CAMPUS AS AN INTEGRATED LEARNING ENVIRONMENT: LEARNING IN CAMPUS OPEN SPACES

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I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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ABSTRACT

CAMPUS AS AN INTEGRATED LEARNING ENVIRONMENT: LEARNING IN CAMPUS OPEN SPACES

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Recent researches on campus learning environments present that there is a seeking for alternative learning spaces among students. Researches argue that more learning is taking place outside of class time than ever before. With an increased emphasis on collaboration and group projects, students are learning in small groups outside of the classrooms as they accomplish work related to their courses. Literature defines these experiences as *'informal learning'*. Therewithal, campus open spaces are one of the major areas where students prefer for their informal learning experiences.

This thesis aims to search the influence of campus open space design on students' learning experiences. Additionally, it argues that there is a strong relation between the learning and the space where learning action occurs. In doing this, it both covers a theoretical framework and a case study. Within the theoretical part, it discusses various learning theories with respect to the prominent principles for each theory. It reveals learning space design indicators which affects learning both in indoor and outdoor learning environments. In the case study, with the analysis of different sample areas from METU campus, the study both investigates the learning experiences actