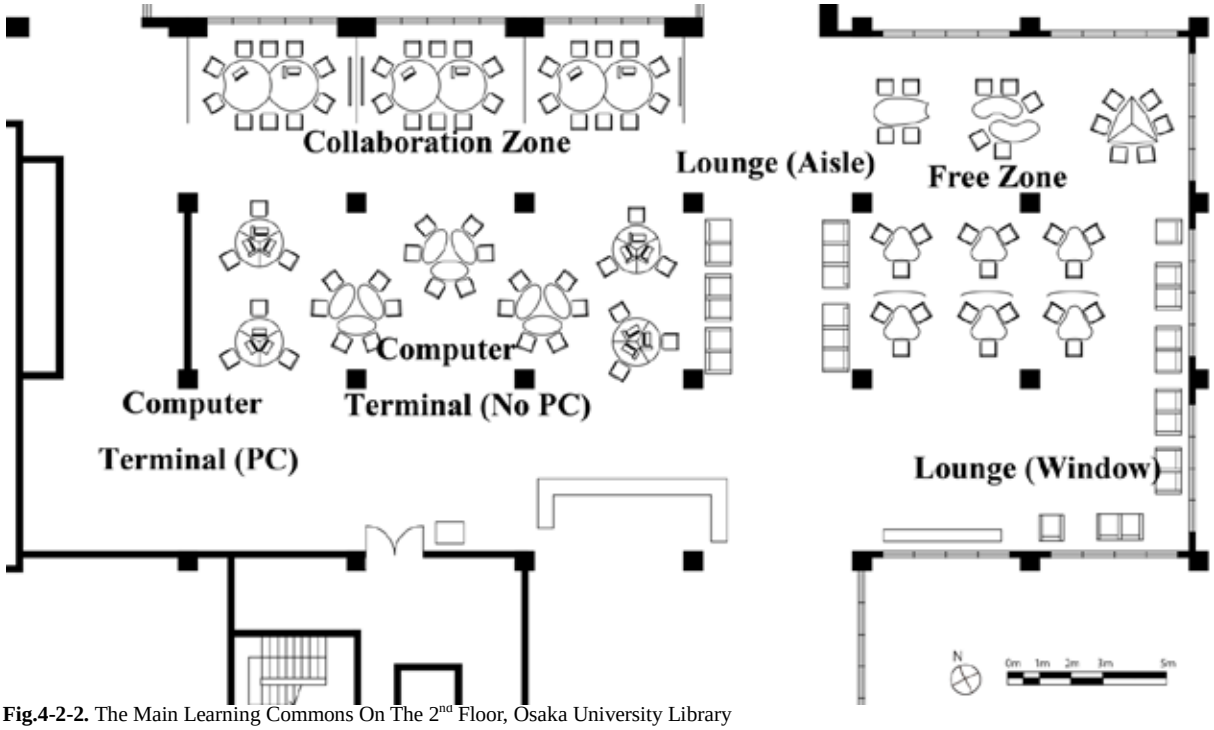


Fig.4-2-2. The Main Learning Commons On The 2nd Floor, Osaka University Library

i. ***Collaboration Zone***: this space can serve 3 groups; each group can have up to 10 members, and can make use of two available PCs, a movable large whiteboard and movable chairs. Each group sitting area

is separated from the adjacent group by a transparent partition. This zone's configuration makes it easy for medium to large groups to work, study or conduct presentation rehearsals if they borrow one of the lendable projectors.

ii. ***Computer Terminal Zone***: this is a space that provides for individual computer work. This area includes two combinations of table configurations. The first found at both edges of this zone; it includes 4 circular tables, each table provides three desktop PCs separated by partitions, each work area can accommodate two users making it suitable for tutoring or computer assisted work. The second type of table configuration is found at the center of this zone. It includes flexible larger tables grouped together, with flat whiteboards in the middle. It can accommodate groups of 6-7 users, and is intended to be used for group work, and for those who want to use laptops.

iii. ***Free Zone***: this is a highly flexible area for group work. Students can make use of a mixture of flexible tables, chairs and whiteboards. Available power connection points on the walls and columns, and the wireless internet connection make it possible to use laptop PCs. The table configurations can accommodate groups of 3 to 7 users. The provided whiteboards can also be used as partitions between adjacent groups to achieve some privacy if needed.

iv. ***Lounge Zone***: this is a space that provides for social interaction. It includes a mixture of soft furniture and sofas. It can be used by single users or groups

Student support is provided by a nearby service counter; it includes TA counter and reference counter. TAs are mostly graduate students from all disciplines who provide tutoring services in various subjects, in addition to providing technical support with PC problems and relevant issues. The reference counter provides students with library staff support; they can facilitate books retrieval and provide advice about the available collections of books and other paper and digital media. Also, it is worth to mention that the learning commons includes some shelves that provide books about using software and developing presentation skills and other hot topics that may arise during the use of space.

The 3rd floor is primarily a computer work area with 138 seats. It includes clusters of tables supplied

with 38 information education system computers, 28 multimedia computers and 1 printer. In addition 2 group study rooms can be used based on reservation. The 4th floor provides 150 seats for silent study; this includes many carrels and is dedicated for individual quiet study.

A. Collaboration Zone

B. Computer Terminal Zone

C. Free Zone

D. Lounge Zone

Fig.4-2-3. The Learning Commons Zones in Use, Osaka University

4.2.2 Methodology and Purpose

Structured observation was used as the main methodology. The observation in Osaka University main library learning commons was conducted in December 2011 for a period of four hours from 11:00-15:00, four observers participated in the observation session. Behavioral mapping was used to collect data in the learning commons. Behavioral mapping at the facility under survey was carried out by recording observed data in a mapping sheet. The space under consideration was divided into smaller observation zones to make it more manageable by the four observers. Each observer was stationed at his

designated area, equipped with a mapping sheet, watch and a digital camera. The mapping sheet showed layout of the studied zone with a brief reminder of the behaviors to be recorded. The tables in the learning commons were given symbols to ease analysis of data later on (Fig.4-2-4).

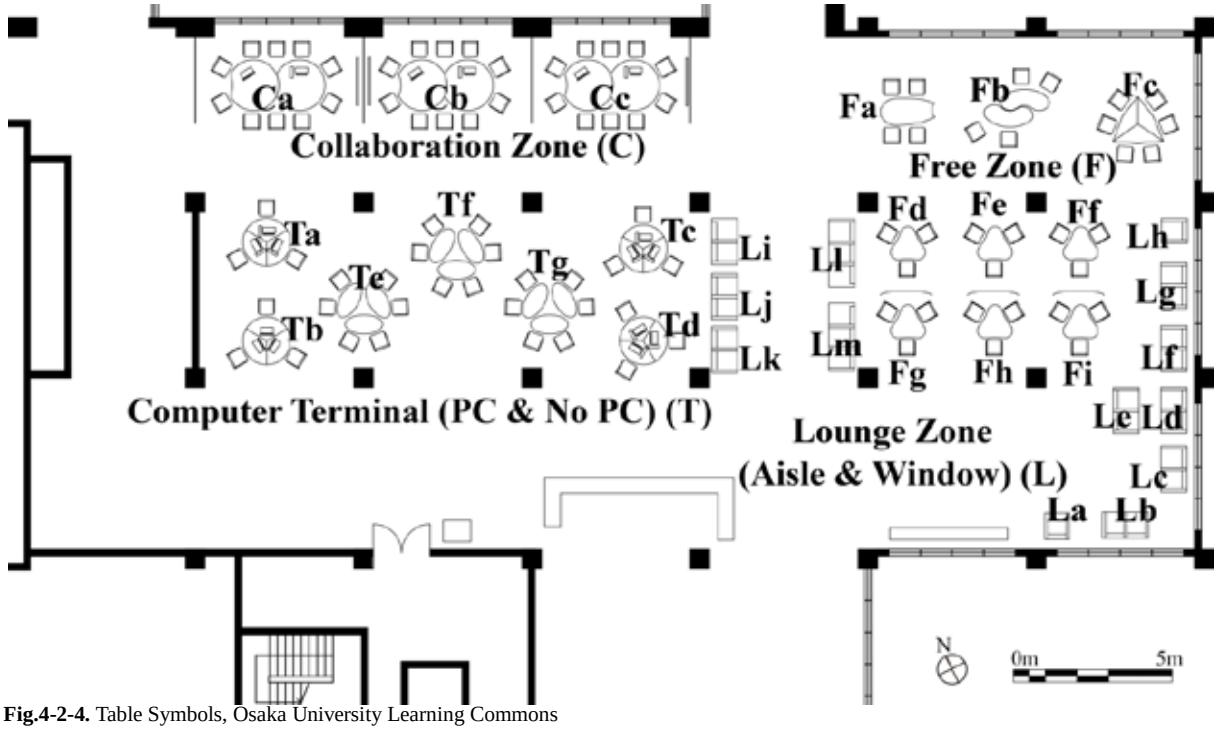


Fig.4-2-4. Table Symbols, Osaka University Learning Commons

A list of desired observed behaviors was agreed upon beforehand based on primary observation trips and literature review. For practical reasons, abbreviations were used to record all events, including activities of space users, duration of activities, movement of users within space, interactions, tools used and others. The mapping was carried out in sessions of 15 minutes with 5 minutes break between two consecutive sessions. The 5 minutes break is necessary for observers to rest to prevent exhaustion due to continued concentration and to prepare for the next mapping session. The observers need to have some experience to collect reliable data, yet diversity of input by different students would enrich the collected data. In addition, the observers were encouraged to take pictures using the digital camera of important events. Later on, the structured observation data was transformed into both quantitative and qualitative information to be analyzed. The aim was to understand actual activities of students and actual space use. Students learning behaviors were the focus of research. The feedback can be used to enhance the design

and facility management of learning commons and other learning spaces in campus.

4.2.3 Learning Space Use

4.2.3.1 Movement Spines

The learning commons had two main movement spines. The major spine is the horizontal spine extending from west to east; this spine starts at the entrance of learning commons passes between the collaboration zone and computer terminal zones and ends in the free zone and the lounge zone (Fig.4-2-5).

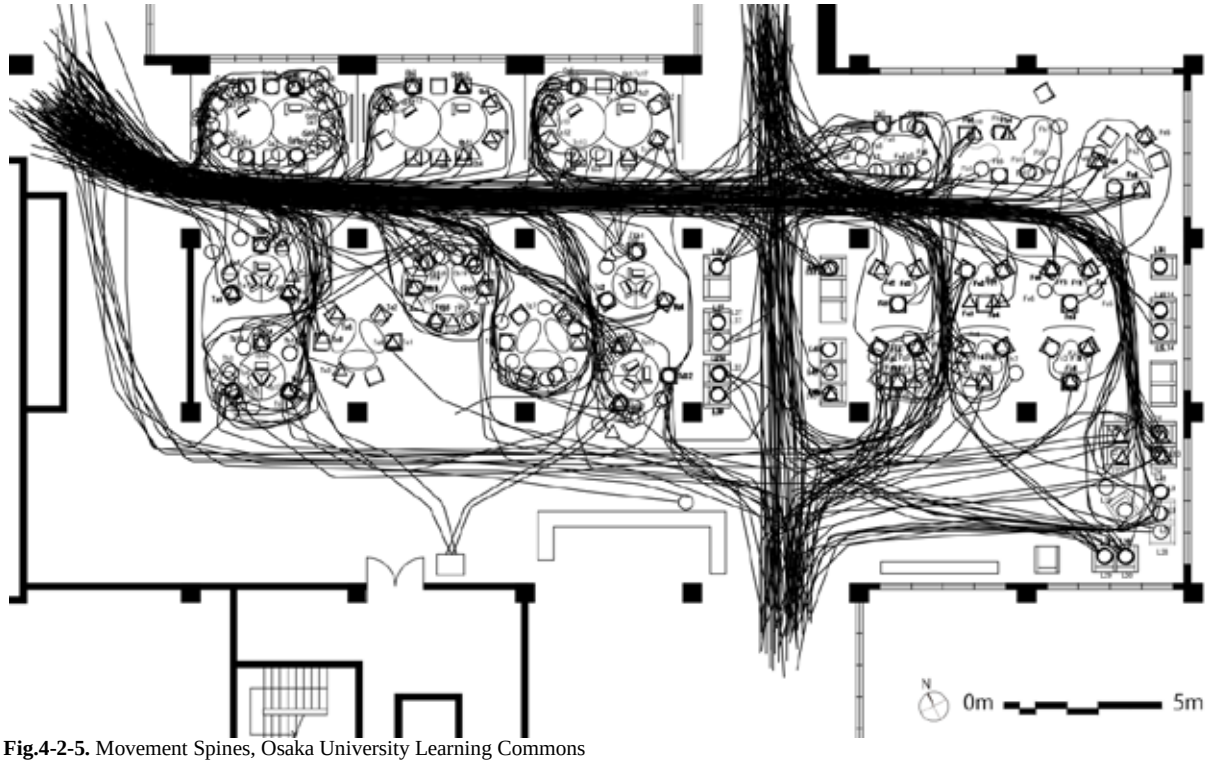


Fig.4-2-5. Movement Spines, Osaka University Learning Commons

This spine was continuously used by students, those who used the learning commons or those who were just passing by from building A to building C of the library. The western part of this spine was

more congested and got less congested in the eastern part; many students would enter the learning commons and then move along this spine, the majority of them were going to the collaboration zones and computer terminals. The centrality of this spine, spaciousness and the fact that the view from it is open to other parts of the learning commons made it effective in facilitating students and visitors' movement within the space. Another movement spine was a vertical spine extending from the north to the south; it mainly functioned as a connector between buildings A and C, yet some students used it to enter the learning commons, especially those coming from building A and heading to the free zone or the lounge area. It was congested at the northern part and got less congested at the southern part near the reference counter. It was noticed that there was a minor movement horizontal spine at the southern edge of the learning commons but it was used lightly.

4.2.3.2 Seat Occupation Ratio

Average seat occupancy ratio for the learning commons was 52%, this ratio is assumed to indicate some ineffectiveness. Looking at the seat occupancy ratio for the individual zones in the learning commons, it was found that there was major differences; the computer terminal (PC) had the highest average seat occupancy ratio of 103%; the users of this zone used extra chairs to accommodate more students than the designed capacity of each table, it was noticed that each desktop PC was used either by individuals or by two to three students in addition to those who interacted with the PC users while standing nearby, it seems that there is an overwhelming need for computer assisted work areas, while the computer terminal (no PC) had the lowest seat occupancy ratio of 29%, mostly a table cluster would be occupied by few users leaving other chairs empty, the lack of privacy because this area is found in a central location played a role in making this space less effective. The second most occupied area was the free zone with an average seat occupancy ratio of 68%, this area is highly flexible and provides

whiteboards to be used as partitions to provide more privacy to user, this area also provides for a diversity of group sizes which gave more control to users on their environment making it effective. The lounge zone (window) found at the eastern edge of space had an average seat occupancy ratio of 43% while the lounge zone (aisle) found on the edges of the vertical spine had an average seat occupation ratio of 30%; this difference is related to the location, the lounge zone (window) provides more privacy and is further from students movement making it ideal for relaxation, while the lounge zone (aisle) was used by users for short time due to its proximity to the vertical spine and lack of privacy. The collaboration zone had an average seat occupancy ratio of 39%, this low rate is due to that although this area was intended to serve groups of up to 10 users, yet it was mostly used by multiple groups of 2-3 members or single users who used the provided desktop PC for long time denying larger groups to make use of this space, besides the use of less flexible pieces of furniture.

4.2.4 Learning Behaviors

4.2.4.1 Users Activities

Generally speaking both talking and PC work were the dominant activities in the learning commons (Fig.4-2-6). Talking formed 27.1% and PC work formed 25.11%. The space layout was successful in creating a conversational learning space by means of providing a variety of zones that cope with the diversification of users needs. Yet no presentation activities were noticed during the observation period, even the collaboration area had no presentations, this area failed to create a suitable space for presentation rehearsals and was mostly used by a mixture of individuals and groups and not by single groups who may have the freedom to engage in information technology facilitated collaboration. The strict regulations on food consumption was successful as food consumption was noticed minimally,

eating constituted only 0.30% of users activities. Sleeping was noticed forming only 3.58% especially at the lounge area. The learning commons was successful in creating a learning environment, as learning activities formed 54.41% of the total activities of users.

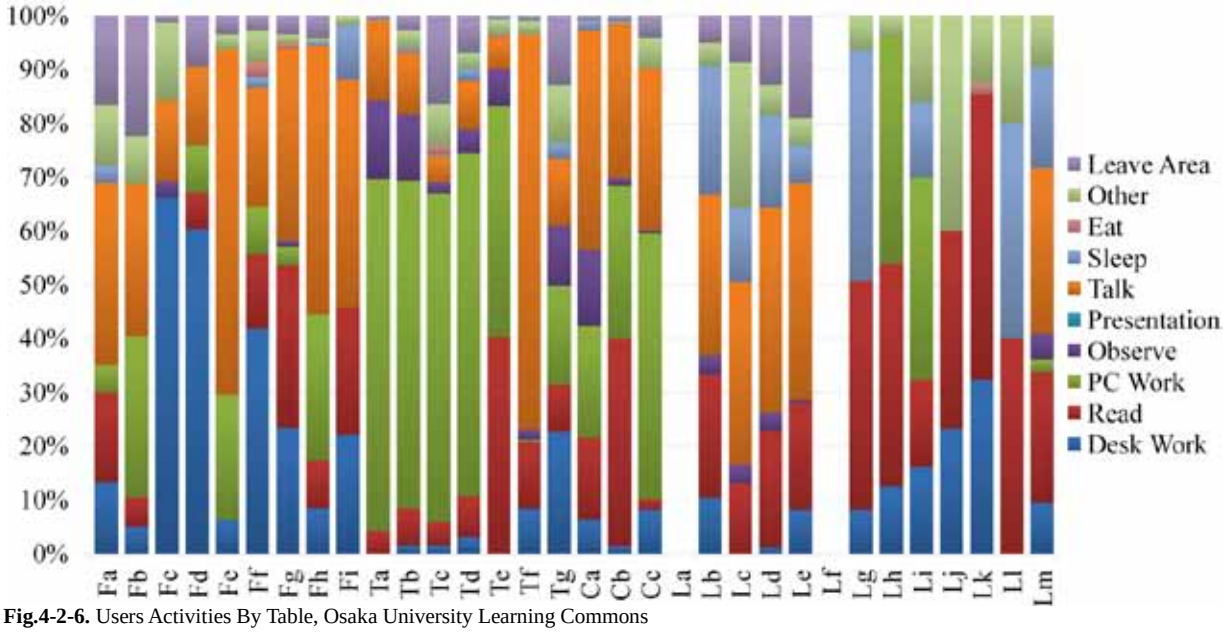


Fig.4-2-6. Users Activities By Table, Osaka University Learning Commons

The activities ratio was seen to be different among zones and even within tables found in a certain zone. In the free zone, the proportion of talking was dominant, followed by desk work; yet it was noticed that tables that had high levels of talking showed less desk work as in Fe and Fh, while tables which had high desk work showed less talking as in Fc and Fd. Also it can be seen that the table that used whiteboards as partitions had generally higher levels of talking; control of own environment and being able to use partitions to have more privacy encouraged more interactions. Tables Fe and Fh had high levels of PC work as many users used laptop PCs.

Looking at the computer terminal zone (PC) including tables Ta, Tb, Tc and Td, it was seen that PC work was dominant and talking was minimal; students engaged in focused individual work with minimal interactions although two to three students were seen to use the same PC in some cases. The same trend was seen in the computer terminal zone (no PC) as in Te and Tg, but table Tf had more talking and minimal PC work because most users did not use laptop PCs. The computer terminal zones

(PC & no PC) were suitable to PC work; users made use of available desktop PCs or made use of their own laptop PCs, those who did not use laptop PCs engaged more in interactions and other activities.

The collaboration zone had more talking and PC work followed by reading. Desk work happened minimally here, this zone was more used for computer work and studying. Students were seen to study in groups and use the whiteboard to support problem solving, yet each table was used by several groups in addition to individual students who worked on the desktop PC to do individual focused work at the same time. Also, it was noticed that many students would work on PC and talk with other students in the zone continuously. This area was successful in encouraging collaborative group work and group study, yet no presentation rehearsals were seen. The desktop PC was seen to attract some single users to work on it and stay for longer time denying larger groups to make use of the space, removing the desktop PC is recommended to encourage more effective space use for IT facilitated group based collaboration.

The lounge area was successful in providing chances of relaxation, in addition to providing a comfortable learning area. La and Lf were never used during the whole observation period. Reading, talking and sleeping were more frequent in this area. Reading was a dominant activity that occurred here more than in any other part of the commons. In the lounge zone (window) talking was more frequent as in Lb, Lc, Ld and Le, while looking at the lounge zone (aisle), it was seen that continuous movement of users in the spine made it difficult to attain enough privacy, so it was used for other activities such as reading or even desk work as in Lk and Lj; it was mostly used by individuals who stayed for short periods of time. Although the lounge zone does not provide tables yet users used laptop PCs to do work as in Lh and Li. This area witnessed less learning behaviors and more social and relaxation behaviors.

4.2.4.2 Tools Usage

As for tool usage in the commons; users were seen to use papers more dominantly followed by

books and laptop PCs. Laptop PCs were used in all parts of the learning commons especially the free zone. Books were used more frequently in the lounge zone. Also, many users did not use any tools at all especially in the lounge zone (aisle), those with no tools in this area came to this area just to sit there, relax and kill some time. Students made use of the desktop PCs and whiteboards provided, especially in the collaboration zone and the computer terminal zone (Fig.4-2-7).

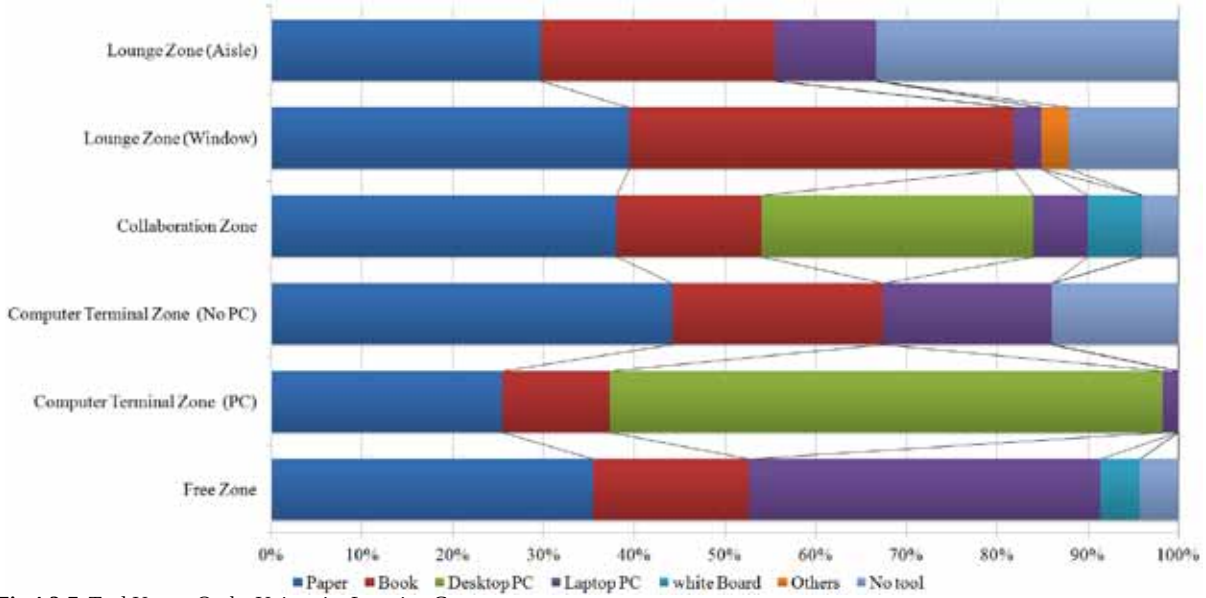


Fig.4-2-7. Tool Usage, Osaka University Learning Commons

4.2.4.3 Communication Patterns

The highest rate of communication in the learning commons was generally observed in the free zone including tables Fe, Fi and Fh, followed by collaboration zone including tables Ca, Cb and Cc, the computer terminal zone (no PC) including table Tf and lounge zone (window) including tables Le, Ld, Lc and Lb (Table.4-2-1). The flexible nature of the free zone, compactness of table size used which enables students to sit closer in addition to providing whiteboards that are used as partitions to attain more privacy facilitated talking between members in a group leading to effective collaborations,

in particular tables Fi and Fh had a 1:1 ratio of learning activities to communication, this sort of communication facilitates sharing tasks and information and guarantees effectiveness. The lounge zone (aisle) had the lowest rate of communication followed by the computer terminal zone (PC). The computer terminal zone (PC) including tables Ta, Tb, Tc and Td had low communication rate due to having desktop PCs, small partitions between users and less flexible tables, many users in this area were observed to be engaged in individual focused PC work with minimal interactions.

Table.4-2-1. Average Communication and Learning Activity Time by Zone, Osaka University Learning Commons

Zone	Average Communication Time (min)	Average Learning Activity Time (min)
Free Zone	18.52	28.18
Computer Terminal Zone (PC)	8.65	31.20
Computer Terminal Zone (No PC)	12.27	14.87
Collaboration Zone	18.31	26.53
Lounge Zone (Window)	10.02	14.41
Lounge Zone (Aisle)	2.60	15.06

More time was spent in learning activities than in talking to others in all zones of the learning commons. The free zone had the highest average communication time of 18.52 min and the average learning time was 28.18 min. The majority of students had less than 20 min talking and learning activities time. The users of this area talked frequently while being engaged in learning activities; these communications were formed by peer learning talks during study or talking to facilitate collaboration. Also, it may be attributed to the proximity of students to each other; having unobscured sight lines, using whiteboards as partitions to attain more privacy, flexibility of tables and chairs and the variety of available table choices.

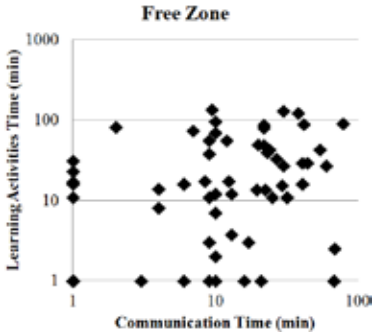
The computer terminal zone (PC) had an average communication time of 8.65 min and the highest average learning activities time of 31.20 min; this area attracted mostly individual users who used a PC to do individual focused work with no interactions, but it was seen in other cases that two to three students would use a PC to perform a shared task and in such a case some communication between students was observed, such communication was necessary to facilitate collaboration. The nature of

tables here restricted interactions; the tables are not flexible and each table would provide 3 desktop PCs separated by small partitions that minimize sight lines leading to decreased communication occurrence. On the other hand, the computer terminal zone (no PC) had an average communication time of 12.27 minutes and the average learning time was 14.87 minutes. Compared to the computer terminal zone (PC), this area encouraged collaboration, group work and Students tended to communicate more with other students. Two types of users were observed; those whose major activity was talking and others who seemed to show somewhat balanced activities divided almost evenly between communication and learning activities. The sociopetal organization of tables, having larger table surface, continuous sight lines and the possibility to accommodate larger groups made this space ideal for collaboration or interactive group study.

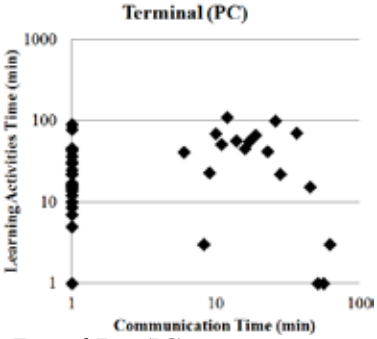
In the collaboration zone, the average talk time was 18.31 min and the average learning time was 26.53 minutes. Students who used this area for collaboration and group study were seen engaged in various activities separated by long periods of discussion while using a whiteboard, on the other hand many individual students were seen to use the desktop PCs to do work or were engaged in individual learning activities such as reading and desk work. The fact that the same space was used by multiple small groups and individuals simultaneously lowered the possibility of conducting effective information technology assisted collaborations and presentation rehearsals.

Looking at the lounge zone (window), the average communication time was 10.02 min and the average learning activities time was 14.41 min. Some users here were seen to engage in individual learning activities such as reading, desk work and PC work for long periods of time, while most of the students who used this area were seen to talk with friends and engage in other leisure activities including sleeping. The location of this zone at the back corner of the learning commons away from movement spines, and the available soft furniture gave it a relaxing friendly atmosphere that encouraged communication and socializing. On the other hand, the lounge zone (aisle) had the lowest average communication time of 2.60 min and the average learning time was 15.06 min. This area had a lot of

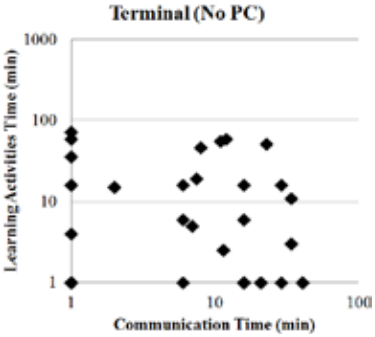
individual users who worked alone on a PC, read a book or studied without any observed conversation. Also, the location of this zone on the edges of the busy vertical spine, lowered privacy levels and made the users feel that they have less control on the environment making it less attractive.



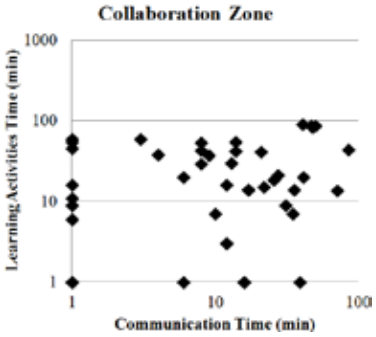
A. Free Zone



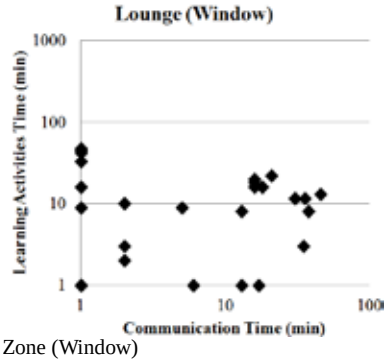
B. Computer Terminal Zone (PC)



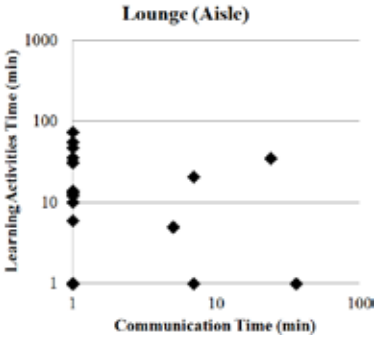
C. Computer Terminal Zone (No PC)



D. Collaboration Zone



E. Lounge Zone (Window)



F. Lounge Zone (Aisle)

Fig.4-2-8. Relationship Between Learning Activities and Communication Duration, Osaka University Learning Commons

4.2.5 Conclusion

The learning commons in Osaka University was seen to be unquestionably a learning space as the

learning activities of students dominated any other type of activity. Yet the space was under used at least at the time of observation. The learning commons provided a combination of individual and group work optimized configurations to cope with the diversification of the users' activities, tasks and needs. It was seen that providing clear and wide enough movement spines helped in smooth transition through the learning commons. Furthermore, the location of zones in respect to the movement spine influenced the users space use, as many tended to use spaces closer to the movement spine.

There is a need for more information technology tools and mainly desktop PCs as many students stayed for long time and used PCs in the computer terminal zone (PC) and the collaboration zone. The table surface area and space around tables in the computer terminal zone (PC) must be increased to provide for the use of desktop PCs by multiple users as observed in many cases. The free zone and collaboration zone witnessed more talking among students who worked in groups to study and to accomplish tasks collaboratively, but such a trend needs to be encouraged by parallel adoption of student-centered learning pedagogies in various courses in campus.

The use of soft furniture in the lounge zone was a distinguished feature of the learning commons, it was successful to attract users who needed to take breaks or socialize with friends before going back to learning activities. Studying usually happens is repetitive sessions separated by breaks, having the lounge area enabled students to find a place to refresh without the need to leave library. The openness and the central location of the learning commons generated many spontaneous informal learning opportunities, many students who were just passing through the commons ended up meeting friends and joined them to study or just hang out.

Flexibility of table configurations and the use of whiteboards in some sections of the learning commons like the free zone gave students more control on the learning environment; this increased students comfort, built their self confidence and urged them to work collaboratively to create knowledge. The collaboration zone was under used for group presentations, this happened because the provided desktop PCs attracted individual or group users who occupied several seats and prevented

other groups from using it for presentations. This can be changed by simply removing the desktop PCs and giving priority for large groups to use this zone especially for presentation rehearsals. Also, the location of this zone needs to be reconsidered, moving this zone away from the entrance and the main movement spine might discourage the use of this zone by individuals.

The lounge zone (aisle) was ineffective; students used the space for short periods only and for learning activities like reading or desk work. Replacing this lounge zone with counter tables and stools would serve better individual short term learning activities including internet browsing or email checking. The lounges could be moved to provide for more students in the lounge zone (window). The policy of no food and only bottled drinks needs to be reconsidered; food and beverage consumption can be considered a social facilitator, in addition to that many students would like to have snacks after long periods of study without the need to leave library. Providing some tables in the lounge area or a café would enhance the comfort levels in the learning commons.

The learning commons was successful, but there is a need to encourage users to make use of the available facilities. Also there is a pressing need to provide more PCs in the library in general. The learning commons changed the nature of Osaka University main library; it became an innovative center of learning and social life in campus.

4.3 CASE STUDY 3: MIE UNIVERSITY EXPERIMENTAL LEARNING COMMONS "GROUP STUDY ROOM"

4.3.1 Introduction and Basic Data

The group study room was opened at Mie University in April 2010. It was considered as an

experimental learning commons. An ordinary classroom of 150m^2 was reconfigured into a learning space. The aim was to provide a learning space to accommodate group work and collaboration in campus. The group study room included 4 zones; group study, workstation area, common area and social space (Fig.4-3-1 & Fig.4-3-2).

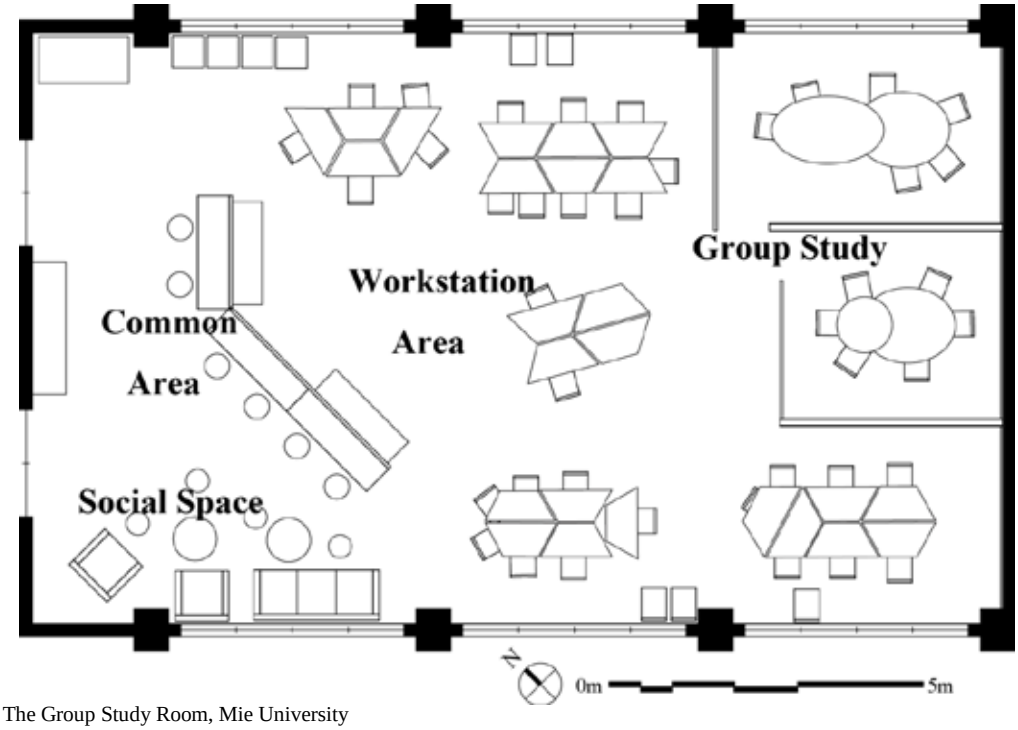


Fig.4-3-1. The Group Study Room, Mie University

i. ***The Workstation Area:*** is a flexible space with movable pieces of furniture that includes trapezoidal desks, chairs, and whiteboards. All the furniture can be reorganized and customized to serve the students needs with various possible layouts.

ii. ***The Group Study:*** is a place that students who seek more privacy can use in cases of conducting presentation rehearsals or using a projector. It can also be used in case of focused group study; it accommodates 6 to 8 users.

iii. ***The Social Space:*** is found near the main entrance, it is a place to relax, socialize, meet others and engage in other leisure activities. The furniture includes sofas and some movable tables.

iv. ***The Common Area:*** separates the social space from other parts of the learning space. It is composed of linear arrangements of high counter tables with high stools; this area has electric points and other

wiring necessary to use laptop PCs. It was mostly designed to be used for short term tasks such as checking email, and has the characteristics of a café like environment.

A. Workstation Area

B. Group Study Area

C. Social Space

D. Common Area

Fig.4-3-2. The Group Study Room Zones in Use, Mie University

4.3.2 Methodology and Purpose

Structured observation was used as the main methodology. The observation in Mie University group study room was conducted in October 2011 for a period of four hours from 12:00-16:00; three observers participated in the observation session. Behavioral mapping was used to collect data in the learning commons. Behavioral mapping was carried out by recording observed data in a mapping sheet. The space was divided into smaller observation zones to make it more manageable by the observers. Each observer was stationed at his designated area, equipped with a mapping sheet, watch and a digital camera. The mapping sheet showed layout of the studied zone with a brief reminder of the behaviors to

be recorded. It is worth to mention here, that additional observers participated in the mapping sessions in shifts as some of the main observers had other appointments especially in the afternoon period. The tables in the learning commons were given symbols to ease analysis of data later on (Fig.4-3-3).

A list of desired observed behaviors was agreed upon beforehand based on primary observation trips and literature review. The observation included recording detailed activities of users such as reading, PC work and other main activities that refer to the apparent purpose of groups detailed activities, the main activities category includes refreshing, studying, collaboration and presentation. For practical reasons, abbreviations were used to record all events, including activities of space users, duration of activities, movement of users within space, interactions, tools used and others. The mapping was carried out in sessions of 15 minutes with 5 minutes break between two consecutive sessions. The 5 minutes break is necessary for observers to rest to prevent exhaustion due to continued concentration and to prepare for the next mapping session. In addition, the observers were encouraged to take pictures using the digital camera of important events. The aim was to understand actual activities of students and actual space use.

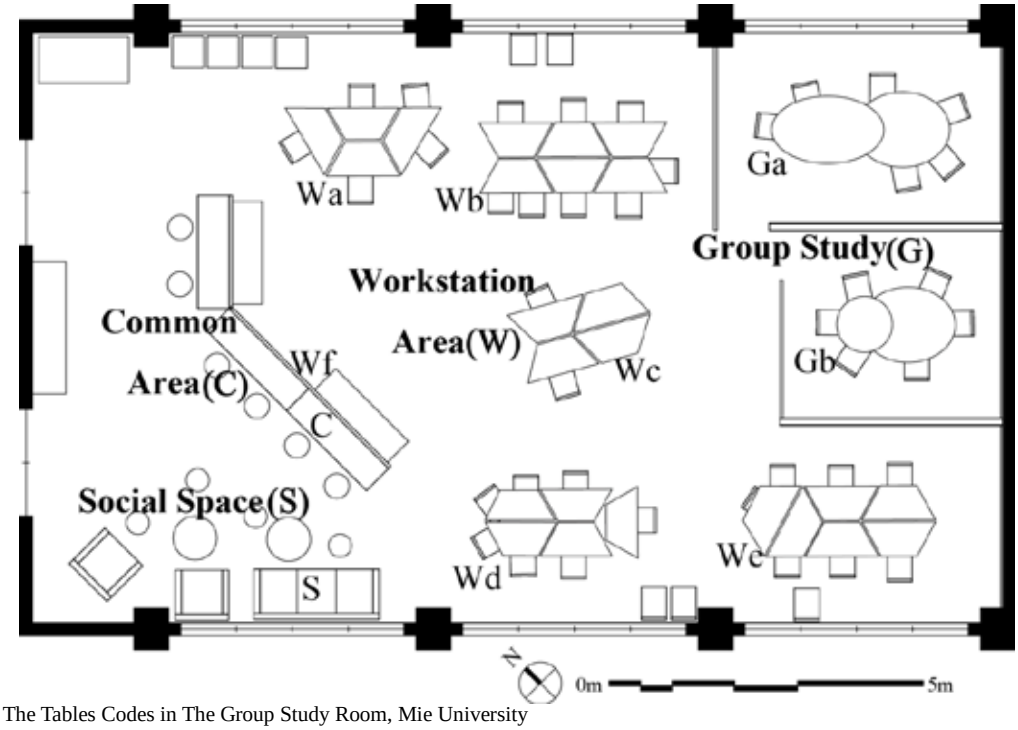


Fig.4-3-3. The Tables Codes in The Group Study Room, Mie University

4.3.3 Learning Space Use

4.3.3.1 Movement Spines

The room had two major horizontal movement lines, starting from the entrance up to the group study area it can be seen that the students' movement is smooth except for the bottlenecks created by the partition wall that separates the common area from the work area at both of its ends. Students mostly used the spines to reach the workstation area which witnessed dense use (Fig.4-3-4).

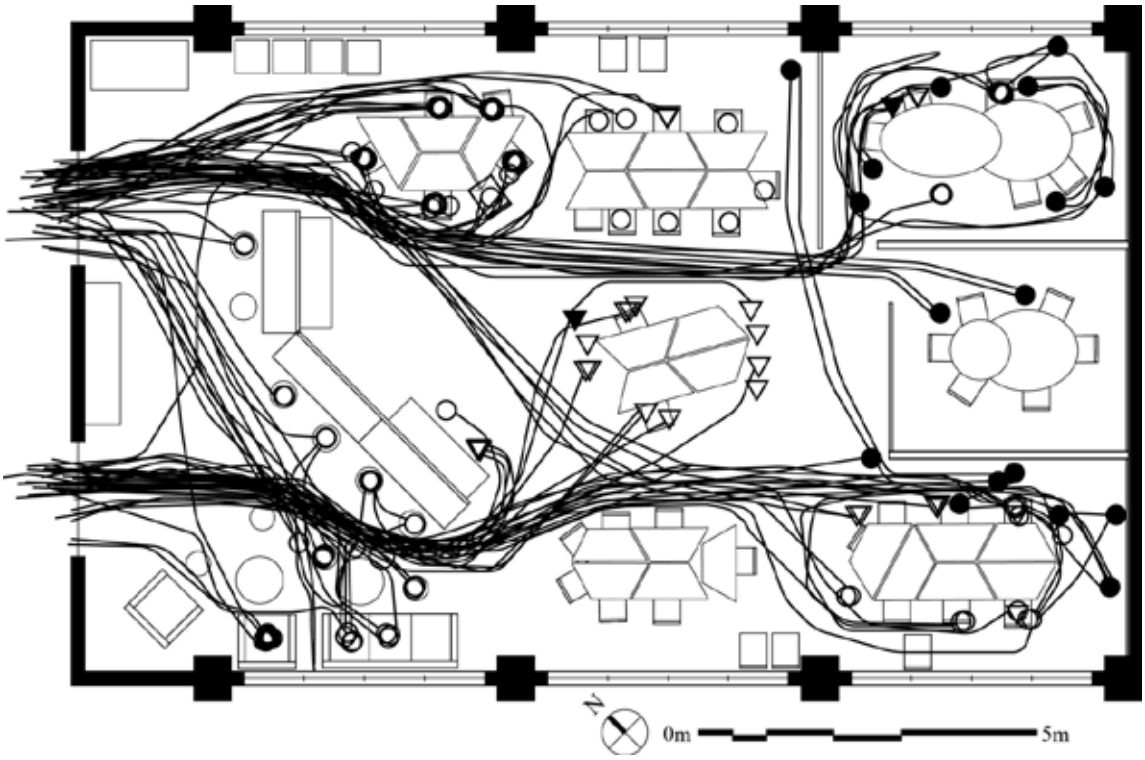


Fig.4-3-4. Cumulative Users Routes Choice and Movement Spines, Mie University Group Study Room

4.3.3.2 Seat Occupation Ratio

The overall seat occupancy ratio was 15.7%, which indicates that this space was under used during

the study period. The workstation area had the highest ratio of 22.1%; this flexible and easily customized area had users stay longer. It can be reconfigured to accommodate groups of any number of users, while providing enough movement space and table surface work area. The social area had 17.1% seat occupancy ratio, this area had users stay relatively longer especially in the lower part of it; where users would find comfortable lounges with enough space in front of them to put their belongings and make use of available movable furniture to meet their friends and socialize. The study group had 12.3% seat occupancy ratio; this space was used by groups who needed more privacy while studying or for using the projector during a presentation rehearsal, room Ga was used more. The common area had the lowest seat occupancy ratio of 11.3%, this area was used mostly by individuals who worked on laptop PCs for short periods, yet being close to the entrance and having many students move behind the backs of those working on the PC reduces privacy and makes them feel vulnerable which lowers the desire to use this area preferring to use other parts if possible to have more control of environment and more privacy. The analysis of data showed that the highest rate of seat occupancy occurred in the lunch break between 12:00 to 13:00, at this time students would come in groups to eat lunch and mingle with other students.

4.3.4 Learning Behaviors

4.3.4.1 Users Activities

Studying the data for the whole group study room showed that generally speaking, talking, observing and desk work were dominant activities (Fig.4-3-5). The room is a conversational learning space that was successful in attracting students from the nearby faculties to meet peers, socialize and study. The students showed diverse activities according to the tasks performed and according to the

area being used.

During the observation some tables of the group study area were reserved by students, who used table Ga to study and learn from peers. Here talking and desk work were more prominent, students occupied table Ga, and they studied primarily yet continuously talked to each other as in g4 and g5. It was noticed that some students in this area talked more than others; in fact they did not do desk work at all, they came with the group and spent most of the time talking to others and observing as in g1 and g2. This area was selected by users who needed more privacy since it is separated from the rest of space by a light partition.

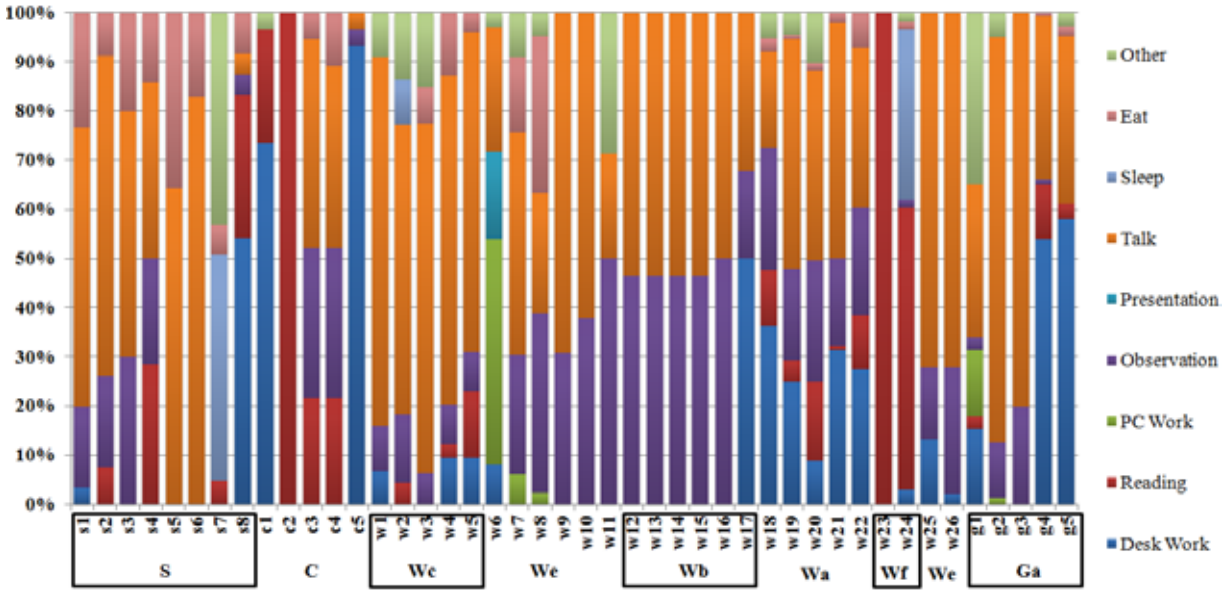


Fig.4-3-5. Users Activities By Table, Mie University Group Study Room

The workstation area had more talking, observing and desk work. Talking activity happened in this area in a higher ratio than in other areas in the group study room. Students made use of the flexibility of chairs and tables, they were seen to move chairs to accommodate a place for new students and tables were moved frequently at well. Also, students were seen to eat or drink while working especially during the lunch break period. Students who used this area showed a high level of diversity in terms to activities according to type of work done on each table. There were those who talked only as the case of users who used table Wb; all students were engaged in conversations as in w12~16. Some students read more as in

w23 and w24, others had more desk work as in w17 and w18. Table We was used by students to conduct a presentation using a laptop PC and a projector; here student w6 did a presentation and used PC while others listened first and then discussed and gave comments, and that is why they had more talking and observation as in w9 and w10, this table was selected because the other two group study areas were reserved, knowing that only table Ga was used by students while the other was never used during the whole period of observation. This area had more users than other parts; flexibility made it preferred by students who can customize the space based on their needs. The control of own environment was reflected into more diverse activities.

The common area was mostly used by individual students for individual study with minimal interaction, yet it was used by couples at certain times. Desk work was the dominant activity followed by reading. Many students showed desk work extensively as in c5, while c2 spent the whole period of observation reading. It is important to mention that no users were seen to do PC work, in spite of that this area was equipped with electricity points to encourage use of laptop PCs.

The social area attracted students who were looking for a place to socialize, relax and hang out, yet some students used it to perform learning activities in a more relaxed and comfortable environment. Talking, sleeping and eating were prominent activities. Eating and beverage consumption was noticed in all areas but it was more prominent here. S7 was seen to sleep within this area for a long time, while s8 was more active as he spent most of the time in desk work and reading.

4.3.4.2 Tools Usage

In terms of tools usage, most students used papers and books. The common area witnessed more reading and that is why most students within this area possessed books. Laptop PCs were seen to be used more in the group study area followed by the workstation area. In the group study area students

used laptop PCs during individual study or to conduct presentations. Whiteboard use was minimal, mainly those in the workstation area used whiteboards. The variety of tools used shows the diversity of students' needs and tasks performed in the group study room. Students are expected to come to a learning space with many belongings, the space needs to provide proper storage places and enough work surface area to enable students to spread belongings and work comfortably (Fig.4-3-6).

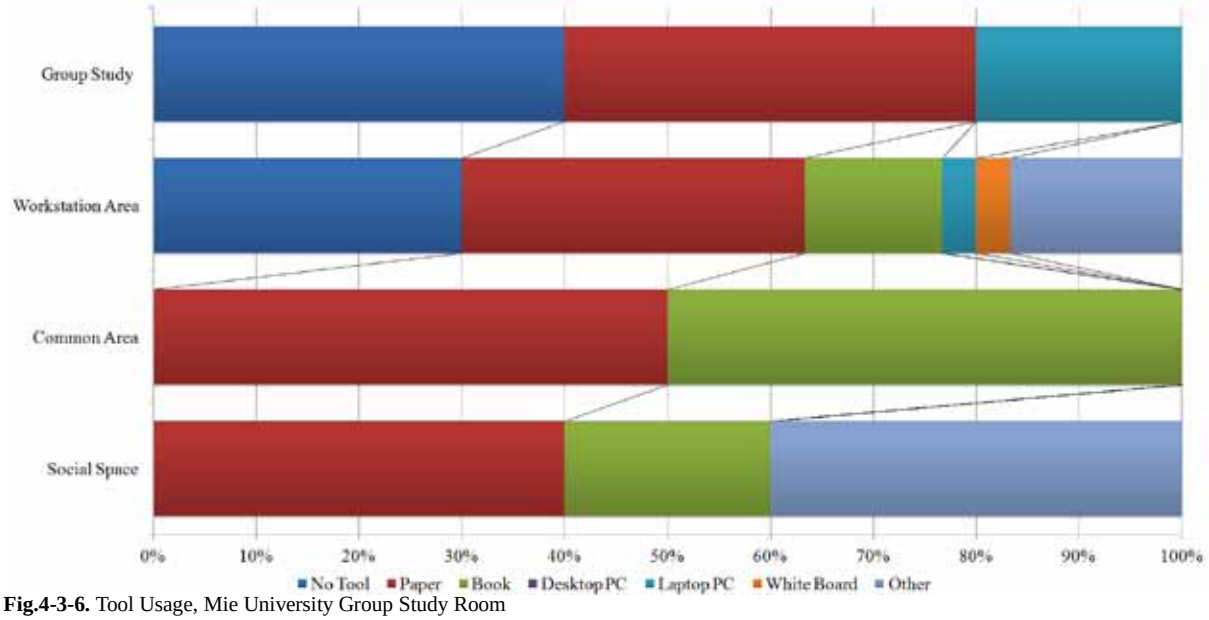


Fig.4-3-6. Tool Usage, Mie University Group Study Room

4.3.4.3 Communication Patterns

The highest rate of communication was observed in the workstation zone including w19, w20 and w22, followed by the social space zone including s1 and s2, the group study zone including g4 and g5 and the common zone including c3 and c4 (Table.4-3-1).

The workstation zone attracted a diversity of users, and provided a successful conversational environment; the flexible tables and chairs that can be customized to different group sizes, the proximity of group members and continuous sight lines contributed to this success. In addition this zone

encourages collaboration in some cases; this can be seen in w28 where the ratio of talking to learning activities composed of desk work and reading was 1:1, talking here supports and facilitates collaboration and knowledge creation.

The lowest rate of communication was seen in the common zone. This zone was mostly used by individual users who were engaged in learning activities and interacted minimally, yet some couples who used this area were seen to talk more. The linear layout of the furniture in this area restricts sight lines, and forces users to sit beside each other which hinders communication, in addition to its proximity to the entrance which lowers privacy levels.

Table.4-3-1. Average Communication and Learning Activity Time by Zone, Mie University Group Study Room

Zone	Average Communication Time (min)	Average Learning Activity Time (min)
Group Study	13.60	14.75
Workstation Area	27.96	12.20
Common Area	10.60	12.80
Social Space	15.50	3.69

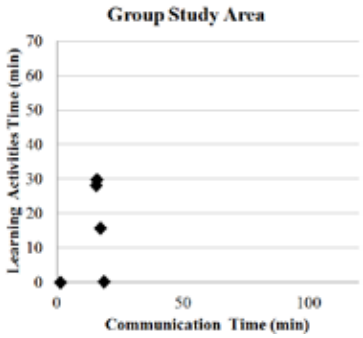
The workstation zone had the highest average communication time of 27.96 minutes and average learning activities time of 12.20 minutes. Compared to other parts of the group study room, this area witnessed many users who stayed for a long time and communication with others was the dominant activity; they included groups of users who seem to be friends and used this area to meet, socialize and interact with each other, especially during the lunch break hours from 12:00-13:00, at this time many groups of students were seen to sit in this area to have lunch with friends. Also, many other students sat in this area to study with friends; peer learning was carried out using communication as a means to transfer knowledge to other members of a group.

The common zone had the lowest average communication time, it was 10.60 minutes and the average learning activity time was 12.80 minutes. This zone was mostly used for individual learning tasks mainly reading and desk work, while talking was minimal. Also, the use of the counter like layout and high stools made it less comfortable which forced users to stay for less time and leave. Also the

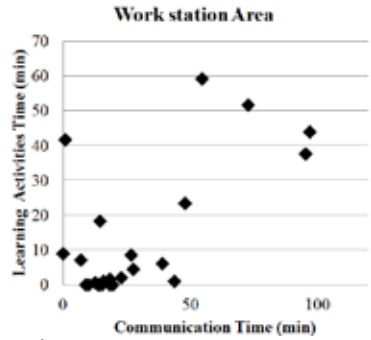
linear layout discouraged groups to use it, only single users or couples used it.

The social area had an average communication time of 15.50 minutes and the lowest average learning activities time of 3.69 minutes; talking, eating and other non learning activities were dominant within this area, the use of sofas attracted users who are seeking to relax, socialize and hangout, which made this area a successful refreshing space.

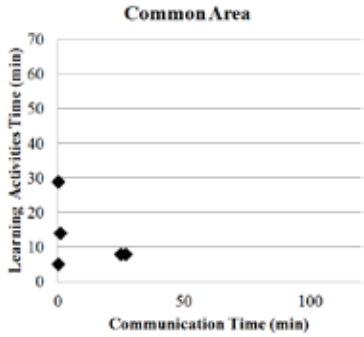
The group study zone had an average communication activity of 13.60 minutes and an average learning activity time of 14.75 minutes. This zone was used for studying with friends; within a cluster of students you would fine those that spent most of the time in individual learning activities like desk work and reading, while others spent more time talking with others to provide support or as a form of peer tutoring which explains the somewhat balanced communication to learning activity time ratio. Also, having partitions gave this area more privacy which encourages on one hand focused work and on the other hand deeper interactions between users (Fig.4-3-7).



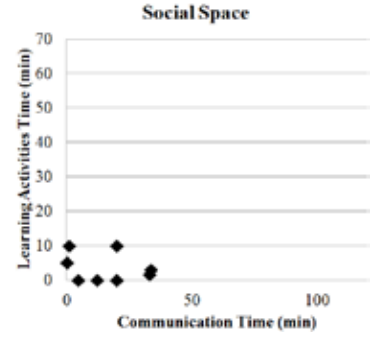
A. Group Study Area



B. Workstation Area



C. Common Area



D. Social Space

Fig.4-3-7. Relationship Between Learning Activities and Communication Duration, Mie University Group Study Room

4.3.5 Conclusion

The group study room was successful in attracting students especially from nearby faculties and mainly during the lunch break hour. Yet more research needs to be done to investigate this room's success as a learning space, because during the observation the room was extremely underused unlike the case of many previous primary observation visits, where the space was crowded.

The design of appropriate movement spines is crucial in a learning commons. The proximity of the edges of the common area partition wall within this facility created bottlenecks in the two movement spines; more space was needed between the pieces of furniture and other fixtures to guarantee ease of movement in case of crowdedness.

The workstation area had most users during the observation. Having flexible furniture provided users with control on the learning environment, and that is why many students favored this area. The workstation area witnessed various group activities. Some groups had more learning activities, others had more conversations and one group used a projector to share work or to do a presentation rehearsal. Furthermore, eating and drinking was a common activity especially during the lunch break.

The social space was the second favored area, students used it to relax, eat, socialize and even sleep. This indicates that students felt comfortable in spite of its proximity to the entrance, movement spine and the common area. Also, this area was used for some learning activities like reading and desk work.

The users of the group study room ranged between those who came with other students to work as a group or those who came alone. The common area seemed to attract mostly individual users within this facility, although couples where seen to use it too. The learning commons needs to provide a variety of configurations to accommodate individuals or groups with various sizes.

Eating was seen to happen in all areas in the group study room, this activity needs to be acknowledged as a basic need, it is not a disruptive behavior; on the contrary eating and beverage

consumption is considered as a social interaction facilitator. Many students came to the group study room with many belongings, providing places to store such belongings is a plus that helps students to feel welcomed and more comfortable. Also, providing wide enough work surface area is essential, as many students were seen to spread belongings on table, use a PC and eat or drink all at the same time.

Effective collaboration was seen to happen when students had equal learning activity time and communication time. Talking among students is essential to make group work smooth and for task sharing to be successful. The workstation area and the group study area were among the spaces that encouraged more communication. The workstation was successful as an interaction promoting area, because it provided students with the opportunity to sit in close proximity, all students could see other group members easily and students had freedom to choose a table configuration that suites the task preformed. The group study area had the highest learning activity time, because it was successful in providing more privacy to users, this gave opportunities for prolonged periods of focused study or even deep interaction between users.

The group study room was successful in promoting learning and interaction among the campus community, it is recommended to create similar spaces all around the campus to spread the spirit of group work and teach students the skills of healthy collaboration.

4.4 SUMMARY

This chapter tracked some of the innovative changes taking place in Japanese universities libraries. The introduction of the learning commons into campus is the clearest demonstration of inevitable change in the design and planning of campus learning spaces. Three case studies were discussed including Nagoya University learning commons, Osaka University learning commons and Mie

University group study room. Structured observation was used as a methodology. Behavioral mapping was used to collect data about various aspects of learning commons use and students activities. In addition, the physical features of the emerging learning commons were emphasized.

Nagoya University learning commons was the first learning commons to open in a national university in Japan; it was conducted in two phases between 2008 and 2009. A clear philosophy was behind the creation of the learning commons in Nagoya University; it focused on creating a learning space that provides IT support, learning support, writing support and peer support. The new learning commons included two major areas: the learning area and group study area, in addition to two seminar rooms. The observation was conducted on two consecutive days in January 2010 for seven hours. The results showed that students used two major horizontal movement spines, and that they tended to use more frequently spaces closer to these movement spines. Seat occupation ratio was 66% indicating consistent use of the learning commons. Tables in group study area were occupied for longer time. Writing support area also, had longer table occupation duration. Communication patterns and activities differed according to task performed, tools used and configuration of space layout. Collaboration consisted mostly of desk and computer work interrupted by talking among group members.

Osaka University learning commons was opened as part of a library renovation project. The learning commons included three floors; each floor had a distinguished function. The main part of the learning commons on the second floor was studied, it has four zones: collaboration zone, computer terminal zone, free zone and lounge zone. An observation session was conducted in December 2011 for four hours. The major movement line was a horizontal spine that passed through space from west to east. The free zone was the most successful zone due to flexibility of tables, proximity of users and providing whiteboards that was used to attain more privacy. The collaboration zone did not witness any presentations using projectors because the space was used by multiple groups and individuals at the same time denying larger groups to use it. The lounge zone especially near the window was successful in attracting students; this area provided a relaxed place that was used for socializing. Yet

the learning commons in general was underused, and more effort is needed to encourage students to use it for collaborative group work. Talking and PC work were dominant activities, knowing that activities differed from one zone to another and even from one table to another in the same zone. Learning activities were seen to last longer than talking in all parts of the commons. More PCs equipped areas were needed, it was seen that students used desktop PCs wherever they found them in the learning commons.

The Mie University group study room was studied. It was an ordinary 150m^2 classroom that was reconfigured to provide a learning space. It included four zones; the social space, common area, workstation area and group study area. An observation was conducted for four hours on October 2011. The results showed that two horizontal movement spines were used; visitors of space used them smoothly except for two bottlenecks that appeared near the edges of the wall partition separating the common area from other parts of the room. In spite of its limited area, this room provided a variety of learning spaces to accommodate students' needs. The workstation area was most successful. This area was used by groups of students who used if for learning, socializing, eating and presentations. Its flexibility, enabling unbounded sight lines and giving users total control on environment contributed to this success. The social area was also successful; it attracted students who not only used it to relax but also to engage in many learning activities such as reading. The seat occupation ratio showed that this room was underused. Talking, observing and desk work were dominant activities. Collaboration happened when users participated in learning activities and communication equally.

The three case studies showed how learning spaces designs in campus are changing and particularly in libraries. It was seen that open, flexible configurations that provide continuous sight lines, proximity and users control of own environment were successful. Also, the learning commons must include soft and hard furniture, appropriate table configurations in addition to IT collaborative tools. The learning commons in libraries is expected to play an innovative role as a new kind of hybrid inspiring learning places in campus

CHAPTER FIVE 5

PROBLEM BASED LEARNING AS INNOVATIVE PLACE MAKER IN CAMPUS

The classroom design in campus was considered the most resilient to change. In spite of changes in students and faculty needs and shifts in pedagogies over the years, we still use traditional classrooms optimized for lecturing. Yet, recently the introduction of student-centered pedagogies is surely but slowly impacting classroom designs. This chapter tries to show how Problem Based Learning (PBL) can lead this change and play the role of the place maker in future campuses. Three case studies from Mie University in Japan will be discussed. The first and second cases are for a PBL class called 4-skills startup seminar, it was studied over two terms. The third case is a study of the first specialized PBL class in the department of architecture in Mie University. This class is called architectural planning and design 1. In addition, the results of a survey of students' opinions about PBL class will be shown. The aim of these studies was to understand the impacts of adopting PBL on classroom including students learning behaviors, patterns of space use and adaptations of the classroom space to cope with the processes of PBL.

5.1 CASE STUDY 1: STARTUP SEMINAR OF 2010

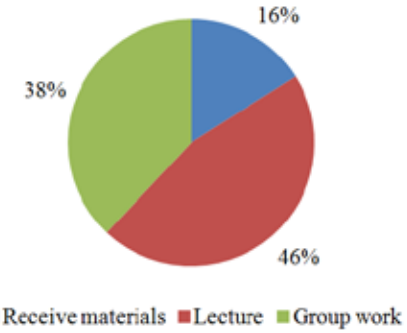
5.1.1 Introduction

As a part of Mie University's efforts to introduce PBL and other innovative pedagogies into its

curricula to achieve educational goals, the university established the Higher Education Development Center (HEDC) in 2005; the center promotes PBL by providing tutorials for faculty and facilitating the application of relevant innovative Information Technologies (IT) as well as E-learning initiatives. A course named “4 Skills-startup” seminar; which is a class based on PBL and is dedicated to the undergraduate students (freshmen) was chosen as a case study. This course aims to introduce the students to university life by equipping them with necessary skills and providing them opportunities to learn how to learn. It includes a selected combination of activities to develop IT application skills, effective communication, group work and problem solving.

The selected course was held once a week between 13:00-14:30. The course was held in a special classroom dedicated to courses applying PBL, yet its layout followed the traditional classroom configuration; a rectangular classroom, with rows of tables, movable chairs and 5 whiteboards, and the main projection screen at the center of the front wall. The class included 42 students who were divided into 14 groups of 3 students. The majority of students were males and the ratio of females to males was 1:4, yet an effort was made so that each group would include one female if possible. The faculty, assisted with two Teaching Assistants (TAs), managed the classroom and provided student support. The observed class consisted of three parts in terms of activity duration: receiving new materials and handouts, a lecture that explained some general ideas about the posed problem and gave some instructions, and then group work where students tackled the problem under concern (Fig.5-1-1).

A. The Class During Lecture Mode



B. Duration of Class Activities

Fig.5-1-1. About The PBL Class, 4-Skills Startup Seminar 2010

5.1.2 Methodology and Purpose

This study focuses on the university learning space; it aims to firstly shed light on PBL and its introduction into the curricula of Mie University. Secondly, it attempts to investigate the effects of applying nontraditional pedagogies on classroom spatial use, collaborative behaviors, and obstacles to learning posed by the currently available classroom layouts. Understanding how users would adapt their learning environment to cope with PBL, observing their actual collaborative behaviors, and grasping the process of problem solving would provide valuable feedback, which would lead to better designs of learning space so that it would create an ideal environment to promote the emergence of independent inquirers.

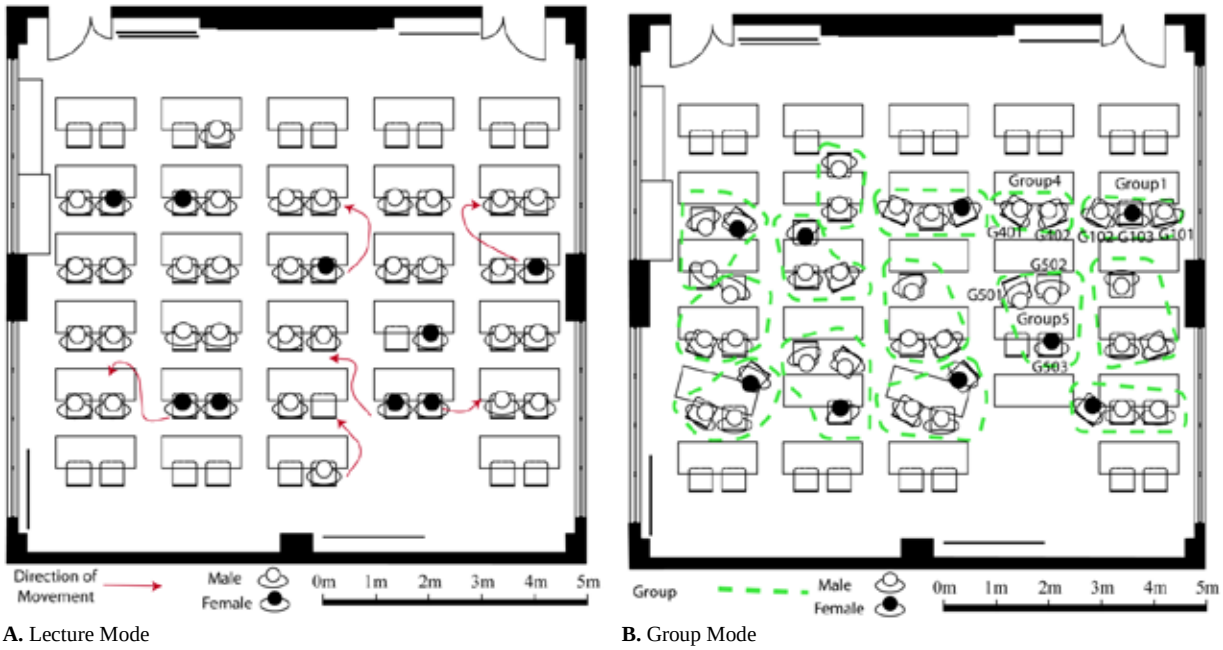
As a methodology, this study was based on qualitative methods. In the selected case study, classroom observations were held by video recording as a tool to capture the behaviors of students and faculty during the lecture hours. The survey was conducted on two separate days, on the 26th of April, 2010 and 9th of June 2010, from 13:00 to 14:30 covering an interval of 1.5 hours. Two DV cams and three web cams where used to cover 80% of available tables in the classroom. In addition, an observer attended the observed class sessions and used a digital camera to record important events, besides taking notes and recording own impressions.

The first survey included more time devoted to group work, and was therefore chosen for further analysis. The collected data was analyzed on two levels; first trying to grasp a general understanding of the events and issues seen to be important to apply PBL smoothly. Secondly, a more detailed analysis was conducted by tracking individuals within each group to understand each individual's activity profile and group interaction dynamics. The frequency and duration of activities were measured per individual for the entire period of group work. The charts that follow were based on these measurements.

5.1.3 Learning Space Use

5.1.3.1 Transition from Lecture to Group Work

The current configuration of class provides for traditional lecture based courses. The class is single focused; all students face the front with clear hierarchy of space, in addition to the use of parallel rows of tables, which are the characteristic of the traditional classroom. This was clear at the transition moments from lecture to group work. Students needed to move from their places, move tables and chairs to sit in more interaction-promoting configurations, and this transition created some sort of interruption of the learning process, because students required some time to settle down and go back to learning activities. Students tried to position themselves in a configuration that helps them to maintain eye contact with group members (Fig.5-1-2).



A. Lecture Mode **B.** Group Mode

Fig.5-1-2. Student Adaptation of The Classroom Environment for Group Work

Two-student groups -the third member of these groups was absent on the survey day- managed to achieve that by tilting chairs toward each others; students either sat beside each other or faced each other

over the table. The first configuration was seen to be more effective, because sitting beside each other facilitates sharing materials, conversation and collaboration. In addition, as PCs were introduced, students could still communicate and work on a PC simultaneously.

For the three-student groups, students tried to either tilt their chairs so that all three students could have continuous eye lines to enable them to have sustained conversations, or sat beside each others. While the first configuration was successful before introducing PCs, after which many students tried to sit beside each other to ensure better contribution to PC work. It is worthwhile to mention here that many students hesitated to move their chairs or to tilt tables unless they were encouraged to do so by either the faculty or one of the TAs; which indicates the strong authoritive image students hold for a teacher built through their previous schooling years. There is a need to stress freedom of action and movement of students in order to encourage them to take control of their own learning (Fig.5-1-3) (Khasawneh, F. A., Shibayama, Y., Kato, A., Mori, S. & Nagasawa, T., 2011).

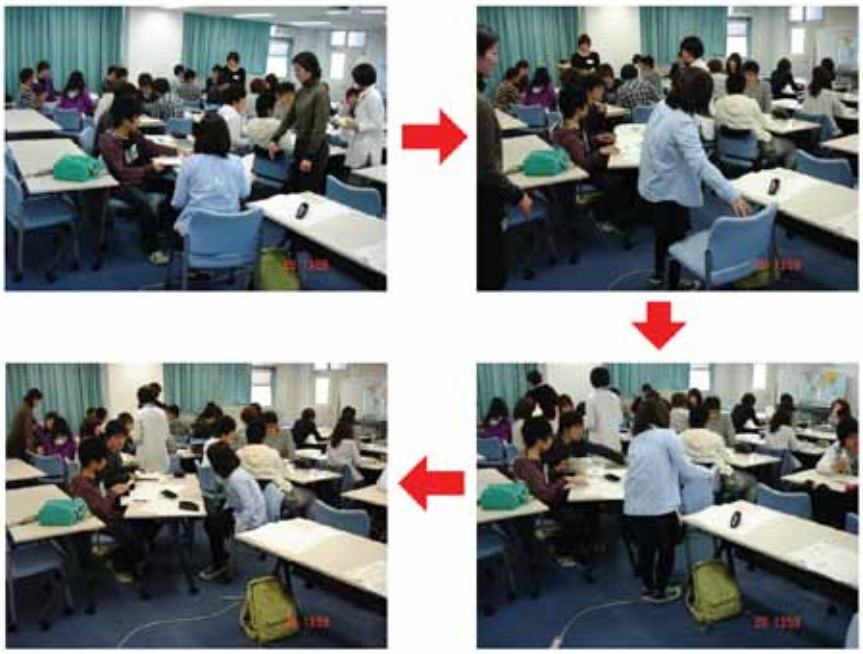


Fig.5-1-3. Moving Chairs and Tilting a Table After Instructed to Do So by Faculty, 4-Skills Startup Seminar 2010

5.1.3.2 Movement Spines

The classroom was stacked with tables, leaving narrow spines for movement; those spines seemed to be congested and when the transition was made to group work, many students moved their seats or tilted some tables. The new configurations, in addition to the students' belongings and electrical plugs on the floor, blocked some spines, which limited the freedom of movement for both the students and the lecturer who frequently moved around the groups. Moreover, it was noticed that the students needed to move around to see some resources posted on a whiteboard at the front of the classroom, but the lack of space and obstacles made it difficult. Several students were seen to move around other groups to interact and share points of view with other students before going back to their own groups to continue their discussions of the given problem (Fig.5-1-4).

A. Narrow Spines Blocked by Chairs, Electric Wires and Bags

B. Students Moved Frequently to See The Resources Posted on a Whiteboard

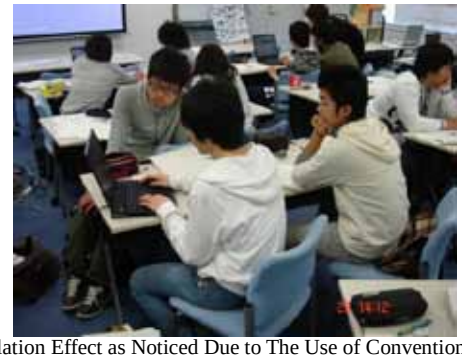
Fig.5-1-4. Movement in Class, 4-Skills Startup Seminar 2010

5.1.3.3 Information Technology Tools

Laptop PCs were distributed to each group by TAs after sometime of group work that mostly consisted of primary discussions of the given problem. This distribution interrupted ongoing

communication and wasted some time as students settled down again and went back to work. The use of such PCs in unsuitable configurations led to ineffectiveness; only one student could clearly see the PC screen, which created an uncomfortable atmosphere for collaboration and lowered the level of group engagement. As a consequence, some isolation effects were observed in some groups, where one member would be detached from the group, which hinders constructive collaboration (Fig.5-1-5).

A. Distribution of PCs by TA



B. Isolation Effect as Noticed Due to The Use of Conventional PCs

Fig.5-1-5. Information Technology Use, 4-Skills Startup Seminar 2010

It is worthy of mention that some students changed their seating locations in the group when the PC was introduced, to be able to see the screen and participate more effectively in the group activities; which led many students to sit beside each other, a configuration that does not help in maintaining eye contact and negatively affects interaction.

5.1.3.4 Possessions and Territoriality

Students required more table surface work area to spread their belongings, because many students used papers, books and the provided PCs. In many cases, students were seen to make use of two tables; they would interact with group members and then tilt their bodies towards the other table to write down notes or read and then go back to interact with group members again, which seemed to make collaboration a cumbersome task (Fig.5-1-6). Although some whiteboards were available, they were not

used, but instead students made use of A3 papers and some Post-it notepapers. Students would engage in interaction and brainstorming regarding the posed problem and use such papers to share their thoughts and develop their ideas. Noise level within the PBL classroom was higher than traditional classes, all those dynamic interactions and lively movements of students created a different image of learning as being an enjoyable experience, although the lecturer was sometimes required to talk louder to be heard, classroom noise level seemed to be acceptable (Khasawneh, F. A., Shibayama, Y. & Kato, A., 2011).

Fig.5-1-6. Using Two Tables Indicating a Need for a Larger Table Surface Work Area, 4-Skills Startup Seminar 2010

5.1.4 Learning Behaviors

5.1.4.1 Prominent Students Activities

The collected data was analyzed in more detail; each individual was tracked for the entire group work period. The focus was on understanding the collaborative behaviors of students. The results of three groups will be discussed. All collaborations consisted of a combination of activities including

communication, PC use, observation, reading, writing and moving. The most important activity was conversing among the group; as such communication would create a link between group members, facilitate sharing relevant tasks and guarantee smooth collaboration. Communication with the teacher was noticed to be marginal, except for the case of a female member of group 5 (G503), which had more communication with the teacher compared to communication among group. Limited communication with the teacher helps to enforce independent learning and the teacher would be seen more as a facilitator rather than an authoritive source of knowledge. The frequency of activities differed among individuals; within each group, PC use was conducted more frequently by one of the group members (G101, G401, G502), and this may be attributed to the layout that enabled one user to easily handle the PC while others participated every once in a while. The observation activity, which is a combination of thinking, watching and listening to instructions, seemed to occur evenly within all group members. Most users, except for one (G502), left their seats and moved to see resources or to interact with others (Fig. 5-1-7).

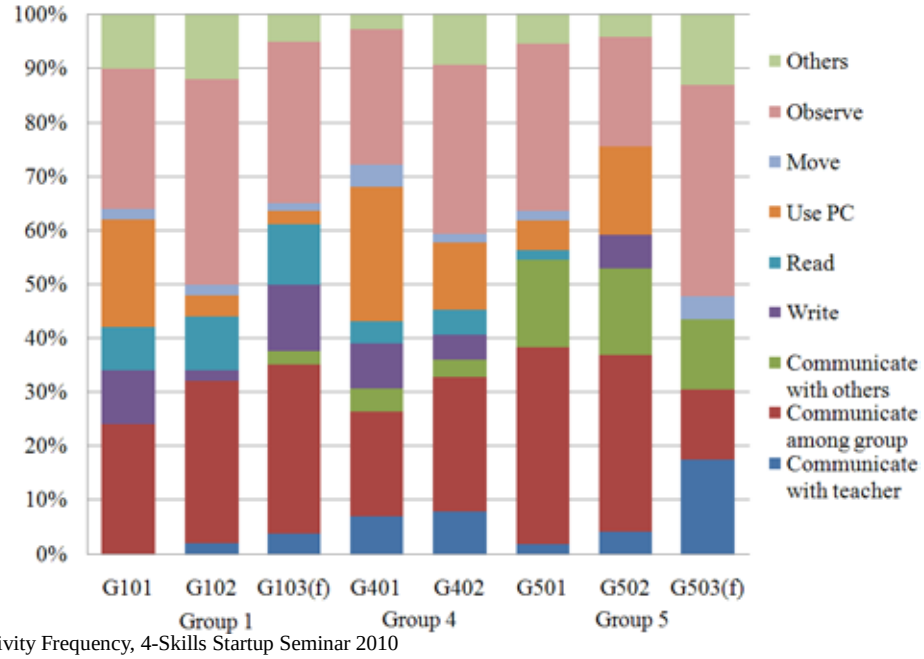


Fig.5-1-7. Activity Frequency, 4-Skills Startup Seminar 2010

The collaborations consisted of many repetitive activities with each activity lasting for a relatively short time; the average activity duration for all selected individuals was 40 seconds, which demonstrates

the lively nature of collaboration. Communication activity was mostly related to observing and using a PC; an individual would communicate with other group members, then observe and think or work on the PC and then go back to communicate with group members. When a person is more engaged with the group, his/her activities will be more frequent and diverse, although communication with group members would seem indispensable.

5.1.4.2 Effective Collaboration and Activity Profiles

The groups with effective collaborative behaviors are thought to make use of its individuals' capabilities to achieve the intended learning goals, the members of a group would participate in the learning activities in equal shares, and more importantly they would communicate with each other with almost similar duration. Group 1 is an example of an ideal case, where all members took part evenly in communication, while both Groups 4 and 5 exhibited unbalanced patterns of communication; particularly, one member in Group 5 (G503) had a low level of communication. Further investigation showed that this student (a female) did not participate at all in collaboration activities, but she spent most of the time just watching silently, looking at her watch continuously as if she was waiting for the class to end as soon as possible (Fig.5-1-8).

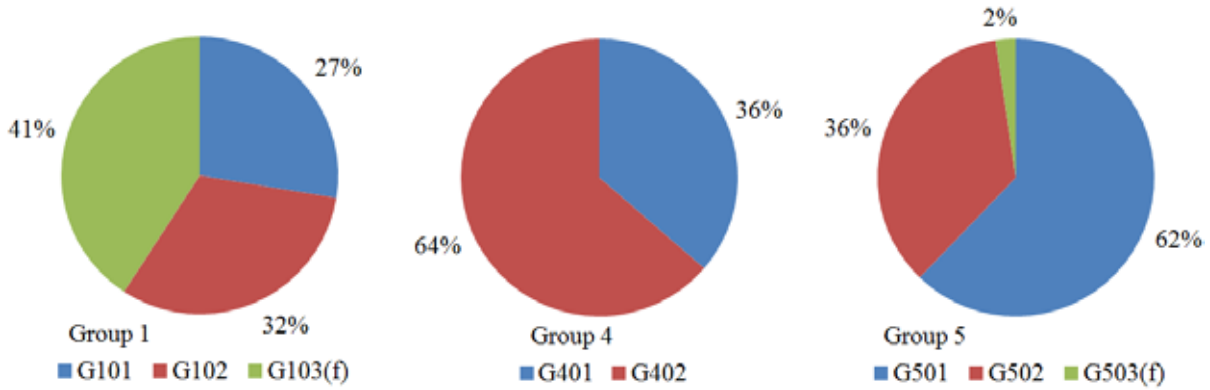
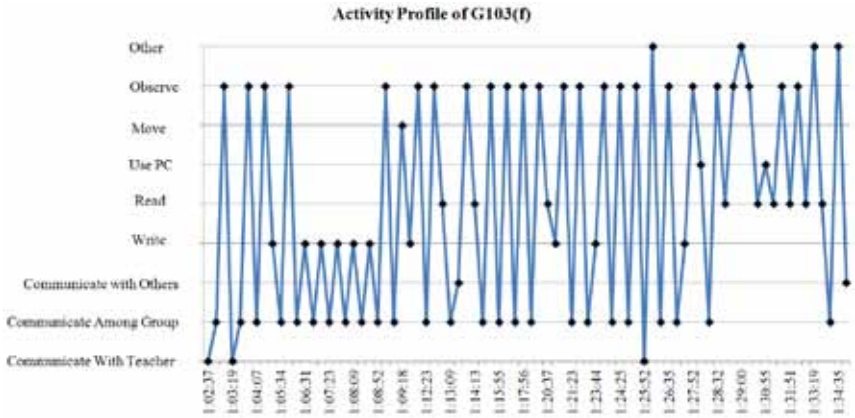
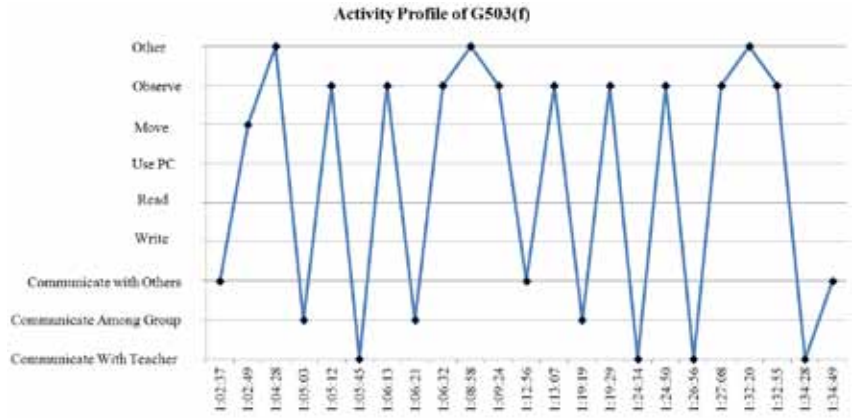


Fig.5-1-8. Cumulative Communication Duration per Individual For Selected Groups, 4-Skills Startup Seminar 2010

Studying the activity profile within time for two female members from Group 1 (G103) and Group 5 (G503), showed that a student with an effective collaboration profile would show a highly repetitive pattern of learning activities, less interruption, and communication with group members would be dominant and mostly related to other activities either by following them or preceding them as the case in Group 1 (G103). In the start of the group work period, the female student of Group 1 (G103) communicated with other members who tilted their seats toward her. She also took the initiative in learning by using A3 papers to record the results of the group's brainstorming every once in a while, as seen in her profile. Later on, when the PC was introduced she changed her seat to sit beside other group members to continue active contribution to the group's problem solving task by using the PC occasionally; a similar level of engagement is seen as desirable in all students to guarantee achievement of the PBL class learning goals (Fig.5-1-9).



A. Activity Profile of Female G103 from Group1



B. Activity Profile for Female G503 from Group5

Fig.5-1-9. Differences in Activity Profiles between G103 and G503, 4-Skills Startup Seminar 2010

5.1.5 Conclusion

A PBL classroom design should meet the needs of PBL, which places focus on students rather than on the lecturer. The layout should be different from traditional class designs that are based on rows of tables and gives the teacher more space, as a reflection of the traditional learning methods; such traditional layouts hinder the effective application of PBL courses. Innovative PBL classroom designs can make use of nontraditional shapes by avoiding rectangular or square shapes and by canceling the front and back sides of the space to emphasize neutralization of the teacher's authority. In addition, such innovative classrooms need to stress flexibility to facilitate transition between different learning modes with minimum interruption to the learning process.

All possible student learning preferences and needs should be catered for, in addition to using whatever means necessary to encourage collaboration and generally increase the level of student engagement with group work and class activities. Table configurations that are optimized for group work and collaboration are an indispensable part of a PBL classroom; such table configurations would guarantee continuous sight lines between students and provide sufficient table work areas to collaborate and use different necessary tools. Moreover, the classroom should have sufficient space to provide ease of movement for the lecturer and students alike. In addition, the class should be equipped with tools and IT resources to facilitate sharing knowledge.

Effective collaboration can be achieved by promoting group work skills that stress the need for equal participation in learning activities, as well as providing appropriate configurations that induce communication. The group work dynamics and collaboration skills should be emphasized and monitored by the faculty or TAs. For instance, observing a tendency by one of the group members to control communication or to deny others from participating in collaboration requires direct intervention by the faculty to highlight mistakes and provide chances for healthy group work practices. Finally, a PBL classroom needs to enable students to have more control of their learning environment, which

would provide more comfort and consequently less distractions and more engagement in the learning.

5.2 CASE STUDY 2: STARTUP SEMINAR OF 2011

5.2.1 Introduction

A second study of the "4-Skills startup seminar" PBL class was conducted during the spring of 2011. The course was held in the same special PBL classroom that actually followed traditional classroom organization and was optimized for lecturing rather than group work and other PBL processes. Several class sessions were observed, this time DV cams only were used to capture students learning behaviors especially during group work. The observed classes consisted of two parts in terms of activity duration: a lecture that explained some general ideas about the posed problem and gave some instructions, and then group work where students tackled the problem under concern. Also, some time was consumed by transition from lecture mode to group work.

The results of the first study of the startup seminar of 2010 was discussed with the course teacher and it was also presented to a group of faculty who belonged to the Higher Education Development Center (HEDC) in Mie University, both meetings provided valuable feedback. The faculty introduced many changes in the management of the startup seminar of 2011; care was made to organize students into groups and place all members of a specific group in adjacent seats in the classroom from the start of class aiming to minimize transition time, the faculty informed students that they have the freedom to bring and make use of the laptop PCs found in the classroom closet, also the faculty tried to encourage students to take an active role in learning even during the lecture mode in an attempt to increase students engagement levels.

5.2.2 Methodology and Purpose

This paper focuses on the university learning space; it aims to firstly shed light on PBL and its introduction into the curricula of Mie University. Secondly, it attempts to investigate the effects of applying nontraditional pedagogies on classroom spatial use, collaborative behaviors, and obstacles to learning posed by the currently available classroom layouts. Understanding how users would adapt their learning environment to cope with PBL, observing their actual collaborative behaviors, and grasping the process of problem solving would provide valuable feedback, which would lead to better designs of learning space so that it would create an ideal environment to promote the emergence of independent inquirers.

As a methodology, this study was based on qualitative methods. The classroom observations were held by video recording as a tool to capture the behaviors of students and faculty. The observation was conducted during the 90 minute class sessions on two separate days during the spring term of 2011 (Table.5-2-1).

Table.5-2-1. The Conducted Observation Sessions in 2011 PBL Class, Mie University

Item	Date	Session Duration (min)	Students' No.			Female to Male Ratio	No. of Supervisors			Supervisor to Students Ratio	Lecture Mode		Group Work Mode		Groups Formations as Observed			
			Males	Females	Total		Faculty	TA	Total		Duration (min)	Percentage	Duration (min)	Percentage	Pairs	3 members' Group	4 members' Group	Total
1st Observation	2011/6/22	90	28	8	36	1:4	1	1	2	1:18	56	62%	34	38%	1	10	1	12
2nd Observation	2011/6/29	90	28	10	38	1:3	1	1	2	1:19	48	53%	42	47%	2	11	0	13
	Sum	180								**Average**	52	58%	38	43%				

In addition, an observer attended the observed class sessions and used a digital camera to record important events, besides taking notes and recording own impressions. The second observation included more time devoted to group work, and the use of DV cams enabled covering 100% of tables, therefore it was chosen for further detailed analysis. The collected data was analyzed on two levels; first trying to grasp a general understanding of the events and issues seen to be important to apply PBL smoothly. Secondly, a more detailed analysis was conducted by tracking individuals within each group to

understand each individual's activity profile and group dynamics. The frequency and duration of activities were measured per individual for the entire period of group work.

5.2.3 Learning Space Use

5.2.3.1 Transition From Lecture to Group Work

The current configuration of class provides for traditional lecture based courses. This was clear at the transition moments from lecture to group work. Some students needed to move from their places, move tables and chairs to sit in more interaction-promoting configurations. The average transition time was 1.37 minutes. This transition can be seen as an interruption of the learning process, because students required some time to settle down and go back to learning activities. Students tried to position themselves in a configuration that helps them to maintain eye contact with group members (Fig.5-2-1).

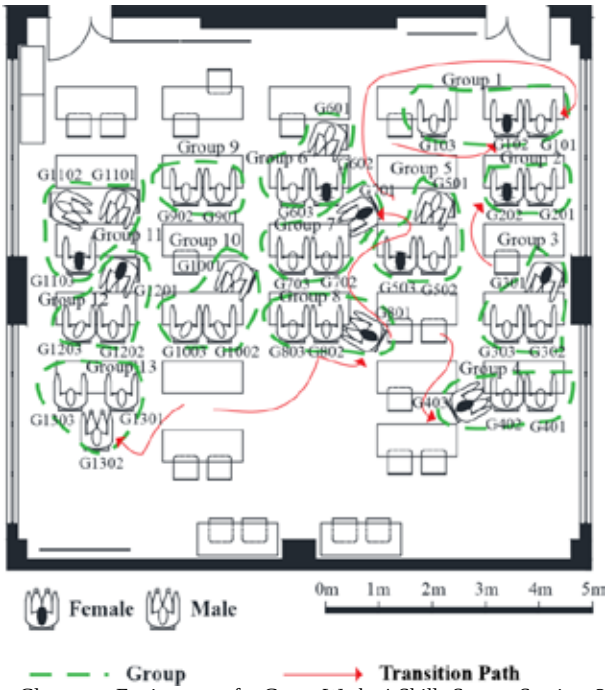


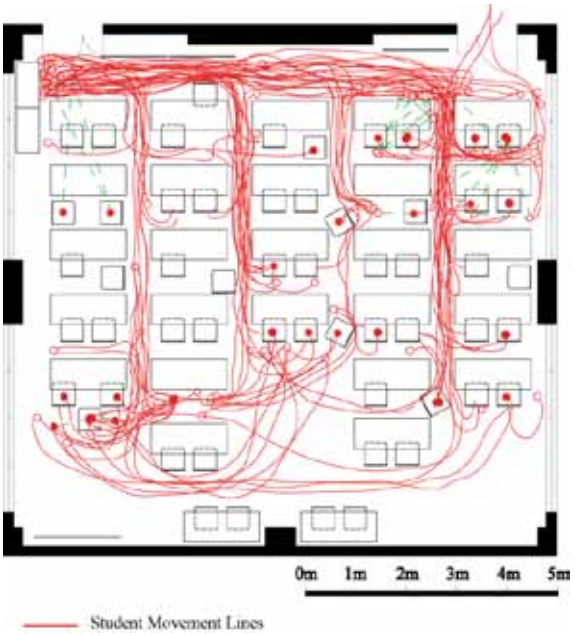
Fig.5-2-1. Student Adaptation of The Classroom Environment for Group Work, 4-Skills Startup Seminar 2011

Two-student groups -third member of these groups was absent- managed to achieve that by tilting chairs toward each others; students either sat beside each other or faced each other over the table. The first configuration was seen to be more effective, because sitting beside each other facilitates sharing materials, conversation and collaboration. In addition, as PCs were introduced, students could still talk and work on a PC simultaneously. For three-student groups, students tried to either tilt their chairs so that all three students could have continuous eye lines to enable them to have sustained conversations, or sat beside each others. While the first configuration was successful before introducing PCs, after which many students tried to sit beside each other to ensure better contribution to PC work. In four-student groups, students managed by tilting their chairs to face other members, but using the PC effectively was difficult. Many students hesitated to move their chairs or to tilt tables unless they were encouraged to do so by either faculty or TA; which indicated that students considered the classroom environment to be a property of teacher and as students they had no control over it. There is a need to stress freedom of action and movement of students in order to encourage them to take control of their own learning.

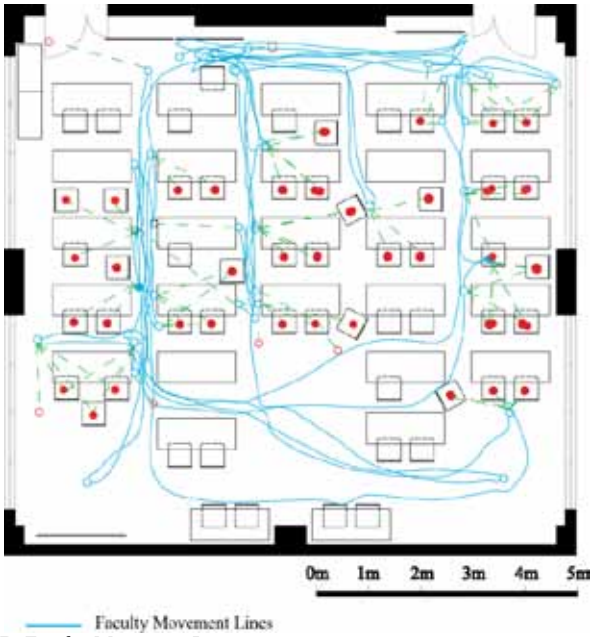
5.2.3.2 Movement Spines

The classroom was stacked with tables, leaving narrow spines for movement; those spines seemed to be congested and when the transition was made to group work, many students moved their seats or tilted some tables. The new configurations, in addition to the students' belongings and electrical plugs on the floor, blocked some spines, which limited the freedom of movement for both the students and the lecturer who frequently moved around the groups. Students moved to bring the PC and take it back to the closet; this kind of movement was prominent at the beginning of group work and the end of class. Many students moved almost at the same time, moving through the unblocked vertical spines and then through the longitudinal spine at the front of class and accumulated around the PC closet. It was also

noticed that some students moved to talk with faculty and TA. In addition, several students moved to see what other groups are doing. The faculty moved constantly between all groups (Fig.5-2-2).



A. Student Movement Lines



B. Faculty Movement Lines

C. TA Movement Lines

Fig.5-2-2. Users Movement Lines, 4-Skills Startup Seminar 2011

All groups were in contact with the faculty at least once. The average interaction time between the faculty and members of a group was 2.33 minutes. The TA started by moving between several groups but eventually ended up staying for a long time at Group 11. The average interaction time between the

TA and members of a group was 2.54 minutes. The users of space were seen in many occasions to cooperate by waiting for others to clear a movement spine before using it to move to their destination.

5.2.3.3 Information Technology Tools

The task of bringing the laptop PC from the classroom closet and when to use it was left for each group, this made students feel and practice more control on their learning. Five groups brought the PC at the start of class, five other groups brought it at the start of group work, two groups brought it after a while of group discussions and only one group - Group 11 - did not use a PC at all. Also, it was noticed that Group 2 used two PCs and its work was based on computer assisted collaboration.

In only six groups, students tried to place themselves in an organization that enables them to see the PC screen by sitting beside each other, while in other cases only two users could see the PC screen clearly while the third member twisted his head and tilted his body occasionally to see the screen, this uncomfortable option lead to short periods of involvement in PC usage or none at all.

The use of PCs in unsuitable configurations led to ineffectiveness; only one student could clearly see the PC screen, which created an uncomfortable atmosphere for collaboration and lowered the level of group engagement. As a consequence, some isolation effects were observed in some groups, where one member would seem to be detached from the group, which hinders constructive collaboration.

5.2.3.4 Possessions and Territoriality

Students' possessions included bags, papers, books, pencil cases, fans, handkerchiefs, hats, electronic dictionaries, mobiles and watches. Bags were used by most students as territorial markers

during both the lecture mode and the group work mode. During the lecture mode, students placed their bags around their chairs or tables particularly in the movement spines. Also, it was noticed that many students placed their bags over the table and left it there during the whole lecture period, this may be related to using such action to clarify own territory as the tables used are shared between two users.

During group work mode, students continued to place their bags near their chairs or tables and many placed their bags over the table. In many cases a student tilted his body toward other group members' tables, yet he placed his bag and other belongings on another table to declare ownership. In fact this additional table was not used by him at all, he engaged in interactions and collaborations while making use of the group shared table.

Some students were noticed to use some personal items to personalize their occupied zone of a shared table; this was mostly done by spreading belongings such as a watch, hat, handkerchief, mobile or even a fan. There is a need to consider providing places for students to store their bags and other items where it will not cause disruption of the nearby movement spines. Students need to feel in control of their learning environment and to have their own territory even during group work, this can be achieved by providing enough table surface area to be shared by all group members; the ideal case would be to give each student his own movable disk that is flexible enough to be organized into interaction inducing organizations if needed.

5.2.4 Learning Behaviors

5.2.4.1 Prominent Student Activities

All collaborations consisted of a combination of activities including talking, PC use, observation, reading, writing and moving. The most important activity was talking among group; as such interaction

would create a link between group members, facilitate sharing relevant tasks and guarantee smooth collaboration. Talking with the teacher was noticed to be marginal, except for the case of a female member of Group 11 (G1103). Limited talking with the teacher helps to enforce independent learning and the teacher would be seen more as a facilitator rather than as an authoritive source of knowledge.

The frequency of activities differed among individuals; within each group, PC use was conducted more frequently by one of the group members (G101, G302, G401), and this may be attributed to the layout that enabled one user to easily handle the PC while others participated every once in a while. The observation activity, which is a combination of thinking, watching and listening to instructions, seemed to occur within all group members (Fig.5-2-3).

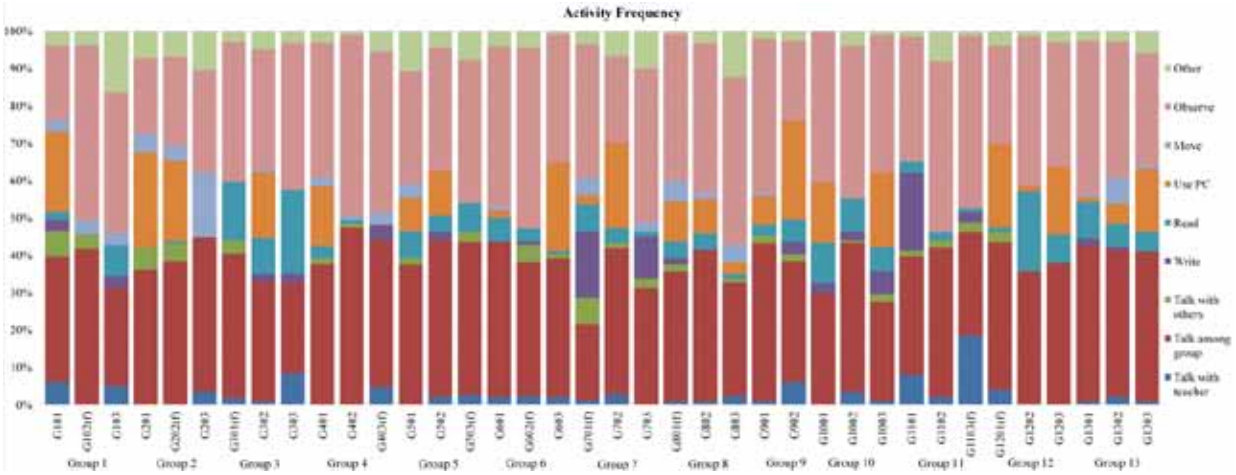


Fig.5-2-3. Activity Frequency, 4-Skills Startup Seminar 2011

In terms of activity duration per individual, it is important to point out here that the understanding of activity duration is necessary to clarify the nature of learning behaviors and the effectiveness of collaborations. Observation, talking among group and PC usage were dominant activities in terms of duration (Khasawneh, F. A., Kato, A., Mori, S. & Nagasawa, T., 2012).

Observation activity had relatively more duration among most students. Student G1102 had the highest observation duration. 40% of the female students were among those who had the highest observation activity duration as seen in the case of students G102 (f), G503 (f), G602 (f), G1103 (f). It was noticed that all the members of group 11 had longer observation duration. Students with more

diversified activities had less observation duration such as student G101. Student G103 spent more time reading because his group talked first and divided the tasks, his task was to read the available materials and take notes. Student G203 talked more than other students, yet he left early for the library leaving the other two members of his group to work alone. Within each group one member had longer duration of PC usage except for Group 2 where two members had relatively longer durations of PC usage because they used two PCs unlike other groups who used only one PC (Fig.5-2-4).

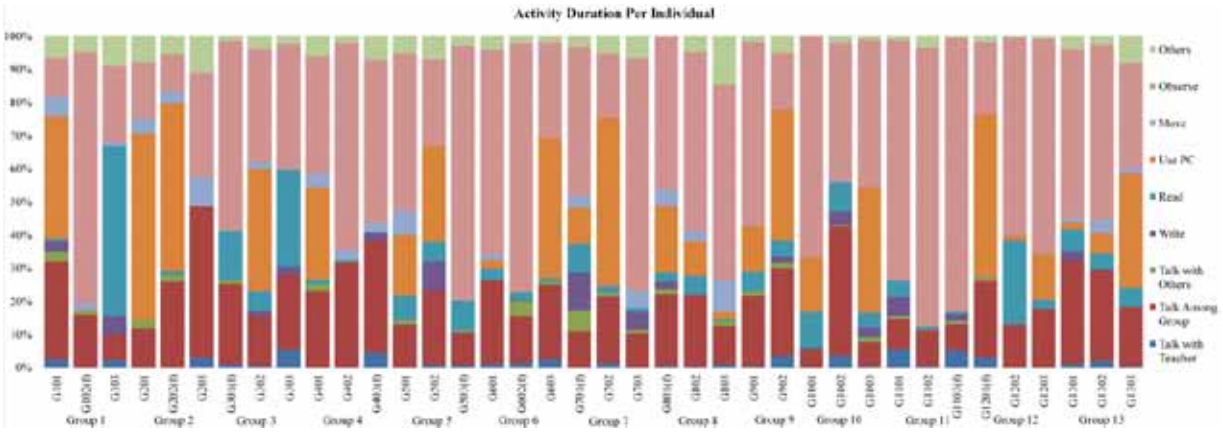


Fig.5-2-4. Activity Duration, 4-Skills Startup Seminar 2011

The average activity duration was 30 seconds, which demonstrates the lively nature of collaboration. Talking activity was mostly related to observing and using a PC; an individual would talk with other group members, then observe and think or work on the PC and then go back to talk with group members. When a person is more engaged with the group, his/her activities will be more frequent and diverse, although talking with group members would seem indispensable.

In terms of cumulative activity duration; observation constituted 48% of students' cumulative activity duration, followed by talk among group with 19% and then PC use with 16%. Sometimes, having long intervals of observation that is uninterrupted by other activities, might be an indication of social loafing. A faculty or TA needs to observe members in a group to make sure that all students are involved in group work; he may interfere to encourage some members to participate or to urge other dominant students to give chances for other students to contribute more in group work.

5.2.4.2 Effective Collaboration and Activity Profiles

The groups with effective collaborative behaviors are thought to make use of its individual capabilities to achieve the intended learning goals, the members of a group would participate in the learning activities in equal shares, and more importantly they would talk with each other with almost similar duration (Khasawneh, F. A., Shibayama, Y. & Kato, A., 2012).

Group 3 is an example of an ideal case, where all members talked among group evenly, while both Groups 1 and 10 exhibited unbalanced patterns of talking among group; particularly, one member in Group 10 (G1001) had a low level of talking among group. This student (a male) did not participate at all in collaboration activities, but he spent most of the time just watching silently, or reading some papers, he later started to use the PC and become more engaged by the late stages of group work (Fig.5-2-5).

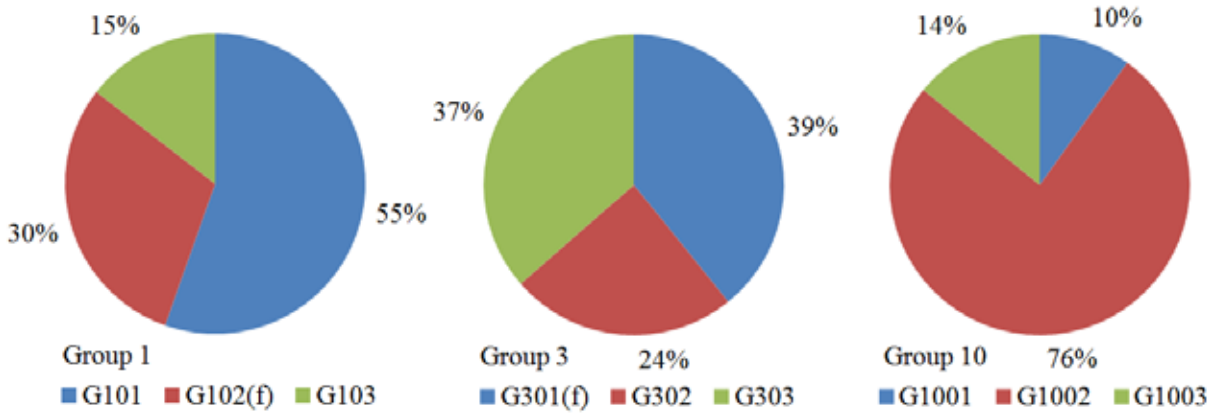
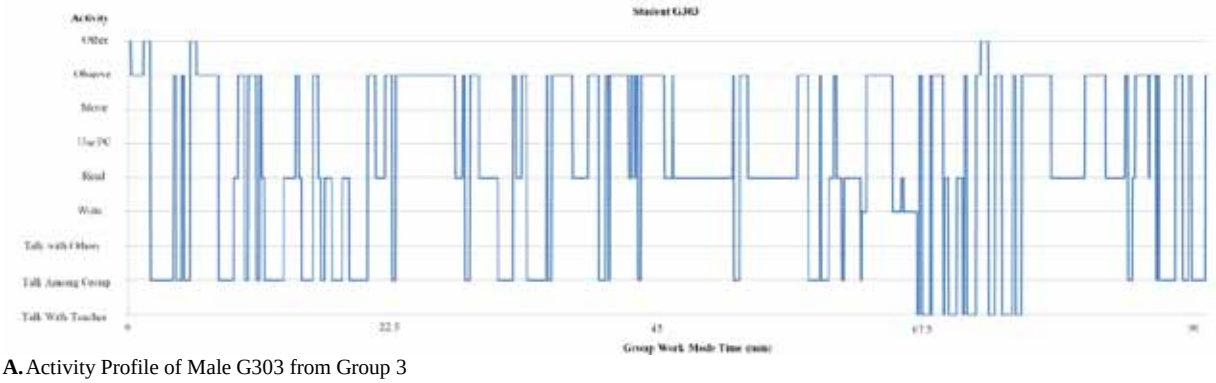


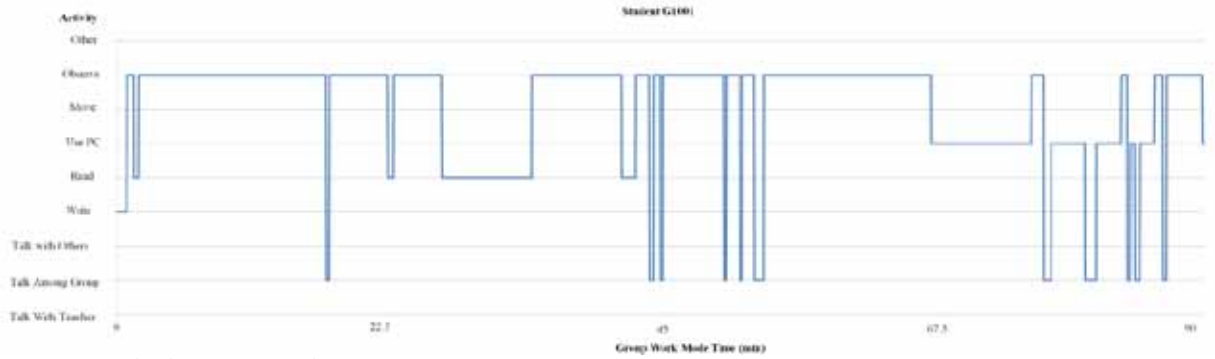
Fig.5-2-5. Cumulative Communication Duration per Individual For Selected Groups, 4-Skills Startup Seminar 2011

Two types of activity profiles were made. The first was based on activity frequency and the second was based on activity duration. Two examples of activity duration profiles will be shown. Studying students activity profiles showed that a student with an effective collaboration profile and high engagement would show a highly repetitive pattern of learning activities, less interruption, talking with group members would be dominant and mostly related to other activities either by following them or preceding them as in Group 3 (G303). while a student of less effective collaboration profile and lower engagement would exhibit less repetitive patterns of learning activities as in Group 10 (G1001) (Fig.

5-2-6).



A. Activity Profile of Male G303 from Group 3



B. Activity Profile for Male G1001 from Group 10

Fig.5-2-6. Differences in Activity Profiles between G1001 and G303, 4-Skills Startup Seminar 2011

5.2.4.3 Engagement

Generally speaking the PBL class had a high level of student engagement. Most of the students arrived to the classroom at least 10 minutes before the start of class. The two modes of the class were noticeably different in terms of students' engagement. The lecture was observed to be less engaging to students; 47% of students were noticed to fall asleep at least once.

The group work mode was more engaging to students; almost all group members participated enthusiastically in group work and discussions. The higher levels of engagement in group work are due to the social facilitation effect which causes all group members to try to work harder and put more effort in the presence of other group members. Lower levels of engagement among few students were seen

occasionally, when such students were sitting in an uncomfortable organization. Students with lower levels of engagement, showed social loafing behaviors; they depended on other group's members to do their part of work.

5.2.5 PBL as a Place Maker

Place making in campus planning and design helps to give the total image of campus, on the micro scale it refers to the physical components used in a certain space or building to define it, giving it its unique character (Dober, 2003). The concept of place making exceeds the physical characteristics to include other issues such as the social meaning of a space experienced by its habitual users. Results of this study demonstrate a misfit between current learning environments -particularly classroom layouts- and the student-centered learning pedagogies and namely PBL. The application of PBL in various academic disciplines would require creating new classrooms and other supportive facilities such as libraries that support group work and collaboration. Some of the physical place making attributes that constitute the characteristics of new PBL classrooms can be inferred by the research findings. The shape of a classroom needs to avoid the traditional rectangular hierarchical organization; it can be a square with a centralized faculty station, so that the faculty may be able to monitor all groups easily. The hierarchy of space can be cancelled by creating multiple focal points, unlike the focus on the front in the traditional classroom. Flexibility is important; this can be reflected in the movable furniture pieces with reasonable sizes to ease transition between all modes including lecture, group discussion and group work. Spaciousness and openness is another indispensable attribute, this permits students to have continuous unbounded sight lines, and wide enough movement spines to facilitate moving. The use of table configurations with enough work space with a place to store belongings such as bags is a plus; this would help to satisfy the students needs of privacy, territoriality and creates a comfortable space to focus

on learning through social interaction with others. PBL as a place maker applied in designing new academic spaces would pave the way to create memorable and innovative learning environments in campus. More universities here in Japan and all over the world are introducing PBL courses; PBL is destined to be a vital place maker in future universities.

5.2.6 Conclusion

A PBL classroom design should meet the needs of PBL, which places focus on students rather than on the lecturer. Traditional class room layouts based on rows of tables hinder the effective application of PBL courses. Classrooms need to stress flexibility to facilitate transition between different learning modes with minimum interruption to the learning process.

Table configurations that are optimized for group work and collaboration are an indispensable part of a PBL classroom; such table configurations would guarantee continuous sight lines between students and provide sufficient table work areas to collaborate and use different necessary tools. In addition, the class should be equipped with tools and IT resources to facilitate sharing knowledge.

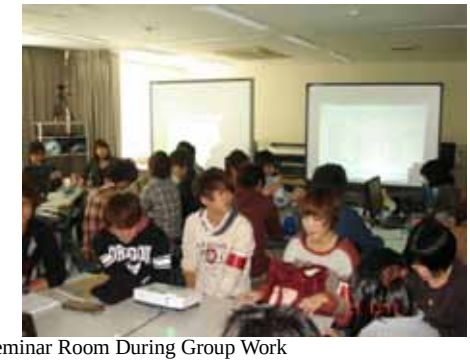
Effective collaboration can be achieved by promoting group work skills that stress the need for equal participation in learning activities, as well as providing appropriate configurations that induce communication. The group work dynamics and collaboration skills should be emphasized and monitored by the faculty or TAs. Finally, a PBL classroom needs to enable students to have more control of their learning environment, which would provide more comfort and consequently less distractions and more engagement in the learning process leading to innovation.

5.3 CASE STUDY 3: ARCHITECTURAL PLANNING AND DESIGN 1

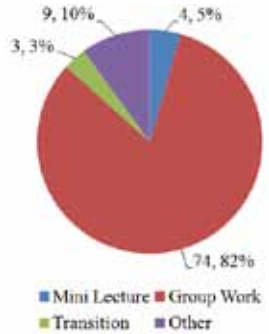
5.3.1 Introduction

Architectural planning and design 1 was chosen as a case study. It was the first specialized PBL class to be held in the department of Architecture at Mie University starting from the fall of 2010. It is a class for first year students; aiming to introduce them to basic concepts in design and architectural planning, as well as familiarizing them with famous architects. This course relied on a series of mini lectures and videos of selected topics that formulate a posed problem, students would tackle the problem to create knowledge and learn through group work and collaboration.

During the observation of November 21, 2011, the mini lecture took only 4 minutes, group work constituted 74 minutes, 9 minutes were taken by other activities and students needed 3 minutes as transition time. The class included 43 students; 10 females and 33 males, ratio of female to male students was 1:3. Students were divided into six groups; only one group had eight members while the others had seven members. The members of Group F were all males. A faculty facilitated the class aided by two Teaching Assistants (TAs) (Fig.5-3-1).



A. Seminar Room During Group Work



B. Duration of Class Activities

Fig.5-3-1. About The Sixth Observation Session, Architectural Planning and Design 1, 2011

5.3.2 Methodology and Purpose

This study gives insight into campus learning space use and students learning behaviors in a PBL class. The objective is three fold; first to identify the prominent patterns of space use and students learning behaviors during problem solving in small groups; second to define effective collaboration; and third to study the effects of cognitive diversity -embodied by the diversification of group members learning styles- on students' engagement levels and their preferences of specific learning behaviors.

As for methodology, qualitative methods were applied. Video recording was used to collect data. Structured observation covered 540 minutes over two terms, each session was formed of 90 minutes of classroom events observation. More focus was put on the observation done on November 21, 2011 in this study, because all students attended class, it had relatively long group work time and the study was done in a more rigorous manner. The analysis was based on tracking all students' behaviors and space use during group work. Frequencies and durations of activities of students were extracted from video forming the basis of analysis.

The Learning Style Inventory (LSI) (see Kolb, 2007) was used to find learning styles of all students in class. An effort was made to include students having the four learning styles within each group as much as possible to provide an acceptable amount of cognitive diversity during group formation phase. Feedback from this study can play a pivotal role in promoting the design of better classrooms optimized for group work and collaboration which form the backbone of PBL.

The LSI results revealed that students' distribution among learning styles was unbalanced; Accommodating style formed 26%, Diverging style formed 32%, Converging style formed 7% and Assimilating style formed 35%. Only 3 students had the Converging style, therefore, only three groups included members with the four learning styles; Groups A, E and F. All students wore colored arm bands to indicate their respective learning style.

5.3.3 Learning Space Use

5.3.3.1 Layout Configuration

The class was conducted in two adjacent rooms; an ordinary classroom with a traditional layout of rows of tables and chairs and a seminar room that shares the same space with a PC laboratory (Fig.5-3-2 & Fig.5-3-3). Students were encouraged to use the library of the department of architecture -found on the same floor- to support their learning needs. Both rooms were reconfigured to accommodate six small groups each having seven to eight students, the class was partially reconfigured to provide for only two groups. The modified layout tried to provide a collaborative environment enriched with IT tools; each group sat on a rectangular table that faced a whiteboard, screen or smart board, used a desktop PC connected to a projector and many students used revolving chairs especially in the seminar room.

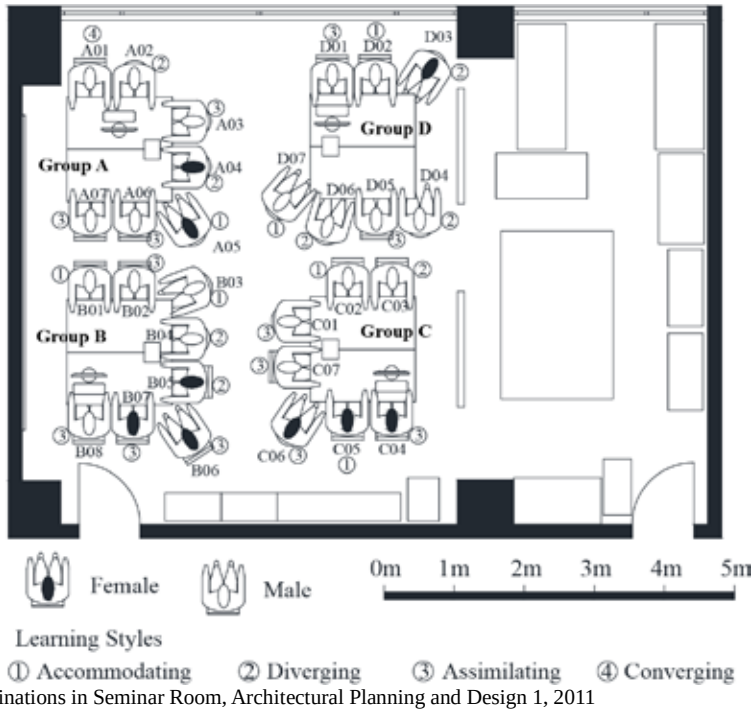


Fig.5-3-2. Groups Combinations in Seminar Room, Architectural Planning and Design 1, 2011

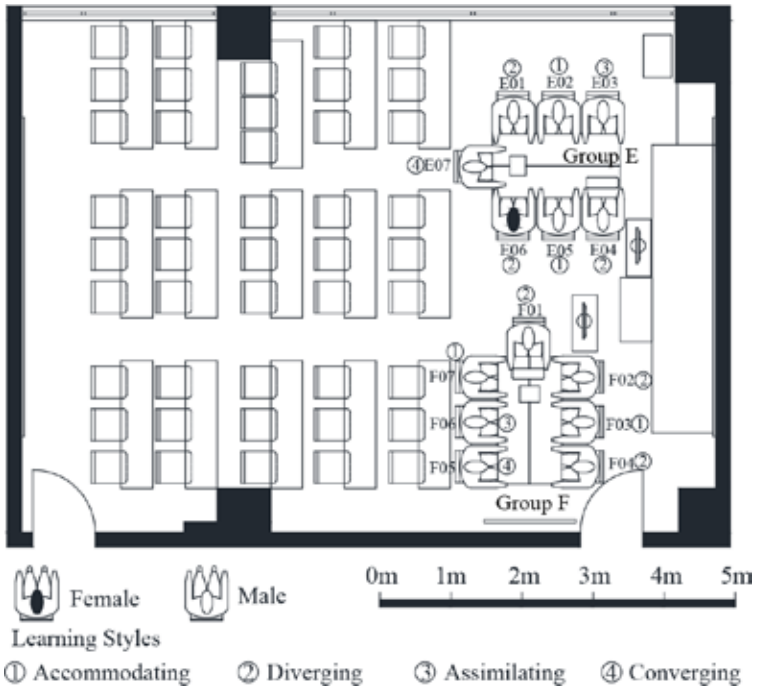


Fig.5-3-3. Group Combinations in Classroom, Architectural Planning and Design 1, 2011

5.3.3.2 Movement Spines

Students' movement was confined to the area surrounding their tables during group work. The majority of student movements happened at the start of group work when students needed to move to their respect group's table found either in the classroom or in the seminar room, and at the end of class when they left. Students' movement differed according to group; some students were seen to move to use the PC in order to do a presentation, or to contribute in a shared task as in Groups A and B. while in many other groups students moved rarely. Also, because the PBL class was conducted in two adjacent rooms, the corridor leading between the two rooms witnessed high levels of movement; by students at the start and end of group work, and by faculty and TAs who needed to move back and forth between both rooms during group work. The faculty moved between all groups, watching what their members were doing, asked questions or gave comments and tips. The faculty talked with all groups once or twice.

The average talking time between faculty and group members was 4.52 minutes. The two TAs moved less and talked less with groups, the average talking time between the TAs and group members was 1.37 minutes. The intentional policy of both the faculty and TAs to minimize talking with students during group work by following mostly the observer stance, helped to send a clear message that the faculty and TAs are only facilitators and that students themselves are the creators of knowledge and should be responsible for their own learning.

Generally speaking, both rooms had relatively narrow movement spines which made movement difficult. In the seminar room, the most congested movement spine was the central vertical spine which was wider than other spines, followed by the horizontal spine near the door and then comes the vertical spine near the door which witnessed dense movement near Group B while movement at its end was minimal (Fig.5-3-4).

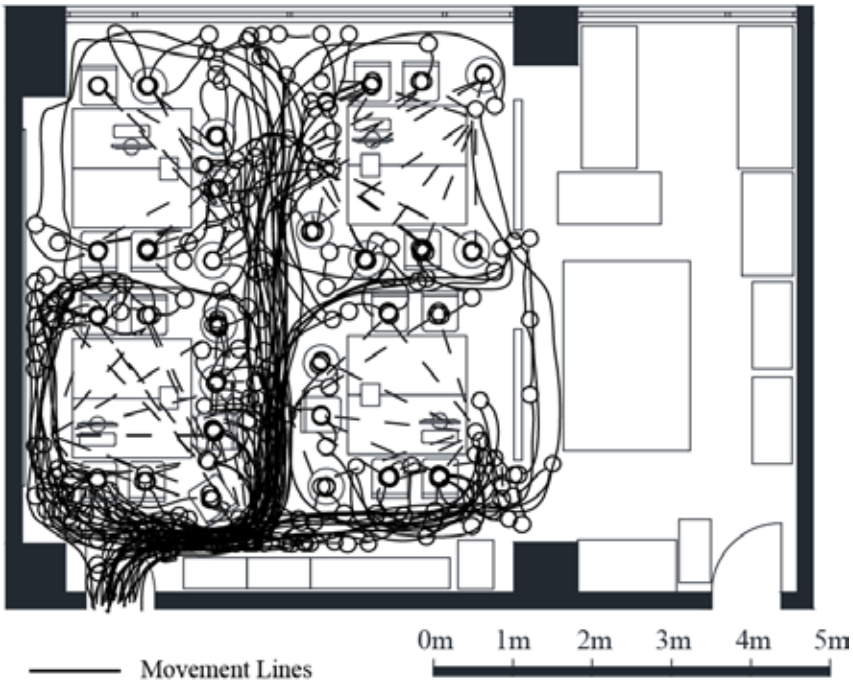


Fig.5-3-4. Movement Spines in Seminar Room, Architectural Planning and Design 1, 2011

Because projectors were used, students tried to avoid using movement spines in front of screens, yet due to limited space, many users were forced to use such spines to avoid bottle necks especially around Group B. The central horizontal movement spine was partially blocked by students' chairs and

belongings, yet many students and TAs were forced to use it in several occasions.

In the classroom, only two groups used the space, yet movement space was limited, the small movement spines were partially blocked by students' chairs, and by using two movable book shelves that were used to carry the desktop PCs and were placed near groups. Users of space used the horizontal spine in the middle to move. More movement happened in the spines near the center of space and around group F. Users of space tried to cope with limited movement spines, by limiting movement and waiting for others to clear a spine before moving to their destination or even by using partially blocked spines (Fig.5-3-5).

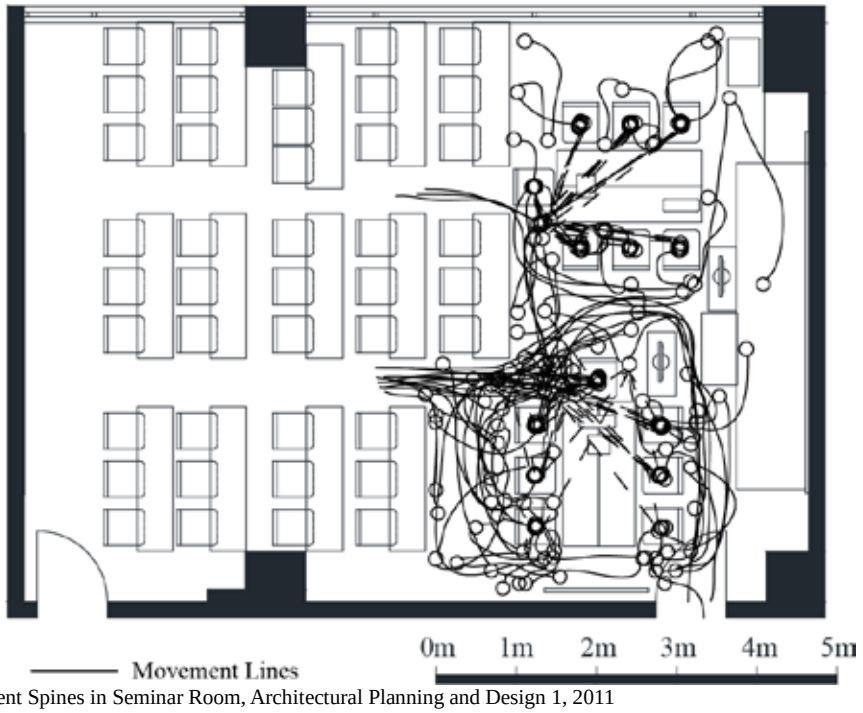


Fig.5-3-5. Movement Spines in Seminar Room, Architectural Planning and Design 1, 2011

5.3.3.3 Information Technology Tools

All groups used the provided PC and projector. Moreover, members of Group F used additional two laptop PCs. Many students shared their work with other group members through presentation. Group A

is an example of a group that made use of the provided IT tools to the fullest; all members except for A03 and A02 presented their work to others. Each student presented his work following a seminar format; talking during the presentation to explain their work, then receiving comments and discussing more with group members (Fig.5-3-6). Group members needed to move from their seats to sit near the PC to use it. This organized movement was seen especially in Groups A and B, in other groups one or two students worked on the PC while other members participated by commenting. Students worked as a team to tackle tasks and finalize solutions. The use of IT tools -mainly the projector- helped to enrich group work and problem solving. Also, it encouraged collaboration and increased group members' engagement levels.

A. Using Additional Two Laptops in Group F

B. Doing a Presentation Making Use of Projector in Group A

Fig.5-3-6. Use of IT Tools, Architectural Planning and Design 1, 2011

5.3.3.4 Possessions and Territoriality

Students' possessions included bags, papers, books, laptop PCs and electronic dictionaries. Students placed their bags near their chairs and spread belongings on the table in front of them. Some students placed their bags over table in front of them and kept it for the whole period of group work; as a territorial marker or indicating a strong need for more privacy by declaring ownership of a part of the

shared table. This gives students a feeling of ownership and comfort which helps them to participate in group work. In some cases, when a student did not find a place to put his belongings on table due to crowdedness, he was more likely to withdraw back away off table and he was more likely to loaf and be less engaged in group work.

Having the projector on the table closer to one of its edges made it difficult for the students sitting near it to find a place to put their belongings, in some cases some students placed their note books over the projector; this indicates the importance of providing enough table surface area to be used by all members during group work. Many students placed their bags in movement spines near their table or seat, while others especially in the classroom made use of nearby empty tables and were seen during group work to move back and forth to fetch needed tools; this indicates the need to consider providing a storage space for bags to avoid placing them in unwanted places.

5.3.4 Learning Behaviors

5.3.4.1 Prominent Students Activities

The frequency of activities differed among students. Because PBL depends on group work; observation and talk among group activities were dominantly more frequent, then came PC use followed by writing and reading consecutively. Talking among group was seen to be the most important activity, because it helped to guide learning behaviors, created a link among group members and enabled sharing tasks. Some students talked among group more frequently than others like C02, while students who showed social loafing -depended on others to do their part of work and showed less engagement- talked among group less like B06(f). Observation activity was a combination of thinking, watching, listening to others or to faculty, it was the most frequent in almost all students. In certain cases if observation

happens frequently and for long durations without being interrupted by other activities it may be an indication of social loafing. PC use activity was important, using projectors made such an activity performed as part of the team's collective effort during problem solving; one student would operate the PC and other students can participate by giving suggestions and comments as in Groups D & E. While students who did a presentation to share their efforts with other group members needed to use the PC as in Groups A & B (Fig.5-3-7).

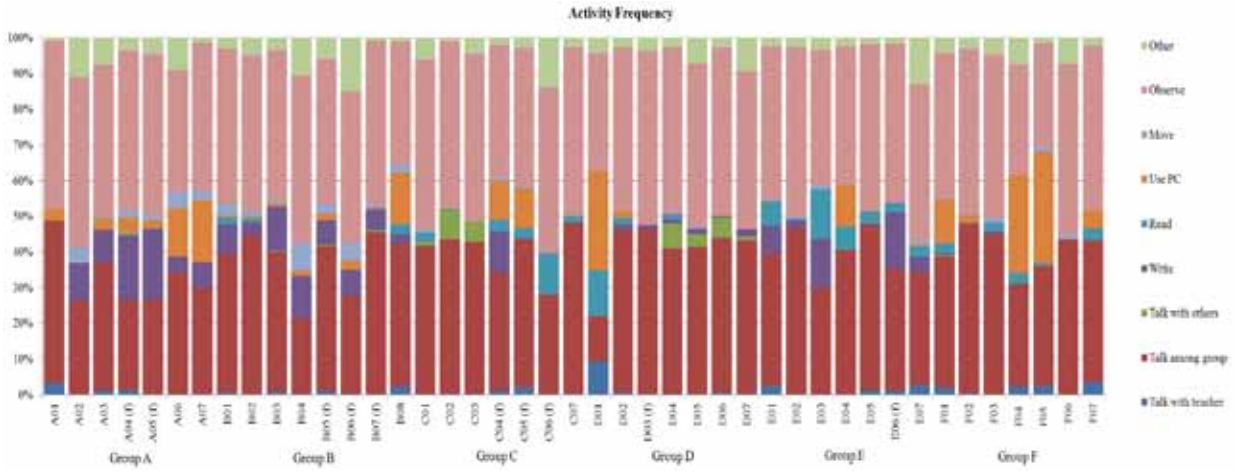
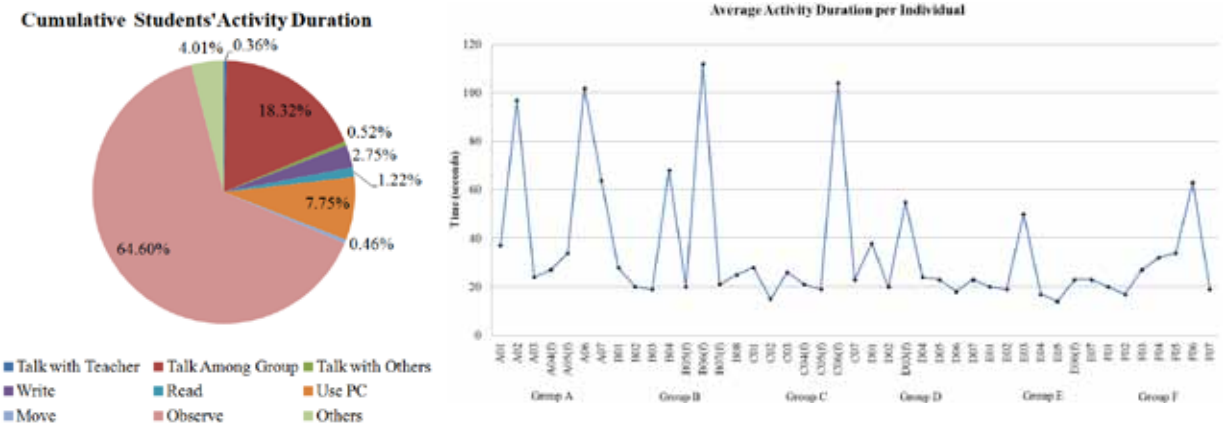


Fig.5-3-7. Activity Frequency, Architectural Planning and Design 1, 2011

In terms of activity duration, the average activity duration was 35 seconds. Observation activity had the highest duration, followed by talk among group and using PC (Fig.5-3-8). The observation formed 64.60% of student activity duration, talking among group formed 18.32% and PC use formed 7.75%. While talking with teacher was marginal, it only formed 0.36% of student activity duration.



A. Cumulative Students Activity Duration **B.** Average Activity Duration Per Individual

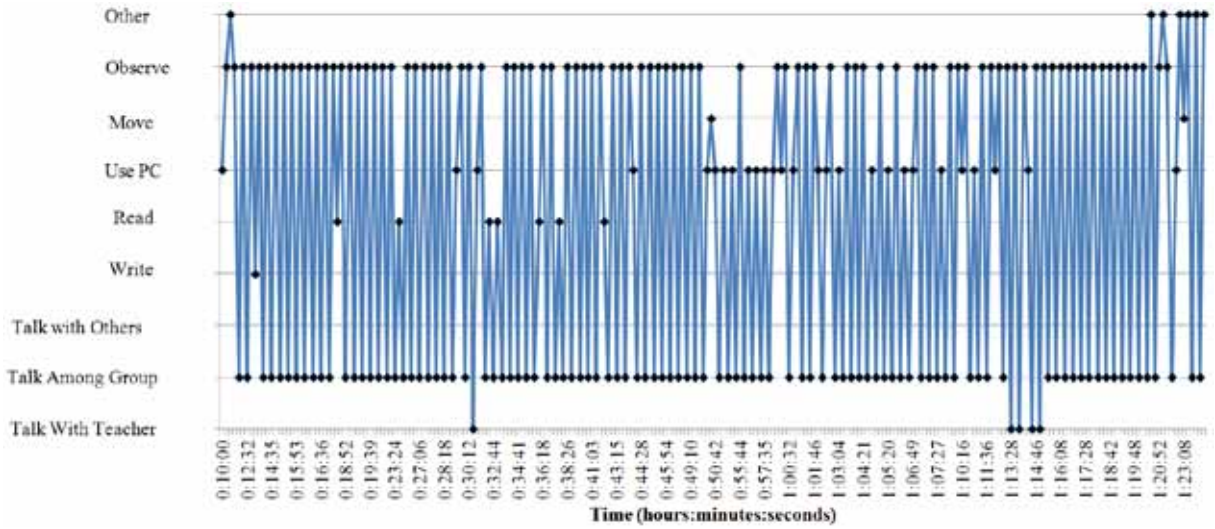
Fig.5-3-8. Activity Duration, Architectural Planning and Design 1, 2011

Having larger groups meant that talking time for each member decreased and members needed to listen more before talking to other members, this makes interaction in such groups more complex and is a great chance for students to learn effective communication skills. Sometimes having long periods of observation that is not interrupted by other activities is an indication of social loafing. Social loafing is considered a negative behavior, it happens when a student depends on other group members to do his share of the work load. Talking among group is considered the most important activity, all members need to participate in interactions within a group to guarantee successful problem solving outcomes. The faculty or the TAs need to monitor group members during group work, they may need to interfere if disruptive behaviors are noticed such as social loafing or communication domination.

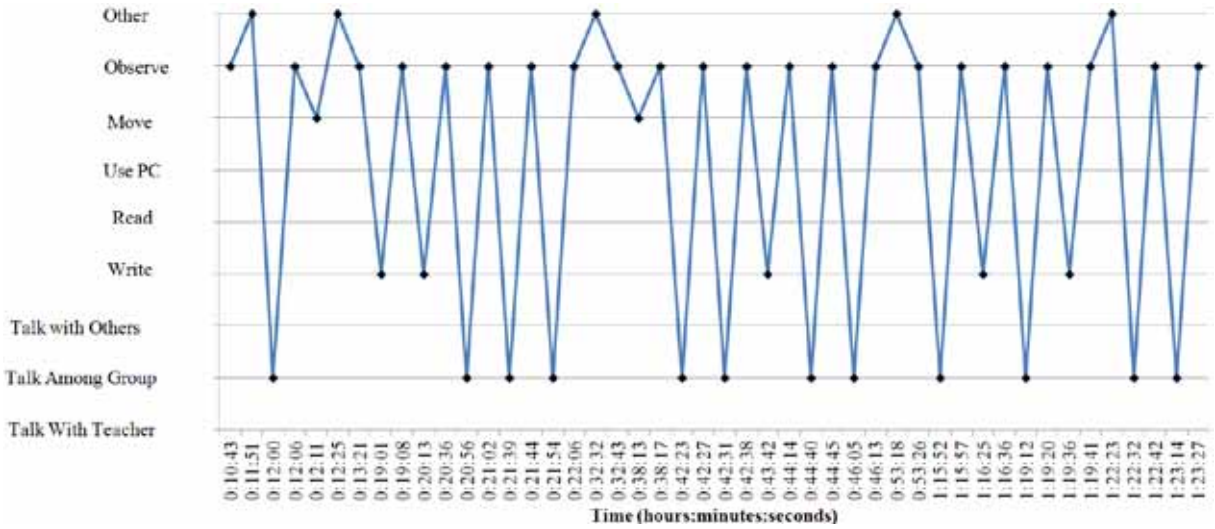
5.3.4.2 Effective Collaboration and Activity Profiles

Collaboration consisted of many repetitive activities including: talking among group, observation, PC use, writing and reading. When a student is more engaged in group work he showed more frequent and divers activities. Effective collaboration happened when a student participated in group work and problem solving efforts, shared work load equally with others and more importantly talked with other members in a balanced manner.

Students' activity frequency profiles can be used to distinguish students with effective collaboration from those who loafed. A student with an effective collaboration profile and high engagement would show a highly repetitive pattern of learning activities, less interruption and talking with group members would be mostly related to other activities by following them or preceding them as in C05(f). While a student of less effective collaboration and lower engagement exhibited less repetitive patterns of activities and observation or other activities were dominant as in A02 (Fig.5-3-9).



A. Effective Collaboration Profile for Student C05 (f)



B. Ineffective Collaboration Profile for Student A02

Fig.5-3-9. Differences in Activity Profiles between C05 (f) and A02, Architectural Planning and Design 1, 2011

5.3.5 Effects of Learning Style

5.3.5.1 Engagement Levels

Students can be divided into three groups in terms of their engagement levels during group work:

i. ***High Engagement***: formed 68% of students, they constantly showed a high level of engagement

during all parts of group work; talking repetitively with other members, taking notes, commenting on other group members work, helping in PC work and contributing effectively in creating knowledge.

ii. ***Fluctuating Engagement***: formed 9% of students, they showed a changing level of engagement within time; their engagement levels fluctuated continuously between periods of high engagement and others of low engagement. At points of low engagement some of these students were involved in disruptive behaviors that affected group work negatively, while others swayed towards a form of social loafing.

iii. ***Low Engagement***: formed 23% of students, they showed lack of interest and less involvement in group work in a constant manner during the whole period of group work. This group of students showed high levels of social loafing. In some extreme cases, it was noticed that a student did not participate at all in group work and spent long time just watching or sleeping as the case of B06. The causes of such low levels of engagement include: personal traits of a student, having relatively large group size that lowers participation opportunities, focusing solely on PC work without talking to group members and sitting in inappropriate configurations (Fig.5-3-10).

Generally speaking most students had high levels of engagement. Such high levels of engagement were caused by the use of sociopetal table configurations that encourage communication and maintain continuous uninterrupted sight lines among members, the use of projectors to create a team spirit while utilizing the provided PCs and the use of PBL which gave students more control on their learning. It was found that learning styles of students had an effect on their engagement levels; their learning and task preference, in addition to their preference to work in groups or alone seems to predict the distribution of students into the three levels of engagement.

Students with Accommodating style showed no low engagement and 82% of them showed high engagement levels. Students with Diverging style had a mixture of all engagement levels, yet 64% of them had high levels of engagement. Students with Assimilating styles had no fluctuating engagement levels and 40% of them had low engagement levels. The Converging style also had no fluctuating

engagement levels and 33% of them had low engagement, but it was noticed that 67% of students of this style showed high engagement.

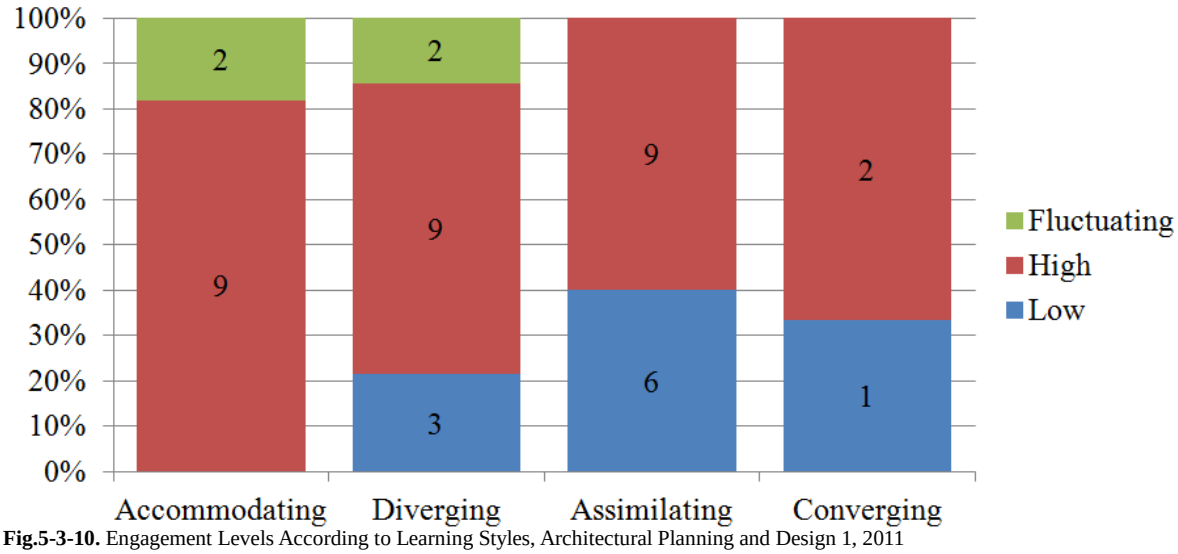


Fig.5-3-10. Engagement Levels According to Learning Styles, Architectural Planning and Design 1, 2011

5.3.5.2 Preference of Learning Behaviors

Student learning styles played a role in students' preference for certain learning behaviors (Figure 6). Accommodating style students tend to talk more among group and depend less on PC use to solve problems, also writing and reading were important. Diverging style students focus on sharing with other groups by talking more to others and have more self independence and less interaction with faculty. Assimilating style students place less importance on talk among group and tend to think and observe more. The Converging style students prefer computer assisted PC work, yet tend to do things placing minimum focus on thought. Having students with different learning styles would definitely enrich a group's problem solving skills.

The knowledge of students learning styles can be used to assign customized student group roles to enable students to complement their points of weakness and develop their learning abilities to be more

balanced rather than relying too much on certain learning styles (Fig.5-3-11).

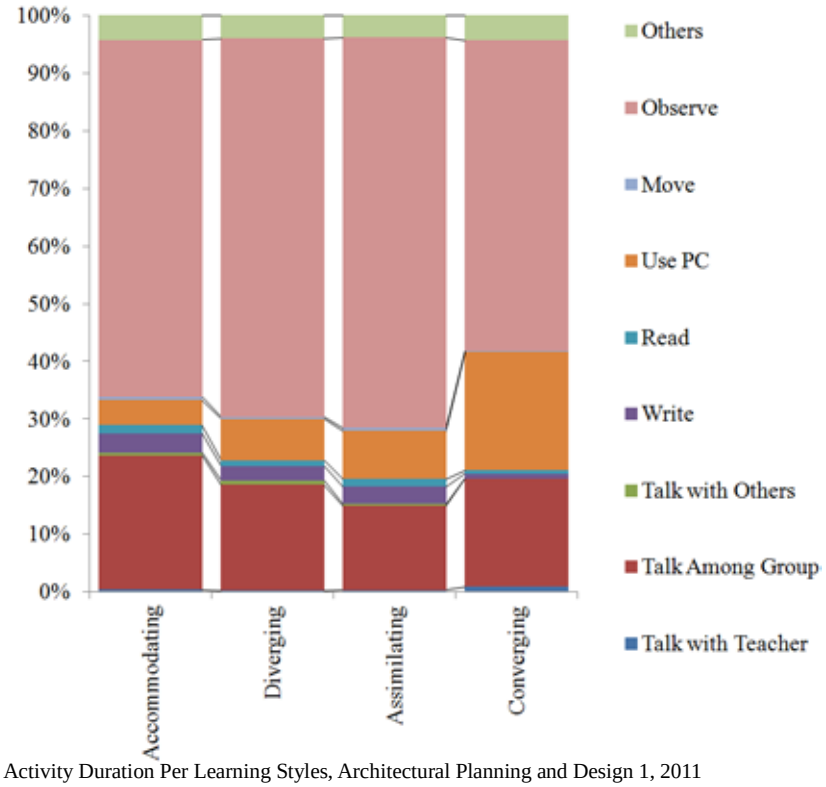


Fig.5-3-11. Average Activity Duration Per Learning Styles, Architectural Planning and Design 1, 2011

5.3.6 Conclusion

A successful PBL classroom design stems from the six core characteristics of PBL (see Barrows, 1996), its priority is meeting the needs of learners. Traditional class rooms optimized for lecturing are barriers to applying student-centered pedagogies. Table configurations that are optimized for group work and collaboration are essential; such table configurations would guarantee continuous sight lines between students and provide sufficient table work areas. In addition, the class should be equipped with IT tools -namely projectors- to facilitate sharing knowledge and to increase engagement levels.

Effective collaboration entails sharing work load equally, talking among group in a balanced manner while engaging in a repetitive pattern of learning activities. Collaboration skills should be

emphasized and monitored by the faculty or TAs. Knowledge of students learning styles can predict their engagement levels and activity preference during group work. The effects of students learning styles must be taken into consideration while designing a learning space or during managing a PBL class. Finally, a PBL classroom needs to enable students to have more control on their learning environment, enabling them to be independent learners.

5.4 EVALUATING STUDENTS CONCEPTIONS OF PBL CLASSES

5.4.1 Introduction

Understanding students' opinions about their experience during a PBL class is important, it compliments data collected during observations as discussed in previous sections and fills many gaps related to students' inner motivations of observed behaviors. One case study will be shown. The study was carried out using questionnaires to evaluate how students see the class environment in relation to PBL processes, how do they evaluate PBL itself, what do they think about selected aspects of group work dynamics and effects of learning style on learning behaviors. Combining observation study's findings and the questionnaire results lead to a more complete understanding of the implications of adopting PBL on campus learning environments planning and design.

Students' needs in universities are changing to parallel recent changes in all aspects of life. Learning pedagogies are changing from traditional to new innovative methods. Namely PBL is being promoted in Mie University to correspond with the changing needs of students besides providing better learning outcomes by shifting focus from faculty to students. Understanding students' needs and opinions in a PBL course is gaining more importance. The evaluation of such classes aims to capture students'

experiences as they adjust to PBL approach. Learning institutions try to build better learning facilities by considering the needs of students, focusing on durability and quality. A better learning environment would be reflected positively on both students' outcome and faculty input.

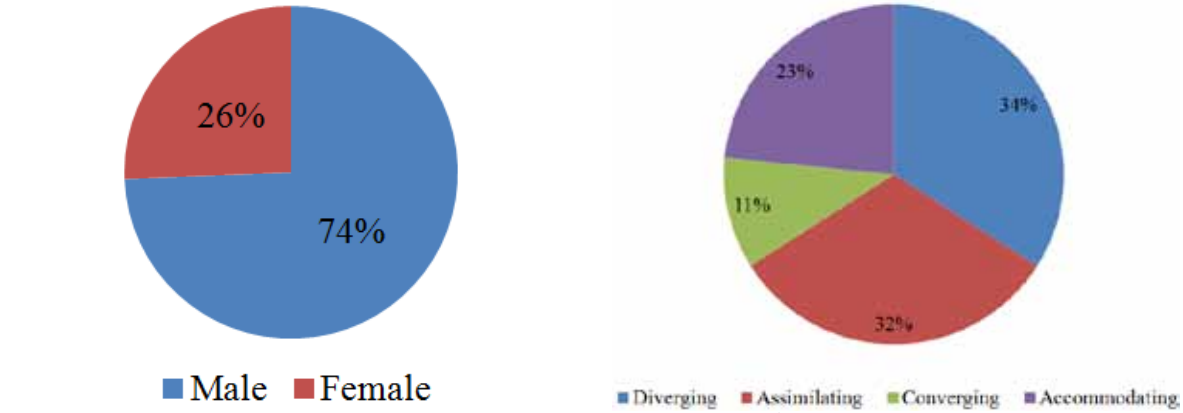
5.4.2 Purpose and Methodology

This research objective is to evaluate students' experiences in a PBL course; focusing on four major aspects: PBL method, group work, class environment and course objectives. Architectural design and planning 1; a first year students' PBL course in the faculty of architecture in Mie University was taken as a case study. This course was held in a classroom, a seminar room and made use of the nearby faculty library on the same floor. As a methodology the study used a questionnaire to collect data from 46 students. The questionnaire included two parts; the first part made use of Kolb's Learning Style Inventory (LSI) to understand students learning styles. The second part of the questionnaire included statements about the selected aspects to be rated on a scale from 1 to 4. In addition observation sessions were held by recording several classrooms by video as well as using a digital camera to document important events.

5.4.3 Student Demographics

The survey was conducted on 29th November 2010. A questionnaire composed of two parts (4 pages) was distributed. The first part tried to find the students learning styles, its results will be shown her as part of the students' demographics. The sample included 46 students; 46 questionnaires were retrieved. 39 forms were considered while 7 forms were disregarded because part 2 was incomplete or due to using similar numbers in part 1. The results of the first part showed that 23% of students

belonged to the Accommodating style, 34% belonged to the Diverging style, 32% belonged to the Assimilating style and only 11% belonged to the Converging style. Students belonging to both the Accommodating and Diverging styles are thought to prefer to work in groups and therefore are expected to prefer learning in student-centered pedagogies such as PBL. Those who would prefer PBL form 57% of all class students (Fig.5-4-1).



A. Sample Gender Composition **B.** Learning Style of Students

Fig.5-4-1. Students Demographics, Architectural Design and Planning 1, 2010

5.4.4 Major Findings

The results of the survey are discussed in this section. The students interacted positively with the PBL pedagogy; they were motivated to take responsibility of own learning and to make use of additional resources to retrieve information (Q1, Q4). The students seem less certain towards the process of problem solving although they express their agreement that the PBL process helped in effective learning -not strongly agree- mostly agree (Q3). In a contradiction to their awareness of the positives of PBL pedagogy and related process of learning, most students express that the PBL class was not fun, furthermore they indicate that they like lecture based classes more; this may be attributed to the feelings of confusion PBL creates which is necessary to motivate learners and also might be a result of the

demanding nature of such a course (Q2, Q5) (Fig.5-4-2).

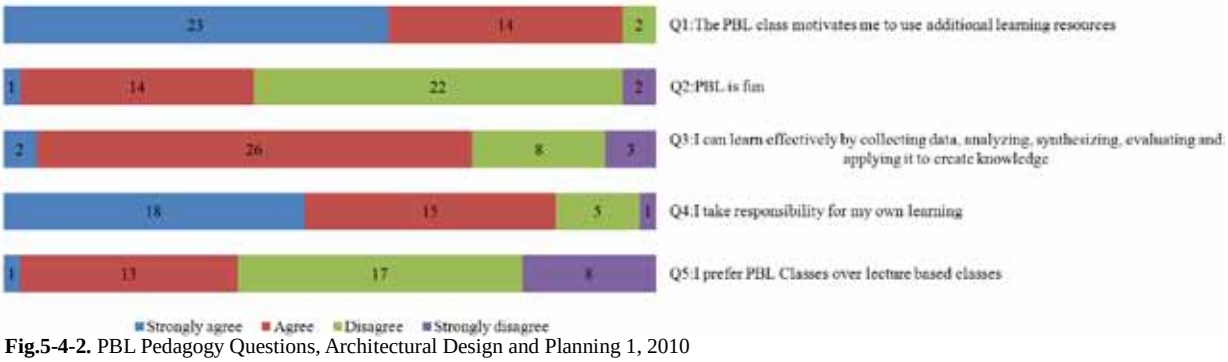


Fig.5-4-2. PBL Pedagogy Questions, Architectural Design and Planning 1, 2010

Students' opinions about group work are generally positive; they see the group work climate as a factor that encourages learning and improves communication skills -not strongly agree (Q6, Q11). In terms of group dynamics; their answers show that there are some issues that need to be tackled to increase the effectiveness of group work. In particular the issue of sharing work load equally showed a division of opinions, this may indicate that some students had some problems in term of managing their project or group members; there might be a need for some intervention from the instructor or tutors to monitor group work and even provide some feedback about healthy practices for successful collaboration (Q7). Also the issue of meeting and working with group members outside of class hours seemed to be controversial; although students were encouraged to make use of the seminar room and library for their out of class group work, yet students did not make full use of the available facilities which needs more investigation (Q8). Students' majority expressed that they can work effectively with others and that they participate evenly in group conversations (Q9, Q10) (Fig.5-4-3).

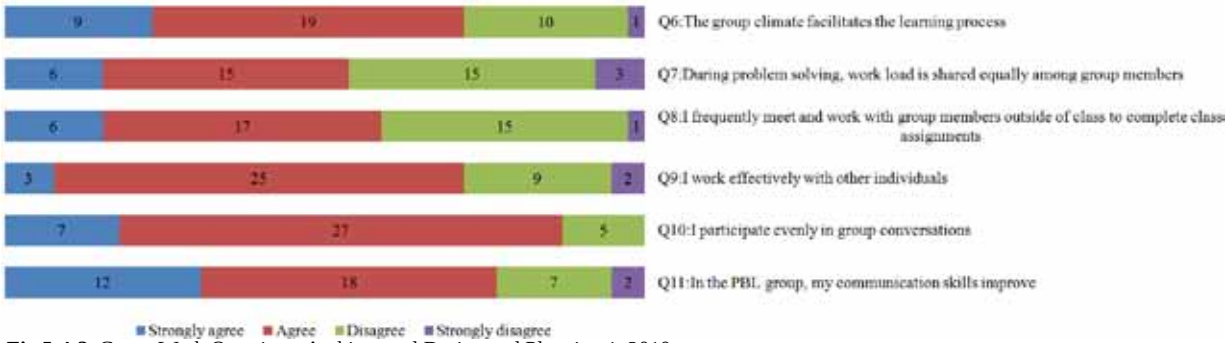


Fig.5-4-3. Group Work Questions, Architectural Design and Planning 1, 2010

Generally speaking the classroom environment was rated negatively according to the opinion of the majority of students although the degree of consent among students differed (Q12-Q15). Students expressed clearly that the current table configurations which place three students beside each other and does not provide movable chairs is inconvenient for group work; because the current configuration makes it difficult to maintain eye contact between group members and limits sharing common resources such as papers, books and laptop PCs as well as the fact that it restricts movement of students (Q14, Q15). The seminar room was rated positively in terms of its furnishings and IT equipment -not strongly agree (Fig.5-4-4).

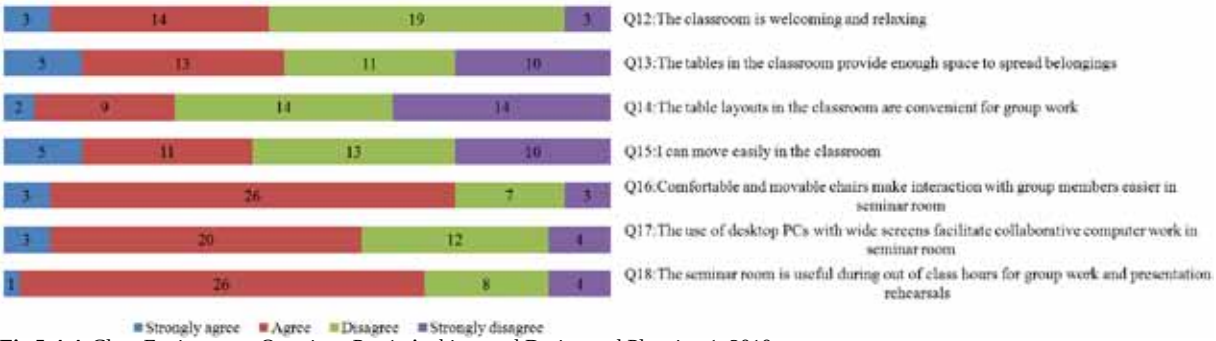


Fig.5-4-4. Class Environment Questions-Part1, Architectural Design and Planning 1, 2010

The majority of students indicated that having comfortable and movable chairs are one of the assets that facilitate group interaction (Q16). Although the majority expressed that the seminar room is useful for out of class hours work, yet its potentials were not taken advantage of, further more students express that the seminar room environment which is enriched with IT was not inspiring; this might be related to the somewhat formal nature of the seminar room, it is always closed and students need to use their cards to enter the room (take off shoes) besides its limited capacity (Q18, Q17, Q19).

The department library was rated positively, mainly students can use the available desktop PC effectively and they even consider the noise level acceptable during class hours which correspond with their needs for places to work collaboratively and interact freely (Q21, Q23). Yet students expressed their dissatisfaction with the size of space in the library which provides few chairs and tables, this in turn prevents many students from using their laptop PCs besides reading books while tackling PBL problems

(Q20, Q22). The previous point corresponds with the fact that applying PBL generally increases pressure on library facilities. The majority of students expressed their satisfaction regarding the available equipments and the use of Moodle E-learning which contributed in supporting their learning experience (Q24, Q25) (Fig-5-4-5).

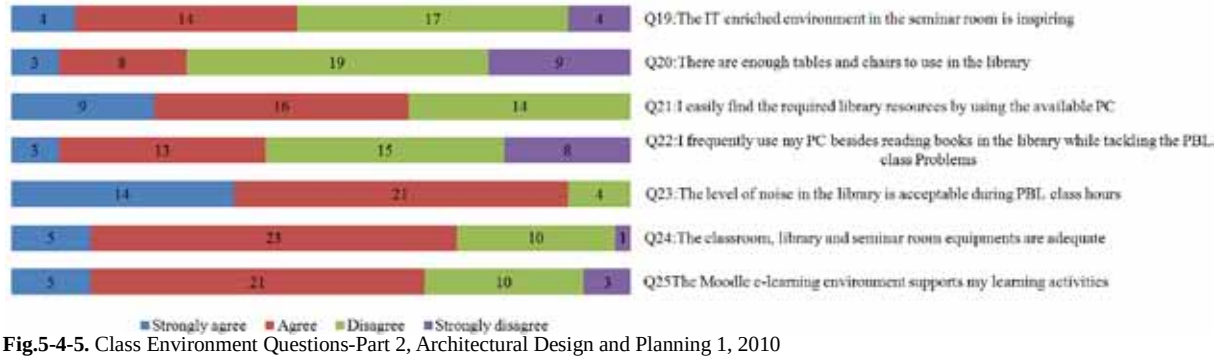


Fig.5-4-5. Class Environment Questions-Part 2, Architectural Design and Planning 1, 2010

In terms of course objectives the main objectives were achieved satisfactorily according to the students' opinions; especially in respect to inducing interest in the main topic of the course which is the residential housing architecture and design (Q26). Also students seem to realize that learning is a continuous process; as they seem to express their intentions to apply the skills learned in this course in future works in design studios (Q29) (Fig.5-4-6).

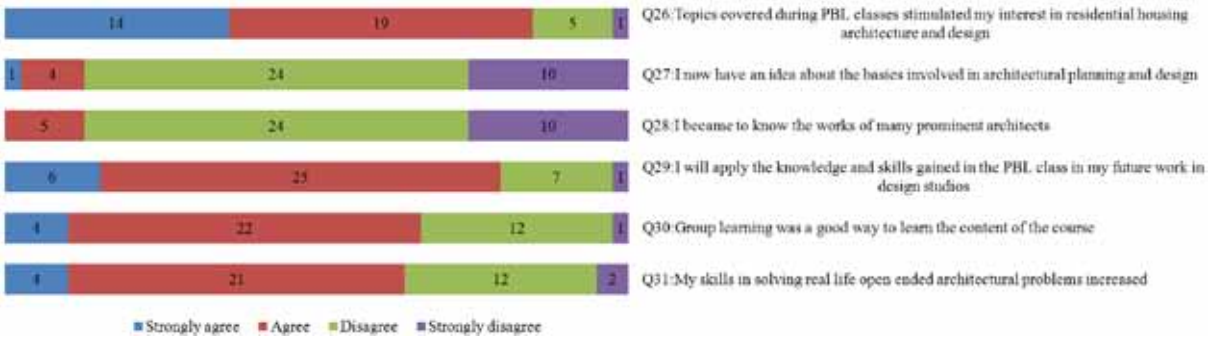


Fig.5-4-6. Course Objective Questions, Architectural Design and Planning 1, 2010

Yet some of the side goals of the course seem to be unachieved; as a majority of students think they did not gain new information neither about the basics of architectural planning and design nor about prominent architects. This might be related to that the problems did not tackle such issues directly; learning about these issues would be a byproduct of looking into resources to tackle the main focus of

the given problems (Q27, Q28). Students think that their problem solving skills improved, and also see group learning as a good way to learning content (Q30, Q31).

5.4.5 Conclusion

Students' conceptions about their experience in PBL classes need to be considered to obtain an effective PBL process. Learning spaces that provide conversational configurations, IT tools besides having a library or other information resources nearby are essential to promote collaboration and boost self learning. Awareness about PBL pedagogy and group work dynamics guarantees successful learning and creating independent learners (Khasawneh, F. A., Kato, A., Mori, S. & Shibayama, Y., 2011).

5.5 SUMMARY

This chapter demonstrated the need for change in the design and planning of campus learning space in campus and namely classrooms. Three case studies were discussed; two cases were studies of the 4-skills startup seminar of 2010 and 2011. The third case was a study of architectural planning and design 1 for 2010 and 2011. The methodology was based on structured observation. Video recording was used to capture the users' prominent learning behaviors and patterns of space use. The aim was to understand students' adaptations of classroom environments implied by the adoption of innovative PBL processes in Mie University, effective collaboration and dynamics of group work.

The 4-skills startup seminar is a PBL class for first year students; it aims to equip students with healthy group work behaviors, effective problem solving skills and the ability to use innovative IT

tools. The first study of this class was conducted in 2010. The results showed that classroom hindered applying PBL effectively. The classroom was optimized for lecturing, this was clear during transition from lecture mode to group work mode; students needed to move from their places, tilt bodies and move tables and chairs to sit in an interaction promoting organization. This transition caused interruption of the learning process. Movement in class was difficult, because it was stacked with furniture and lacked wide enough movement spines. Also, students' belongings, floor electrical plugs and new table configurations blocked many movement spines. Students needed more work surface area, as many of them were seen to use two tables during group work. Collaborative behaviors were observed, collaboration happened when students shared work load equitably and more importantly talked among group in almost similar durations. Talking among group was considered to be the most important activity. The second study of the 4-skills startup seminar was conducted in 2011. In spite of that the faculty tried to put the previous study results into use to enhance the flow of PBL process in class, yet the traditional class layout composed of rows of tables and chairs made it difficult. Students still needed to tilt their bodies and move chairs to work as a group. Students were given freedom of deciding when to use a PC and to bring it from the class closet to give them more control on their learning. Many movement spines were partially or fully blocked by either students' belongings or students' chairs. Movement was difficult and the most congested spine was the horizontal spine in front of class. The faculty needed to move around all groups to monitor group members and confirm understanding. The use of PCs in unsuitable configurations lead to ineffectiveness; in many cases only one student could see the PC screen clearly, therefore some students became isolated from group leading to social loafing. Students were less engaged during the lecture mode, while most students were highly engaged during group work. Limited talking with teacher was noticed, it encouraged students to take responsibility of own learning and become more independent. Collaborations consisted of many repetitive activities with each activity lasting for relatively short time. Students' activity profiles were used to distinguish students with effective collaboration; such students showed a

highly repetitive pattern of learning activities, less interruption and talking with group members was dominant and mostly related to other activities.

The architectural design and planning 1 was the first specialized PBL course in the department of architecture starting from 2010. The study of this class was carried out over two terms, yet the class of 2011 was discussed in more detail. The results showed that major changes must be introduced into current learning spaces to enhance their compatibility with PBL processes. The class was held in two adjacent rooms, students needed to move between classes to start group work, while faculty continuously moved between the two rooms, such movement was unpractical. Students used rectangular tables and made use of a desktop PC and a projector, such organization was successful to induce interaction and collaboration. Students learning styles were found to influence students learning behaviors preference and engagement levels; those with Accommodating style were found to have the highest engagement levels, while those with the Converging style tended to have lower engagement. Observation, talking among group and PC use were prominent activities. Talking among group was seen to be the most important activity. Effective collaboration happened when a student participated equally in group work load and interactions, while showing a repetitive pattern of learning activities. The understanding of students' conceptions during their experience in a PBL is considered important to provide an insight into students' motivations to observed activities. A classroom needs to provide enough space, wide movement spines, appropriate table configurations and collaborative Information Technology (IT) tools to cater for the needs of PBL classes. These various changes in classroom design features implied by the adoption of PBL clearly show that PBL is the new place maker in future campuses.

CHAPTER SIX 6

MANIFESTATIONS OF INEVITABLE CHANGES IN CAMPUS PLANNING AND DESIGN

This chapter provides additional interpretation of the findings described in the previous chapters making reference to the available body of literature and showing the points of agreement or contradiction based on the results extracted through the different research procedures followed within this dissertation. Furthermore, the conclusions and some recommendations would be mentioned as well as providing some directions for future research.

6.1 DISCUSSION

To provide meaning to the results of this study, the findings will be evaluated in relation to the main questions that guided the body of research. The primary research question providing focus for this study was: Within the context of facility management what are the social and the physical qualities that encourage the campus users to use the campus learning spaces including common place, learning commons and PBL classrooms systematically with consistent and diverse patterns of activities in a manner that promotes adopting student-centered learning pedagogies within campus and in that context do these places exhibit place making elements influenced by these innovative learning pedagogies?

In order to answer this question another five supporting questions were posed including:

i. Where can learning happen in campus beside in classrooms and supportive specialized learning spaces?

ii. What are the patterns of use and the range of activities observed within common place, learning commons and PBL classrooms?

iii. How can environmental behavior principles interpret the current patterns of use?

iv. What are the prominent place making elements of effective learning spaces influenced by student-centered learning pedagogies?

v. How future learning spaces could be designed to induce collaboration?

The aim is to understand the physical features and social aspects that encourage campus users to learn effectively in campus learning spaces. Places having unique features whether physical or social in nature are said to have qualities of place making that help to promote a sense of community. This feeling is an essential first step in creating effective learning environments that provides for both the formal and informal learning in campus. The previous questions will be tackled in the following sections.

6.1.1 The Whole Campus as a Place for Learning

The main purpose of creating a university is to provide an ideal learning environment, where a learning community can pursue innovation and create knowledge. Yet a university also supports the social and recreational lives of the learning community, in addition to its main goal of providing inspiring learning environments. Many researchers supported this idea; Turner (1995) states that American higher education focused on academic and extracurricular activities resulting in the diversification of university campus buildings and facilities to include not only classrooms and other academic spaces but also dormitories, dining halls and recreation facilities. The task of a campus designer became not only designing a single building but creating a woven fabric where buildings and ground are organized to create a community optimized for learning. Dober (1996 a) describes knowledge as the prime purpose of higher education, in such institutions knowledge is utilized in

teaching, research and community service. Building knowledge includes creating opportunities of both formal education and informal learning; the first is based on providing specialized formal learning facilities such as lecture halls while the latter is achieved by creating common place where students and other campus community members can informally meet and interact freely to share their experiences and enjoy the campus life.

The learning environment in a campus would provide for the formal and informal learning; the formal part is supported by providing classrooms and similar supporting facilities, while the informal part can happen everywhere in campus including common place and library learning commons. Dober (2000) stressed the importance of campus outdoor place to encourage spontaneous meetings and interaction between users. He also related the rate of use of such places to having appropriate climate, seating fixtures and suitable design elements. Cooper-Marcus and Francis (1998) show that natural areas rich in trees and greenery and other related elements are the most successful. These tend to be the places where students like to sit, eat lunch, interact or just relax to break the stress of the daily routine, refresh and get ready to resume productively the process of learning. Strange and Banning (2001) assume that dining facilities are among campus facilities that foster the creation of a sense of belonging toward the campus community; such a feeling helps to create productive learning environments. Swanquist (1999) argues that campus dining facilities should be flexible and multifunctional; providing many meal alternatives and many combinations of seating, lounges and computer plug-ins, such spaces should be hybrid food service places that are comfortable and lively places to hang out and meet with friends and professors. An observation of campus dining facilities would show that such places exhibit the qualities of common place, users use these spaces to study, use PCs and as a meeting place or just to relax and refresh.

The library learning commons is the latest embodiment of a university as a learning space; it is a hybrid learning space where informal and formal learning happens. Tramdack (1999) stresses the role of an information commons to emphasize the multi dimensional life of library; it is a center for all sorts

of activities besides its pivotal role as a source of knowledge and information. He points out the important role the users play to identify the requirements of the information commons and service needs to develop working spaces that facilitate integrated activities including collaborative learning. Many studies focused on learning environments such as schools, colleges and universities, but most of them as Deasy and Lasswell (1990) point out, considered learning as a process in terms of teacher and students in classroom discarding the fact that learning activities take place whenever individuals respond knowingly to a stimulus. They also ascertain that learning involves acquiring new knowledge, skills, experience and wisdom; as such this may occur anywhere in a school room or a corridor and in this case even in a campus common place and library learning commons.

To answer the first supporting question that states: Where can learning happen in campus beside in classrooms and supportive specialized learning spaces? The research tried to take a variety of case studies that include mostly unspecialized learning spaces such as outdoor common places, dining facilities and library learning commons, in addition to PBL classrooms. The different case studies presented earlier demonstrated that learning can happen anywhere in campus; in common place found in outdoor spaces and in dining facilities, in the library learning commons and of course in classrooms. The findings of this research in this regard agree with all the previous issues discussed by earlier research in connection to seeing the university as a learning space that provides opportunities of both formal and informal learning. Looking at outdoor common place case study in Toyohashi University of Technology (TUT) and the dining commons in Forest restaurant in Nagoya University; it was found that many learning activities happened is these spaces; they were mostly informal learning activities. The major pattern of activity observed in TUT outdoor common place related to the informal and motivated learning was the knowledge sharing activity; such an activity takes place in a formal or informal way, many students take part in a discussion about a certain topic with some of them possibly writing or reading a book while talking to each others. It is a purposeful activity aiming to share knowledge gained by one or more of the students to others which is one of the main aims of universities,

this activity is considered to be complementary to the formal process of learning. Mostly it involves one or more students reading a book or a newspaper while others seem to be listening, as noticed the users were sitting almost on the ground, yet they arranged themselves in a somewhat circular organization to ease interaction, the campus designer could have encouraged this trend by just adding some flexible tables and seats. The Forest restaurant witnessed various patterns of use and activities besides eating, such activities supports the notion of common place and learning in the dining facilities; such facilities should be designed to support the actual observed behaviors and activities besides eating. Many activities as such were observed by analyzing the video recordings of the dining facility survey. Eating and lunch hour within the context of campus is thought of as being spontaneous meetings generation event. The university system is organized to provide break hours between the consecutive lectures and other formal learning procedures, users of the campus within time program their food breaks according to the pre-set academic schedules. The majority of users at lunch hour would be heading for the restaurant of their choice to have their meals, mostly they would be moving in groups with friends but sometimes due to schedule differences they go separately, without planning they bump into friends and take advantage of the occasion to engage in interactions. In many occasions students would use PCs, books and interact with other students or faculty while having lunch which is a form of informal learning. Place making contributes in creating the overall image of campus, furthermore it is considered to be essential to design successful and pleasurable outdoor common places and dining facilities. The diversity in common place environment should be sought by facility managers and designers. Such facilities must provide its users with a technologically enriched environment and spaces that encourage collaborative work and socializing which promotes knowledge sharing as well as research in a relaxed stress free environment, unlike the available formal environments found in laboratories and classrooms.

Recently the learning commons is emerging as a new trend in university library design. The case studies of learning commons demonstrated that the learning commons can be considered as a new kind of hybrid learning spaces that support students' collaborative learning and IT enhanced knowledge

creation. It is a learning space that copes with the adoption of emerging student-centered learning pedagogies such as PBL. The essence of learning commons concept may be applied to other campus facilities including the outdoor places and dining facilities. Bailey (2005) associates the term learning commons to the physical, technological and social places that provide for collaborative work and support creating and sharing knowledge yet such places are mostly related to university libraries. While Schmidt and Kaufman (2007) refer to two models of commons; the first is consultive focusing on problem solving and somewhat reactive while the second is educational focusing on the advancement of students making it more proactive, the dining facilities and outdoor places can be considered from the point view of the second trend. The scope of the learning commons concept can be broadened to include any facility or space that provides for informal and motivated learning opportunities. Furthermore, the essence of the concept of learning commons can be applied to unconventional facilities in campus, here the dining facilities and outdoor places in campus are considered to be the favored candidates for such pioneer trend. As mentioned, such places already serve as hubs of interaction among the wide spectrum of the campus users, this relative advantage can be further enhanced if the actual needs and the prevalent patterns of users are acknowledged and taken into account to create an enhanced learning environment that is flexible, multitasked and technologically enriched. The multiplicity of activities observed in the study especially those pertaining to informal interactions among campus users points out to the importance of these spaces, furthermore these places should be highly considered to serve as hybrid places; that is providing multiple functions and chances to engage in a wide spectrum of informal activities in support of other formal learning carried out in campus. Usually such places are scattered all around the campus, if their environments and designs are to be enhanced to cope with the notion of learning commons, it would make them serve as supportive incubations of knowledge sharing, paving the way to extend the benefits of informal and motivated learning and broadening the commons concept application to include the whole campus.

6.1.2 Prominent Patterns of Use and Effective Collaboration

The understanding of students and other users' needs, activities and learning behaviors in campus learning spaces is of utmost importance, especially in light of the emergence of a new generation of campus users and the application of student-centered learning pedagogies. Oblinger and Oblinger (2005) explain the Net-generation preferences which include: working in teams, tendency for engagement and interaction, fond of arguing and interested in what technology enables, use of technology for participatory learning to construct own meaning and enhance interaction of experiential learning and preference of learning modes that are visual and kinesthetic. The informal learning spaces including common place and the learning commons are gaining more importance recently, as campus users are seeking more learning spaces to engage in a wide range of social and collaborative learning activities. Lippincott (2010) points out that the learning commons seem to be popular among the new generation of users mostly referred to as the Net-generation; such facilities provide for the new users learning preferences who prefer to work in groups, use technology extensively and tend to mix academic and social lives. Understanding the users' needs help to create better learning environments that engage students and lead to innovation and creativity. Stuart (2008) urges designers of learning facilities and particularly those concerned with learning commons development to collect information on the actual needs of students and other facility users and not to depend solely on needs perceived by the librarians.

Common place case studies showed that learning happens everywhere in campus. Common place according to Komatsu and Kato (1994) includes all non specialized space that is connecting to and adjacent to specialized spaces which are designed to fulfill the formal purpose of any facility. Scott-Webber (2004) elaborates that certain behaviors of potential campus users are induced and affected by the campus physical features and the institutional nature of the university. The findings of this study support the previous notions, through the multiple case studies it was noticed that common place in outdoor place and dining facilities witnessed a wide range of activities and several types of users.

Furthermore, the findings showed that the library learning commons in campus forms the core of interaction and informal learning between the different members in campus community. Smith, Sheppard, Johnson and Johnson (2005) claim that student-centered learning pedagogies increase engagement by encouraging student-faculty contact, collaboration behaviors and active learning.

To answer the second supporting question that states: What are the patterns of use and the range of activities observed within common place, learning commons and PBL classrooms? Looking at common place studies, we must distinguish between outdoor common place and dining facilities in terms of nature; outdoor common places are purely places without any specialized activity intended solely to take place in such spaces, therefore it seems logical that users of such places would show a wider range of activities in a stress free environment and with more freedom. While the dining facilities are considered to be specialized spaces intended for having a single purposeful activity which is eating to satisfy the basic need for food, yet dining is a social event which leads to many activities and patterns of use that denotes the use of dining facilities as a common place.

In regard to the activities performed in outdoor common place, maybe it is necessary to refer to the seven patterns of use retrieved from the survey conducted in TUT outdoor common place as being the framework of all possible activities actually taking place in any outdoor common place, those patterns of use include:

i. ***Time Killing Activity***: such an activity takes place informally with many students taking part in it, these students may be seated at the fixed seats or landscape elements found or even at a step on the ground, during such an activity students gather to talk between lectures or after eating lunch for no particular reason except that of time killing.

ii. ***Knowledge Sharing Activity***: such an activity takes place in a formal or informal way, many students take part in a discussion about a certain topic with some of them possibly writing or reading a book while talking to each others. It is a purposeful activity aiming to share knowledge gained by one or more of the students with others which is one of the main aims of universities, this activity is considered

to be continuity to the process of learning inside lecture rooms and other facilities in the university. Mostly it involves one or more students reading a book or a newspaper while others seem to be listening.

iii. ***Basic Needs Satisfying Activity*** : this activity includes a wide range of actions including smoking, eating, reading, phone using and other actions that may be performed in groups or by oneself but usually it is performed informally. Some of these activities such as eating become a sort of an event within the context of university.

iv. ***Spontaneous Meetings***: such meetings are informal interactions that usually happen while standing, it mostly occurs at the entrances of many faculty buildings, lecture hall complexes, cafeteria and some pedestrian spines. The number of participants may vary from two to several students, the frequency of spontaneous meetings was seen to intensify when an individual has finished his main aim of being in the outdoor common place and is going to resume learning activities after lunch hour. Sometimes it may seem that some of the students went into the outdoor common place as a means to relax and bump into someone to talk with.

v. ***People Watching Activity***: an informal activity done by a single student or several students, it usually happens while sitting at a place which overlooks a major movement spine or a space that includes several individuals whether moving or performing certain activities.

vi. ***Waiting (Appointment) Activity*** : such an activity includes an individual or a group of individuals who are waiting for other individuals at a certain place usually near a major landmark or a pedestrian movement spine, this activity includes waiting for a certain time, then grouping and moving on to a new destination.

vii. ***Moving Around (Passing) Activity***: includes all the individuals passing in the space while moving from one point to another destination, this may be performed individually or within a group. Such activity varies from one hour to another, in certain times large groups of students move around specially at the lecture rush hours and in the lunch and break times, this activity is the most common one in the outdoor common area which forms the major movement spine connecting the different facilities in

campus.

Each of these patterns of use require the provision of certain design elements and appropriate conditions to occur, of course the use of outdoor common place is mostly unpredictable and sometimes the same sitting is used by the same group in different ways and for a different range of activities, furthermore the same type of activity might be carried out in a different manner, yet the previously listed patterns form the base to which more variations of activities may be added.

In dining facilities it was clear that activities pertaining to common place were more prominent in pre-peak and post-peak periods, that is in the relaxed and stress free periods in the dining facilities, as the facility is considered to be less stressed the more such activities denoting common place would be noticed to be taking place, while for more stressed dining facilities as those found in Nagoya University Forest restaurant those activities would intensify in relaxed conditions and would seem to be less frequent at other times. Generally some activities were noticed to be taking place more frequently, regardless the location and layout of the dining facility, these patterns of use include:

i. ***Multiplicity of Activities***: the user would consider the dining facility to be a comfortable place to practice a wide range of activities besides eating; this may mean that the user would be engaged in a sequence of various activities in a planned manner, this usually starts by having lunch then engaging in many activities including studying, reading and PC use.

ii. ***Meeting Others***: the dining facility would be used as a meeting place such meetings might be arranged in a deliberate way to be more like a lunch meeting, where members of the group would be engaged in fruitful discussions besides eating, such meetings were seen to incorporate a professor and his seminar group which is considered to be some sort of informal interaction between the faculty and students. The other form includes making use of the available tables and seats to hold a discussion as the main activity, here food and beverage are not consumed although in many cases drinks were seen to be used as interaction facilitators.

iii. ***Spontaneous Meetings***: the users would be coming to the dining facility separately having in mind

getting a pleasant meal, yet due to the gathering nature of the dining facility they end up meeting friends or colleagues, in many cases such meetings may develop from brief interactions or elongated ones while standing into joining the friend's group, developing such a sudden meeting into a full social event making use of the opportunity.

iv. ***Following Daily Dining Habits and Rituals***: this refers to habitual dining rituals developed by single or group users, mostly these include the frequent users of dining facility. The dining process becomes part of the daily system or schedule of campus life. Users in campus become connected and develop affiliation to certain groups and even develop attachment to certain seats or tables, through frequent use they would develop feelings of belonging and ownership. This is reflected in many habitual rituals in dining including developing more processes or activities to make the dining event more relaxing and enjoyable.

v. ***Hanging Out***: the dining place is seen more like a lounge or a place to hang out and pass time. Users would be keeping the dining table for a long time, their activities would include a wider range of purposeless activities such as using mobile, gossiping and people watching, such activities aim at passing time and having fun. Such an activity mostly takes place under more relaxed conditions.

In the learning commons a wide range of activities were noticed, the activities included desk work, computer work, reading, talking, presentation rehearsal, copy, using audio visual resources, using mobile phone and others. Those observed detailed activities formed the components of a repetitive pattern of main activities that were noticed to be taking place more frequently, the main activities include:

i. ***Study***: it is a learning activity that may be performed individually or in a group. It includes reading, using PCs and writing. If it is performed individually, it needs a quiet place and a high level of focus, also the student needs a table with enough table work area to spread belongings. While if it is done in a group, it includes more interaction among group members, requires tables that afford the various possible combinations of group sizes and guarantees continuous eye lines between group members to

facilitate communication and sharing materials, students would read and write then share some resources or ask other group members some questions, also PCs are used and whiteboards as well. Studying was seen to be composed of a series of purposeful learning activities separated by breaks; students would rest for a while at the table by talking with other members, consume beverages or leave the table for a while.

ii. ***Collaboration***: it is the most important collective learning activity. Users would work together and share work load equitably to achieve a common goal or solve a problem. Talking between group members is essential to guarantee smooth problem solving and task sharing among group members, users would read, write use PCs and then talk among group repetitively. It requires providing table configurations that encourage interaction and facilitates IT assisted collaborative work. Users need to share resources continuously; using a PC with a projector enables users to use the PC as a team which facilitates accomplishing the task under concern.

iii. ***Presentation Rehearsal***: users who work in the learning commons to prepare a paper or a presentation would need to present it to others to get comments. A student would use a PC connected to a projector to show other group members his work, he talks first to explain his efforts and work, then other group members would talk in turn to give their comments, then students discuss more to introduce modification on the presentation or paper. This activity might be performed several times, and requires specialized spaces equipped with a PC, a projector, tables to accommodate different group sizes and some privacy to increase students focus and limit disturbance to other learning commons users.

iv. ***Refresh and Relax***: students need some moments to refresh and go back to focused learning activities; students cannot work or study for long hours without taking breaks. Students were seen to relax, drink beverages, eat, use phone and even sleep especially if the learning commons contained soft furniture such as lounges.

v. ***Socialize and Hanging Out***: the learning commons is seen as a place for socializing with other

students and hangout. Users would be keeping table for a long time, their activities would include a wider range of purposeless activities such as using mobile, gaming, gossiping and people watching, such activities aim at passing time and having fun. Such an activity is part of the informal learning that may occur everywhere in campus.

To answer the third question that states: How can environmental behavior principles interpret the current patterns of use? It should be declared that the findings of the research confirms with the framework of theories presented in this field. Most of the patterns of use in outdoor common place and dining facilities, library learning commons and PBL classroom can be interpreted using principles pertaining to the research of Hall (1990), Sommer (1969) and many others. The major concepts related to the interpretation include proxemics theory, personal space, territoriality, sociofugal and sociopetal organizations and small group ecology. In outdoor common place, the actual patterns of use is closely related to the types of sitting fixtures available, in this regard sociopetal arrangements would be seen appropriate to encourage more interactions while sociofugal arrangements would tend to keep users apart. Also the type of seating affects the projected patterns of use and the size of group. For instance it was noticed that linear benches would be convenient to a certain degree for two-user groups, they could sit close to each other, and with minimal body or head movement they could keep direct eye contact necessary for interactions, while for groups of three and more, users of linear benches in this case would seek an organization that ensures the direct eye contact, mostly there would be some users sitting and others standing in order to maintain interaction.

In dining facilities, activities and patterns of use interpretation is more connected to issues of territoriality, personal space and small group ecology. For instance it was noticed that users in relaxed conditions would prefer to sit on different empty tables away from others, and that they would avoid sharing tables with others if possible, this behavior is related to trying to provide for the natural needs of territoriality and keeping one's personal space intact as a means to achieve desired levels of privacy. Another example is that single users in crowded conditions are sometimes forced to share tables with

other groups, in such situations they would avoid sitting directly across single users yet proximity to the side is tolerated, this confirms with the fact that personal zone would disappear in crowded conditions as in this case, so proximity would be tolerated to the side but proximity to the front of user is never tolerated.

In the learning commons studies, the results can be interpreted in connection to territoriality, personal space and small group ecology. Students selected flexible tables that enable them to organize themselves in conversational layouts, they mostly were sociopetal organizations. The distribution of tables in relation to the main movement spine was seen to be important, students tended to use spaces closer to the movement spines. Openness of space enables students to see each other and creates chances for unplanned meetings which create opportunities for informal learning. Those who are engaged in presentations would require more privacy than those that are using the space for socializing. Many students were seen to use territorial markers to keep certain tables to own group members and drive intruders away.

In the PBL classroom studies, the results can be interpreted in connection to territoriality, personal space and small group ecology. It was clear that there was a misfit between traditional classroom layouts and PBL; the transition from lecture mode to group work mode made it clear, as many students needed to move from their seats to sit in interaction promoting organizations. Sociopetal organizations were sought as they facilitate interaction among group members and facilitate sharing resources. Students needed to have enough work table surface area and tried to keep their personal zone intact, otherwise they will tend to be less engaged and may show social loafing. Many of these patterns of use in learning spaces were demonstrations of the previous research conducted in the field of environmental behavior studies.

6.1.3 Problem Based Learning as a Place Maker of Campus Learning Space

The different case studies presented earlier demonstrated the importance of the physical features of a learning environment including common place, library learning commons and PBL classrooms. The introduction of student-centered learning pedagogies and namely PBL requires learning spaces to provide opportunities for group work and collaboration to be successful, students would take PBL courses in classes optimized for PBL processes then after class they would need to meet in out of class learning spaces where they can continue their work on solving the given problems, such spaces can be found in library learning commons, common place and all around the campus. The findings of this research in this regard agree with all the previous issues discussed by earlier research in connection to place making and PBL. Dober (2003) uses the concept of place making in campus planning and design to refer to the overall structure of campus including the organization and positioning of its buildings, landscapes, routes and other elements. He furthermore suggested that it entails edges definition and harmony of campus with its surrounding environment. Dober (2003) explained that place making includes within it another concept which is place marking, he argues that place marking deals with the definition and refinement of certain physical attributes leading to unity and a sense of place. Both place making and place marking define the total image of a campus or any particular part of it. Here the physical features are seen as the essential container of social interaction and activities that furthermore define the space in respect to its frequent users and give it deeper meanings. Place making as used within this research refers to both the physical and social aspects of a particular place which in many cases cannot be separated. Barrows (1996) clarifies that PBL can be further explained by understanding its six core characteristics; it consists of student-centered learning, learning occurs in small groups, teachers act as facilitators, problems form the basis for focus, problems stimulate the development and use of problem solving skills and new knowledge is obtained by means of self directed learning. Students usually start with a problem rather than being exposed to abstract facts, and then they move to acquire

knowledge and skills in a sequence of real world problems presented in context with associated learning materials and support from a teacher.

Keating and Gabb (2006) point out that the introduction of PBL into engineering and architecture faculties requires major changes in ways students learn. Learning institutions try to build better learning facilities by considering the needs of students, focusing on durability and quality. A better learning environment would be reflected positively on both students' outcome and faculty input.

Bell, Greene, Fisher and Baum (2001) stress that there is a growing need to create new classroom designs with inspiring furniture configurations to free students of traditional barriers and enable them to embrace innovative thinking, problem solving skills and healthy collaborative behaviors. Kolmos, Graaf and Du (2009) point out that new PBL classrooms need to cater for group work and collaboration. Lynday (2006) refers to issues pertaining to adapting information technology in learning environments and the need to develop innovative future classrooms among the top issues affecting facilities management profession within the context of university campus.

Beagle (2002) designates the information commons as a mechanism to realign the library with new learning pedagogies by functional integration of information and technology services; this caused a revolution that changed the previous negative aspects of library use such as empty reading rooms, declining door counts and low book circulation into a new image of crowded information commons halls and more demands to expand such facilities. This new trend in libraries ended the speculations of the death of the academic libraries paving the way for a new service concept that would provide the base for libraries of the 21st century.

Dewey (2008) attributes the wave of library transformations to the highly networked, digital, hyper technological environments nowadays and to the emergence of born digital students and faculty, the needs of the new generation of users needs to be considered. She promotes the circle of service model as a planning tool to create learning commons that incorporates partnerships. This model is composed of general planning issues and a set of accompanying customizable tools. It is a collaborative planning

process that aims to develop information commons that provide for the needs and the changing learning styles of the new generations. Bailey (2005) promotes the learning commons as an effective model of integrated library services; it combines the traditional library services with information technology and digital resources. Here catering for high level research needs and knowledge creation are the driving force to create such innovative facilities.

To answer the fourth question supporting the main quest of the study that states: What are the prominent place making elements of effective learning spaces influenced by student-centered learning pedagogies? We must understand that many of the findings of this study in this regard agree with the similar issues in previous research. In the outdoor common place many previous studies dealt with this topic indirectly. Outdoor common place is composed of all spaces found between buildings and the major circulation paths and roads. Dober (2000) discussed many issues in relation to campus landscapes, he stressed the importance of providing enough seats, well designed movement paths and nodes and natural elements. Cooper-Marcus and Francis (1998) showed that natural areas rich in trees and greenery are the most successful. Deasy and Lasswell (1990) stress that interaction in such outdoor settings is related to providing activities and proper sitting places and fixtures that permit group formation. Abu-Ghazzeh (1999) points to the importance of campus outdoor place and the need for a variety of such places to accommodate a wider range of activities and users within campus. As for Whyte (2001) the study of public spaces provided insight into the successful physical elements, he stressed the importance of providing enough sitting places and fixtures, such places should provide its users freedom of choice and it should express its stress free environment by the extensive use of natural elements.

The findings of this research recommend the following as place making elements to promote successful outdoor common place:

i. ***Carefully selected locations of common place***: the outdoor common places should be located at places that are easily accessible whether physically or visually by all potential users. Mostly such places

are to be found at nodes where main pedestrian spines meet, in front of or near main buildings especially students' service buildings and main lecture halls where plazas are formed, along main pedestrian spines, places with a view on natural elements and urban landmarks, and between buildings and within green areas. Such locations should be safe to use by all users and during the different day hours and even at night by providing proper lighting fixtures, they should never be located in isolated or uneasy to see locations, also special care should be taken in selecting shrubs and trees which do not block view or cause isolation.

ii. ***Multiplicity of sitting fixtures***: this element is the most important; a well designed place will not invite users to sit in it unless it provides proper sitting fixtures and other elements that provide for the different projected patterns of use. Sitting fixtures should be rich in alternatives to provide for users comfort, here comfort refers to physical comfort by providing the proper measurements of seats that are derived from the human body, also comfort refers to the social aspect referring to having the freedom to choose among many alternatives to achieve the required degree of isolation or grouping desired by potential users. In this regard such sitting alternatives may include a combination of sociopetal and sociofugal organizations. Sociopetal organizations are used to create places that position users closer to each other making maintaining direct eye contact easy leading for more possible interactions, while sociofugal organizations would place seats in a way to discourage interaction which provides places for isolation and not being involved with others.

iii. ***The use of natural elements***: any successful sitting place should include a variety of natural elements, in this regard it was seen that water elements and trees that cast shade are one of the most successful features in an outdoor common place, and such elements would act like a magnet that attracts groups of users especially in spring like weather. Such elements help to create a stress free environment and promote relaxation, it helps the campus users to break the routine rhythm of formal learning and it provides a place of enjoyment and contemplation.

In reference to dining facilities common place, Whyte (2001) explained that food is one of major

attractions of people in public places. Dober (1996a) refers to the new emerging types of dining facilities making use of the notion of full service, central kitchen, and exhibition style cooking platforms and food courts or food malls. Milshtein (1999) stresses the importance of providing more seating alternatives and food serving methods to create successful places. Swanquist (1999) argues that campus dining facilities should be flexible and multifunctional; it should be hybrid food service places that are comfortable and lively places to hang out and meet with friends. Klassen et al. (2005) relates the choices of food outlet in campus to its attractiveness as a meeting place and other services and to its proximity to the location of classes. Kimes and Robson (2004) suggest that generally users prefer anchored tables in dining facilities more than unanchored ones and they would avoid sharing tables with others unless they are forced to. According to Deasy and Lasswell (1990) the users of dining facilities fall among two groups, first those who like to eat alone and quickly, second they may want to eat in groups seeing dining as a social event, the successful dining facility should provide for such alternatives.

The findings of the research agree with many of the previously stated points of view, the analysis of the case studies showed that the prominent place making elements in dining facilities may include:

i. ***Clear and strong definition of the dining process***: this can be done by providing dining facilities that follow a clear service process reflected by its internal planning and design; there would be a clear entrance and exit properly used by its frequent users, also the service process would be streamlined in a logical way, where students flow naturally through space with minimal conflicts. Movement and service spines would be wide enough to serve the potential users even in extreme crowded conditions.

ii. ***Multiplicity of seats and tables configurations and layouts***: this element is one of the most important, as users come to the dining facilities in different groups formations and with multiple attitudes towards the dining process, tables layouts should try to cater for the different potential users providing places for those who intend to eat and go or for those who intend to eat and then stay for interactions. The layouts of tables should consider the groups of users, for example in Forest restaurant case it was noticed that two seat tables would be a good investment as two-user groups were frequently

seen to occupy other tables preventing full use of the available seats. The dining facilities should try to provide the highest number of anchored tables, as seen through the various surveys most users would prefer such tables, also it would be wise to limit the use of shared table as such tables were never fully occupied which contradicts with the main aim of such tables which was seating more users in a certain space.

iii. ***Providing proper lighting and color schemes and other complimentary elements that provide the users with a feeling of comfort and relaxation***.

In reference to PBL as a place maker in learning space, including learning commons and PBL class, this research findings corroborate previous research. Augustin (2009) claims that classroom design can have profound effects on students; by affecting their learning outcomes and social or collaborative behaviors. Kiib (2004) argues that PBL optimized learning spaces need to be open environments to facilitate creating and transforming knowledge by means of group work and collaboration. Strange and Banning (2001) recommend educational environments to support formal and informal learning to succeed. Formal learning carried out in classrooms and laboratories is important to gain basic information -know what-, yet knowledge -know how- is gained by informal learning that can happen anywhere; in common places, learning commons in libraries and similar facilities. Brown (2005) stresses that a learning commons should be the product of integrating learning theory principles, information technology innovations, users' needs with flexible conversational physical spaces. Sinclair (2007) tries to summarize the theoretical basis and service models of learning commons to embody a facility that incorporates the following features: the freedom of wireless communication, work space clusters that promote interaction and collaboration besides individualized work, comfortable furnishings and designs to make users feel relaxed, encourage creativity and support peer learning. He strongly urges designers of learning commons and other learning facilities to design spaces that are open, free, comfortable, inspiring and practical.

Results of this study demonstrate a misfit between current learning environments -particularly

classroom layouts- and the student-centered learning pedagogies and namely PBL. The application of PBL in various academic disciplines would require creating new classrooms and other supportive facilities such as libraries that support group work and collaboration. Some of the physical place making attributes that constitute the characteristics of new student-centered learning spaces can be inferred by the research findings:

i. ***Use of innovative shapes of learning spaces***: this is mostly important in PBL classrooms, the shape of a classroom needs to avoid the traditional rectangular hierarchical organization; it can be a square with a centralized faculty station, so that the faculty may be able to monitor all groups easily. The hierarchy of space can be cancelled by creating multiple focal points, unlike the focus on the front in the traditional classroom. In the learning commons this means using a variety of tables and zones to inspire students and encourage students to use the space for long hours without feeling bored.

ii. ***Flexibility***: flexibility is important; this can be reflected in the movable furniture pieces with reasonable sizes to ease transition between all modes including lecture, group discussion and group work.

iii. ***Spaciousness and openness***: spaciousness and openness is another indispensable attribute, this permits students to have continuous unbounded sight lines, and wide enough movement spines to facilitate moving.

iv. ***Use of appropriate table configurations***: the use of table configurations with enough work space with a place to store belongings such as bags is a plus; this would help to satisfy the students needs of privacy, territoriality and creates a comfortable space to focus on learning through social interaction with others.

v. Use of collaborative IT tools

PBL as a place maker applied in designing new academic spaces would pave the way to create memorable and innovative learning environments in campus. More universities here in Japan and all over the world are introducing PBL courses; PBL is destined to be a vital place maker in future

universities (Fig.6-1-1).

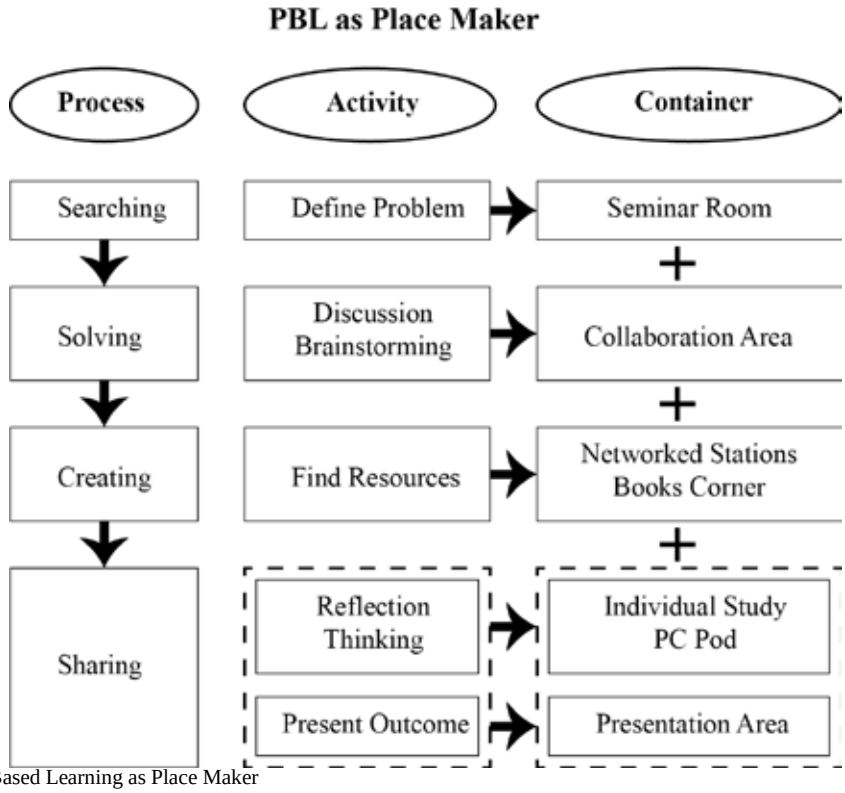


Fig.6-1-1. Problem Based Learning as Place Maker

To answer the fifth supporting question that states: How future learning spaces could be designed to induce collaboration? The study of PBL classes enabled understanding student collaboration. Barkley, Cross and Major (2005) define collaboration as the work done by two or more students, who work together and share the work load equitably as they progress toward intended learning. This research results especially those related to PBL class enabled defining effective collaboration. All collaborations consisted of a combination of activities including talking among group, PC use, observation, reading and writing. The most important activity was conversing among the group; as such communication would create a link between group members, facilitate sharing relevant tasks and guarantee smooth collaboration. The collaborations consisted of many repetitive activities with each activity lasting for a relatively short time. The groups with effective collaborative behaviors are thought to make use of its individual capabilities to achieve the intended learning goals, the members of a group would participate in the learning activities in equal shares, and more importantly they would talk with

each other with almost similar duration. A student with an effective collaboration profile and high engagement would show a highly repetitive pattern of learning activities, less interruption, talking with group members would be dominant and mostly related to other activities either by following them or preceding them. Effective collaboration can be achieved by promoting group work skills that stress the need for equal participation in learning activities, as well as providing appropriate configurations that induce communication. Learning spaces can encourage collaboration by providing sociopetal table layouts with uninterrupted sight lines that enable group members to talk among each other. Also, providing collaboration tools such as whiteboards or smart boards facilitate sharing resources and brain storming, in addition IT tools could be used in a way to encourage team work and minimize individualism; providing a PC with a projector for each group enables one student to work on the PC while others would follow his work and give comments when necessary, this makes PC work collaborative and minimizes isolation of some students that may lead to social loafing. Using the previous mentioned design guide lines helps to create collaborative future learning spaces in campus.

6.2 CONCLUSIONS

6.2.1 Drawn Conclusions

In general the physical features in any campus are important; student-centered learning pedagogy -namely PBL- as innovative campus place maker is necessary to create effective learning spaces. The following conclusions may be drawn:

i. Place making is an important element in creating a successful campus environment, especially in the learning environments that may include common place, library learning commons and PBL

classes.

ii. The notion of place making in campus universities is global; it may be applied anywhere taking into consideration the context of each particular university, knowing that PBL is spreading all over the world which means that the requirements of PBL and its influences on campus design is becoming global.

iii. Place making in addition to its concern with physical features refers to the social and emotional meanings experienced in a setting by its habitual users.

iv. Campuses of effective learning environments based on PBL as a place maker help to shape the people of tomorrow, since such facilities are where the students of today gain knowledge and necessary skills including the ability to work in groups, communicate effectively with others and solve real world problems, such skills are highly in demand by future employers. Students educated in innovative learning environments can succeed in their professional life.

v. Learning spaces should incorporate more seating alternatives taking into account the groups served, also flexibility, openness and providing wide movement spines are important.

vi. Collaboration needs to be encouraged in learning spaces by providing appropriate table layouts and collaborative IT tools.

vii. The facility managers in campus should take actual uses and behaviors of its frequent users into consideration to create effective learning spaces in common place, library learning commons and PBL classrooms

This research finding can be used to develop a model for testing various facilities - especially learning spaces - in order to increase effectiveness. The model starts with selecting the facility or space to be tested, then this facility is studied focusing on observing actual usage, this includes studying movement spines, table occupation, prominent activities and other aspects of space use making use of a research method that corresponds with the case in hand, the results of the study is then evaluated, if the facility or space lacks effectiveness some modifications can be introduced to the layout and

configuration of space before retesting it, sometimes the results may lead to new discoveries that may need more research, and when the facility achieves effectiveness then the findings can be shared and used to create a data base that informs future facility testing and can be used to upgrade research methods (Fig.6-2-1). This study feedback - especially in relation to the learning commons and PBL classroom case studies - was used practically to design the furniture layout of several facilities in Mie University; such practical contributions correspond with the previously mentioned model and reflect a form of results sharing (see Appendix B & Appendix C).

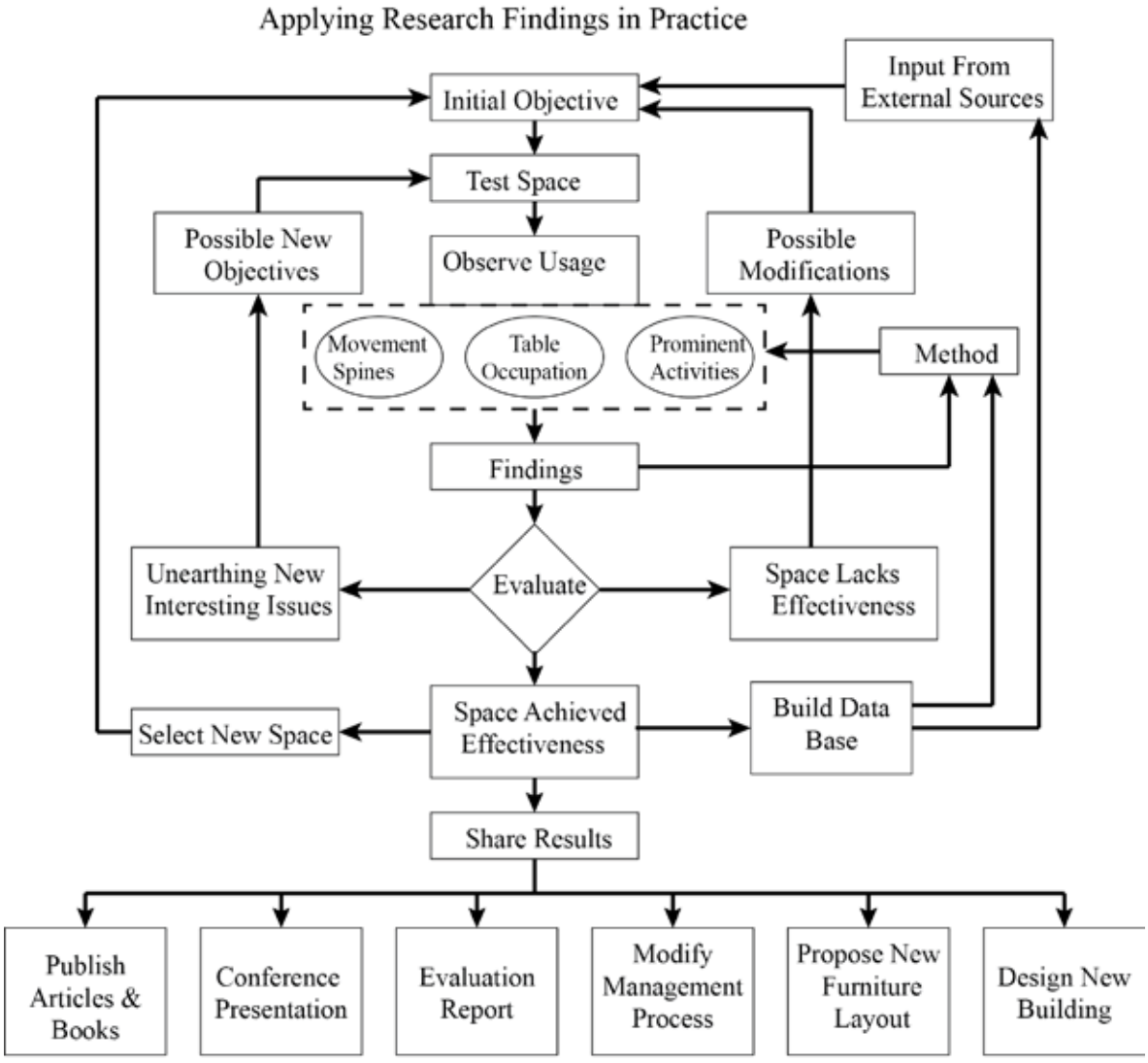


Fig.6-2-1. A Model for Applying Research Findings in Practice

6.2.2 Implications to Campus Planning and Design

The findings of this research could be used to provide guidelines to create better learning spaces that promote formal and informal learning within campus. The guide lines may include:

i. Providing a variety of learning spaces in campus; the institutional nature of higher education facilities needs to be broken by creating multiple innovative learning spaces all around campus. Classrooms and other formal learning spaces must be reconfigured to accommodate PBL classes in addition to catering for traditional lecture based classes. Also, informal learning spaces in campus including common place and library learning commons need to provide a variety of layouts and configurations that induce campus users to interact and work collaboratively to create knowledge.

ii. Incorporating IT tools and applications in learning spaces; it is important to strive to create smart learning environments that cope with the new generation of users including technology dependent students and faculty members. Using smart boards in classrooms, providing wireless internet connection and power points all around campus is necessary to enable students to stay connected and encourage them to make full use of their university life. Special care must be made to provide learning commons and PBL classes with collaborative IT tools that facilitate group work.

iii. Layouts of learning spaces in general should be based on the actual observed patterns of use; such layouts should consider the groups' formation and types of activities taking into consideration the manner with which each activity is carried out in common place, learning commons and PBL classes. There should be a clear zoning of a learning space to provide a variety of seating fixtures and different supportive tools to accommodate all possible students' behaviors; the actual behaviors may include studying, reading, eating and many other activities including learning and recreational activities.

iv. Learning spaces need to create a balance of individual and group learning opportunities. This can be done by providing sociopetal table configurations with various capacities to encourage group work and collaboration, in addition to providing quiet carrels for students who intend to engage in individual

focused learning activities.

v. Use of innovative non-institutional learning space designs are desired; this can be done by using lively colors and decors as those used in internet cafes to induce interest and inspire students to use learning spaces in a different way. Also, soft furniture use is necessary in addition to providing vending machines or cafes as part of learning spaces or nearby them to provide students with opportunities to refresh and relax, this would increase the comfort levels of students which would lead to extended use of learning spaces.

vi. Informal learning spaces in campus should be seen as a continuity to formal learning spaces; applying student-centered pedagogies such as PBL is bridging the gap between formal and informal learning spaces designs, both types of learning spaces are becoming similar in terms of trying to be flexible, open, IT enriched environments that encourage social collaborative learning.

6.2.3 A Prospect of Future Research

This research was qualitative in nature, further investigation may be held to include quantitative studies to measure in more details the meanings and conceptions of learning spaces to campus users, and this may include the evaluation of the physical and social context of university learning space. Such a study requires developing a questionnaire that focuses on issues related to measuring the campus environment and particularly learning spaces in context of place making and emerging student-centered learning pedagogies. Such a questionnaire would provide additional data relying on opinions of campus users which may be compared with the qualitative data and particularly focusing on issues of actual activities as observed in learning spaces and declared needs by campus community. This could give a more comprehensive view of the issues of campus learning spaces including common place, library learning commons and PBL classes.

Another possible issue that requires more investigation in detail is the gender differences and its effect on the use of learning spaces especially in common place and library learning commons, such an investigation requires concentrated observations of selected groups of both genders in addition to those groups formed from a mixture of both genders. The focus would be on noting the differences of needs, attitudes towards other groups or users, total stay time and activities carried out and their observed manners. In addition to investigating differences in engagement levels and learning styles based on gender.

This research focused on issues related to learning behaviors and collaboration within common place, learning commons and PBL classes, yet further studies could be carried out to investigate the effect of interior design elements including color and lighting schemes, types and layouts of tables and use of IT tools or other elements on the satisfaction of users with the available learning environment space qualities.

APPENDIX A

MALL USE IN JAPANESE UNIVERSITIES

The mall concept can be used in the planning of a campus to create better outdoor common place; this concept can be used easily in small scale campuses where the mall can be used to organize the surrounding buildings of a campus while in the case of mega campuses the mall concept can be applied to various campus districts, for example several malls can be used to organize the various faculties buildings in campus and these malls can be connected to each other and served by vehicle ring roads. The use of the mall concept in a mega campus can be understood by looking at the plan of Hiroshima University where several districts were created by organizing its buildings around central malls (Fig.A-1).

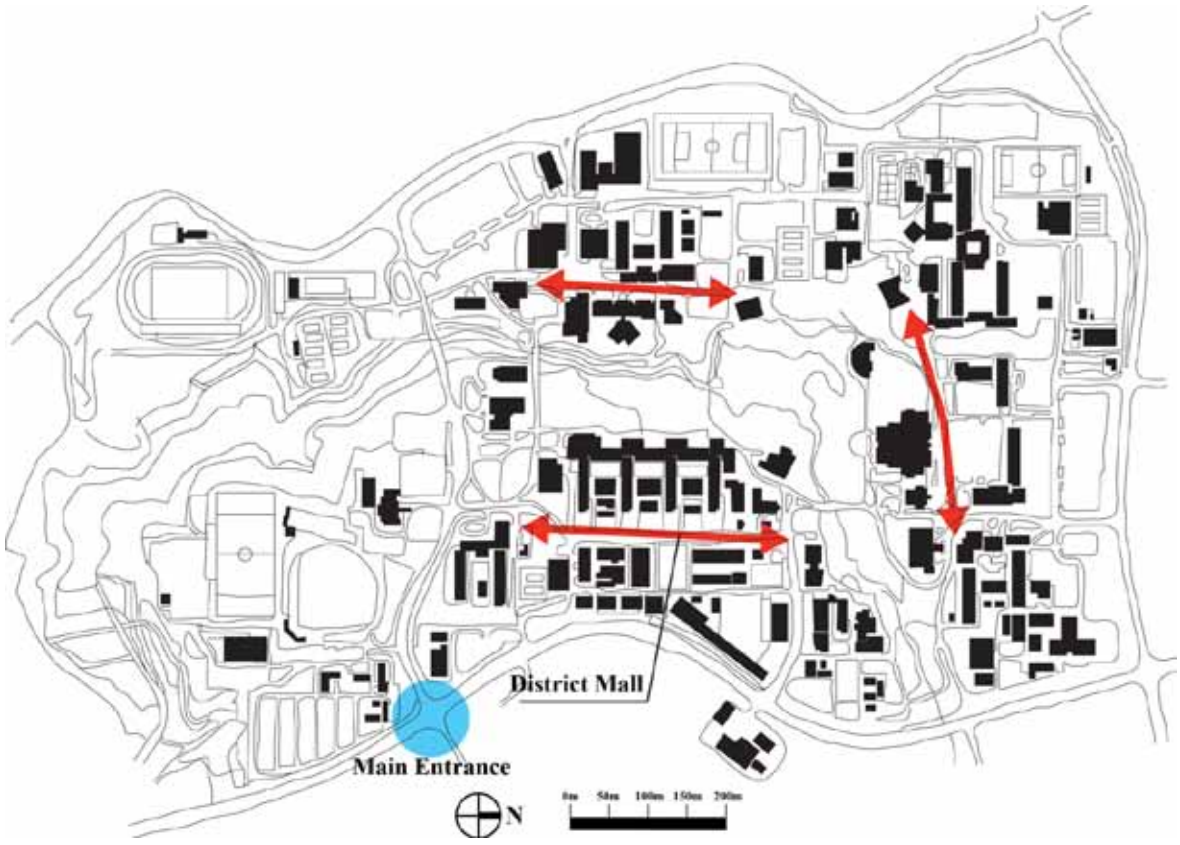


Fig.A-1. Mall Use in Hiroshima University

The plans of both Toyohashi University of Technology and Nagaoka University of Technology (Fig.A-2 & Fig.A-3) are good examples of the use of the mall concept in a small campus.

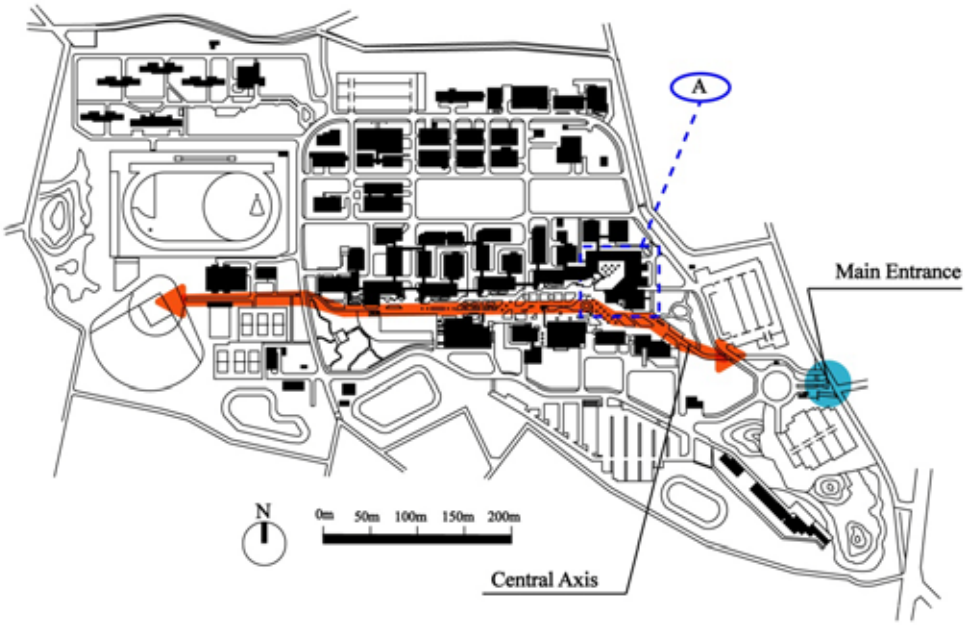


Fig.A-2. Mall Use in Toyohashi University of Technology

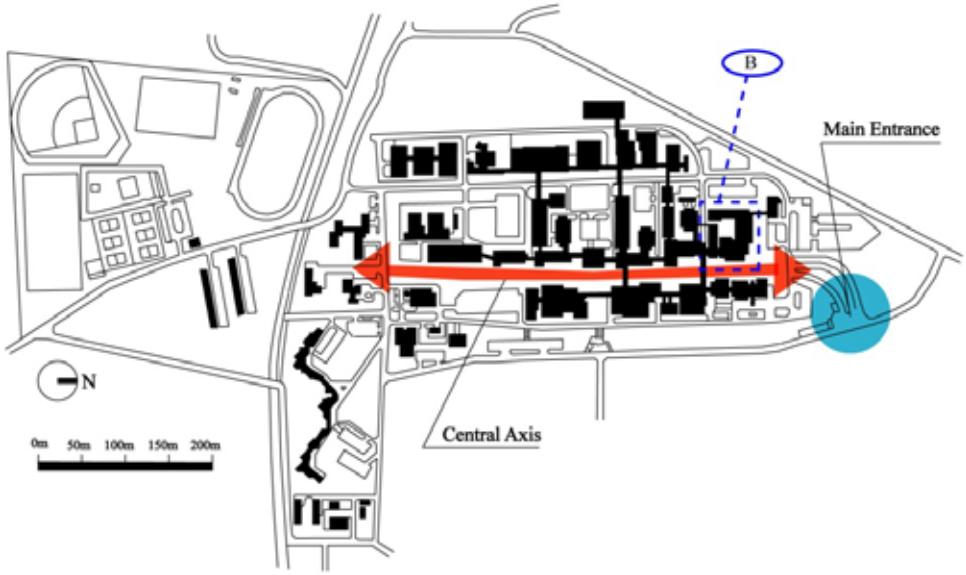


Fig.A-3. Mall Use in Nagaoka University of Technology

MIE ENVIRONMENTAL AND INFORMATIONAL PLATFORM

Mie Environmental and Informational Platform (MEIPL) opened in Mie University on April 2012. Findings of research were used to inform primary design concepts of 2nd and 3rd floors of this building (Fig.B-1 & Fig.B-2). The 2nd floor includes a learning commons (Fig.B-3 & Fig.B-4) while the 3rd floor includes Problem Based Learning classrooms and teaching commons (Fig.B-5 & Fig.B-6).

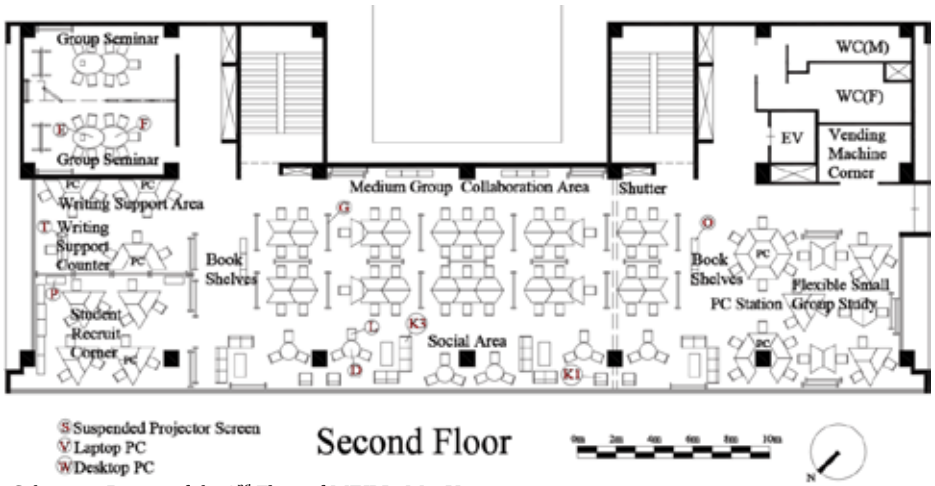


Fig.B-1. Primary Schematic Design of the 2nd Floor of MEIPL, Mie University

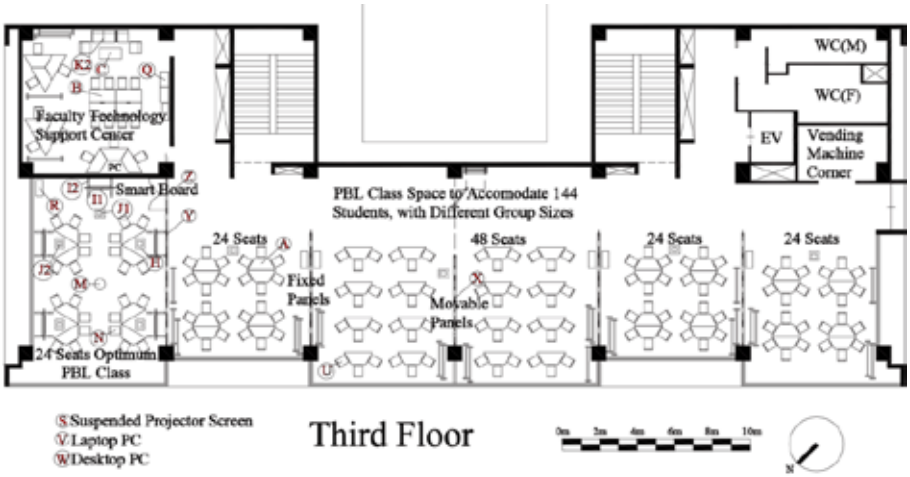


Fig.B-2. Primary Schematic Design of the 3rd Floor of MEIPL, Mie University

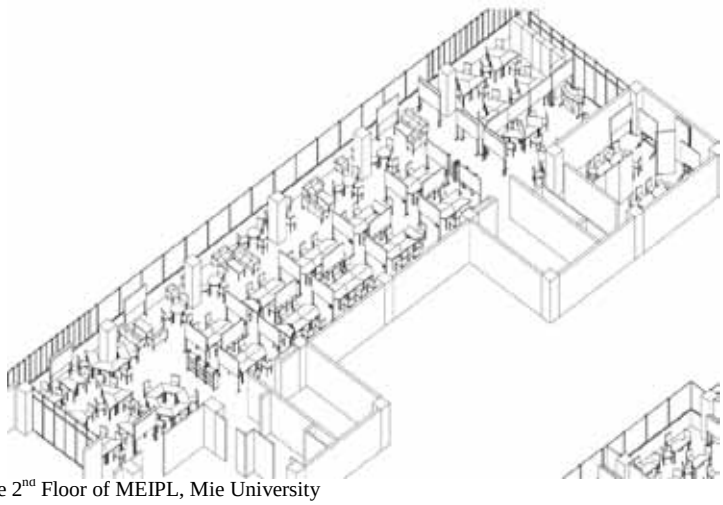


Fig.B-3. General View of the 2nd Floor of MEIPL, Mie University

A. Individual Study Area

B. Social Area

C. Flexible Small Group Study Area

D. Medium Group Collaboration Area

Fig.B-4. Main Areas in the 2nd Floor of MEIPL Being Used by Students, Mie University

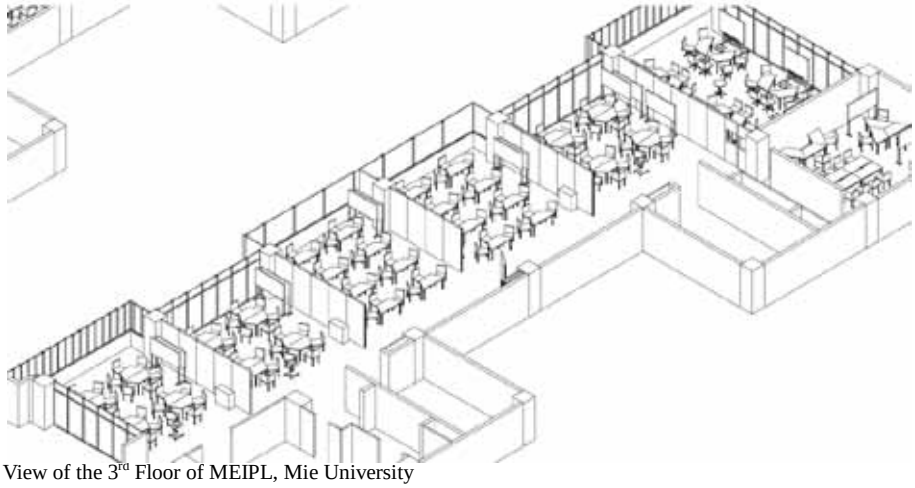


Fig.B-5. General View of the 3rd Floor of MEIPL, Mie University

A. Students Divided into Groups

B. Use of IT tools

C. Use of Whiteboards

D. Brain Storming Making Use of Note Pads

Fig.B-6. Use of the 3rd Floor of MEIPL During Architectural Planning and Design 1 PBL class, Mie University

RENOVATION OF MAIN LIBRARY OF MIE UNIVERSITY

The research feedback was used to inform a primary design concept for the renovation of the 1st and 2nd floor plans of the main library of Mie University to include a learning commons and this primary concept was later on developed into the final project which is currently under implementation.

The first floor concept aimed to create a hybrid learning space, it was basically composed of six zones; the computer literacy center, seminar room, presentation practice, flexible group study, social area and E-mail checking station. An effort was made to use both soft and hard furniture and to provide enough movement spines and IT technology tools. Also, using flexible furniture was stressed. The design was based on the continuum of service by providing a variety of zones where students can perform all their learning tasks starting from collecting information, manipulating it, preparing presentations and rehearsing them without leaving library (Fig.C-1 & Fig.C-2).

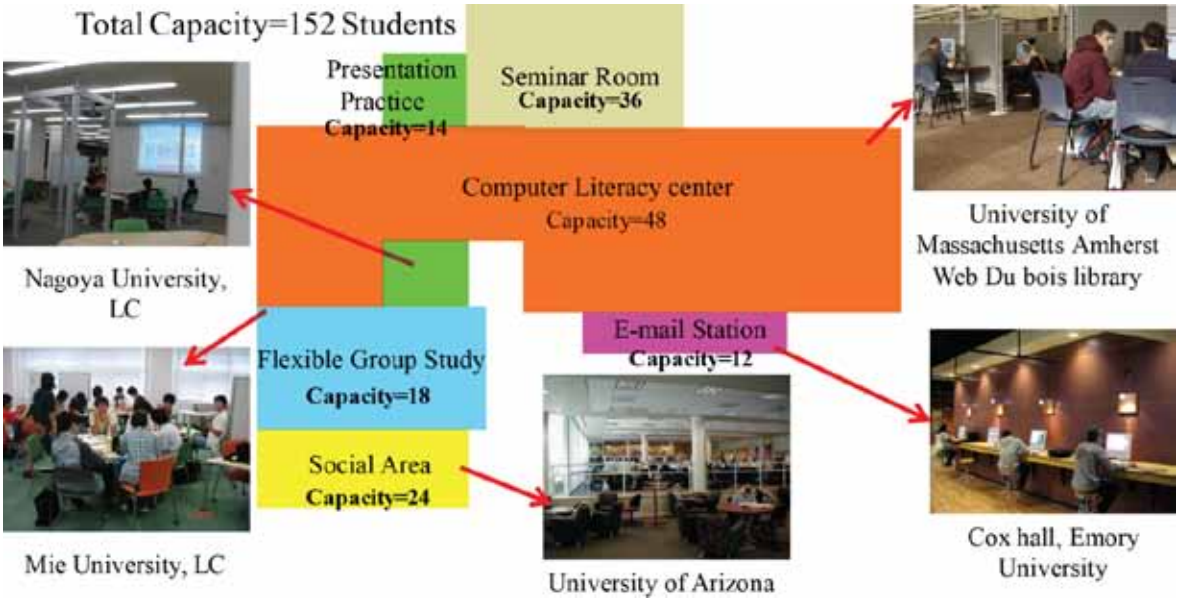


Fig.C-1. The Primary Concept of the First Floor of Mie University Library

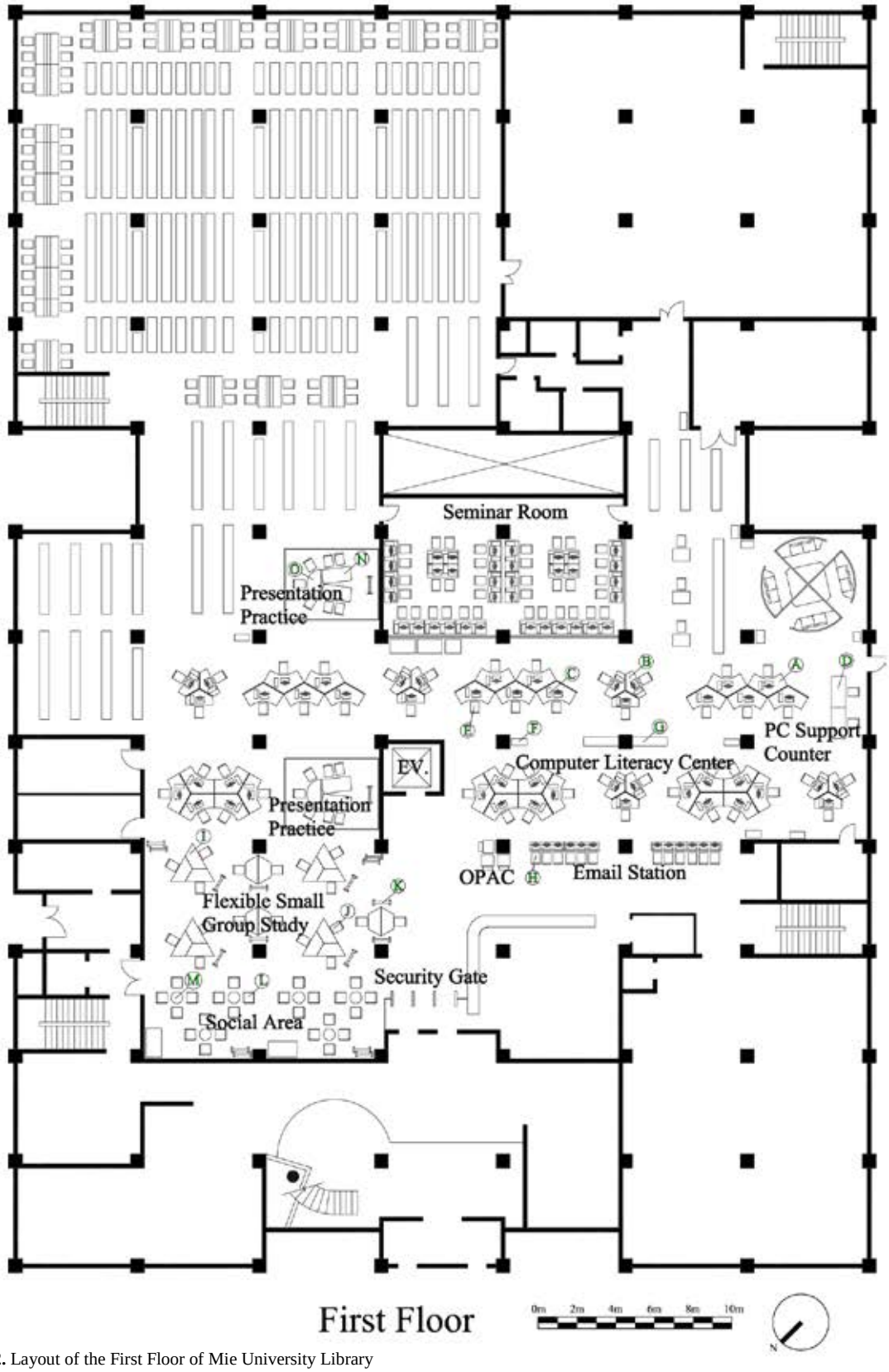


Fig.C-2. Layout of the First Floor of Mie University Library

The second floor concept tried to complement the functions of the first floor by focusing on creating chances for group work in a variety of layouts. The second floor concept tried to create five zones; flexible small group study, presentation practice, PC pods, collaboration booth and social area. This floor had a large area dedicated for group study; it includes a combination of flexible trapezoidal tables that can be organized to accommodate different group sizes, in addition to providing whiteboards. Also, the floor would include several collaboration booth areas, this area tried to use booths like those used in restaurants that can be used by groups of students, this area was part of an effort that aims to introduce various layouts to induce students' interest by providing elements that try to create a learning environment that is untraditional in nature (Fig.C-3 & Fig.C-4). The second floor is connected with the adjacent Mie Environmental and Informational Platform (MEIPL) building through a bridge, this aims to enrich the students learning experience and supports the adoption of emerging student-centered learning pedagogies that was embodied by providing many PBL classrooms in the third floor of MIEPL.

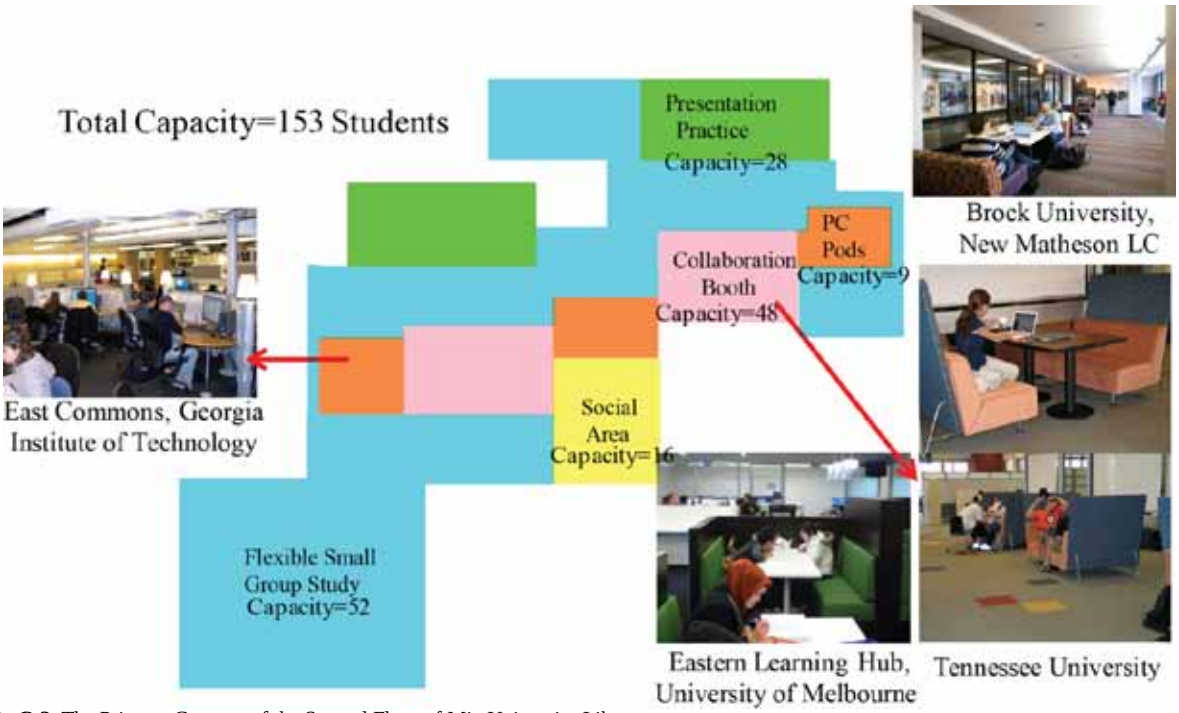


Fig.C-3. The Primary Concept of the Second Floor of Mie University Library

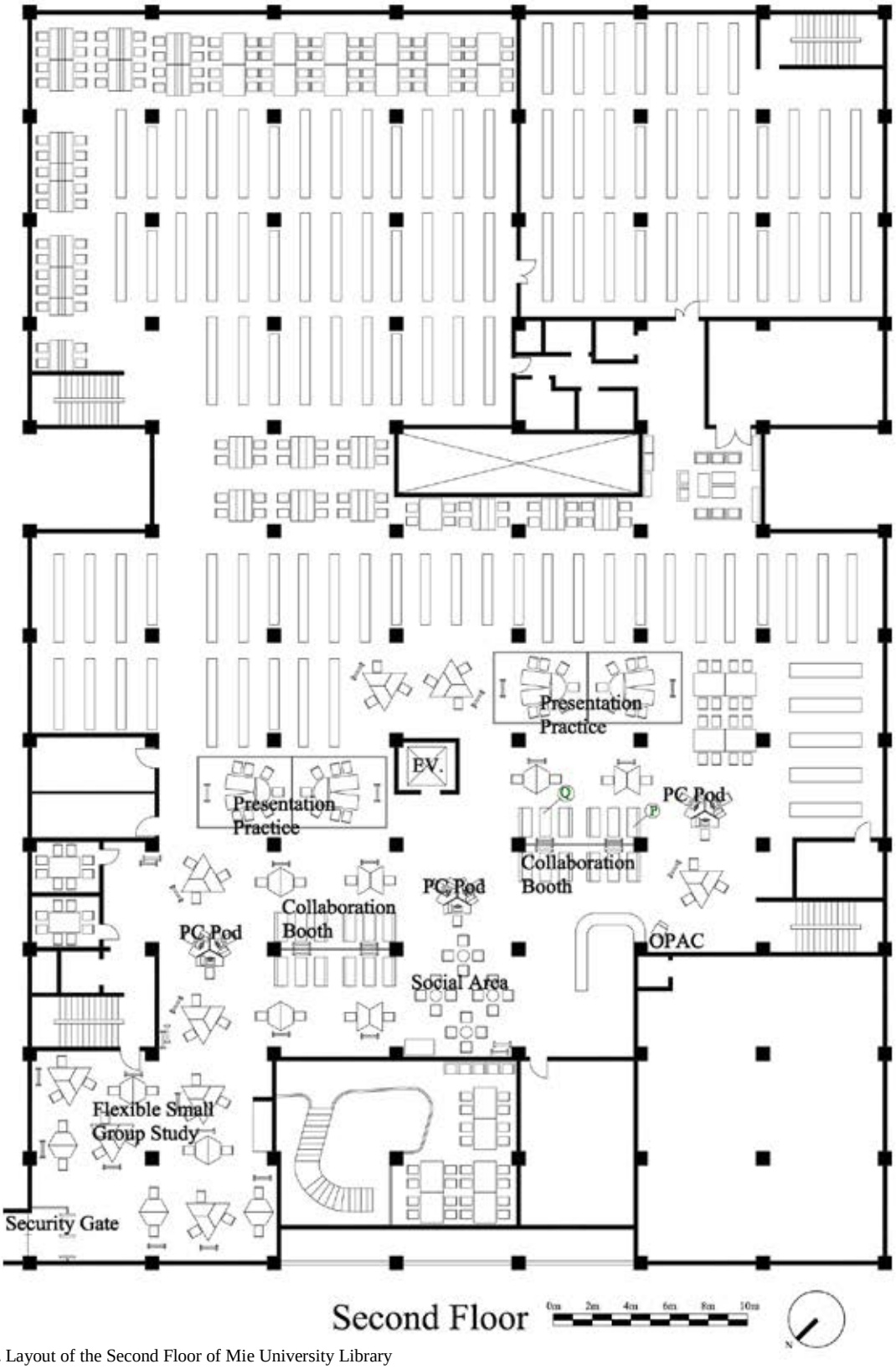


Fig.C-4. Layout of the Second Floor of Mie University Library

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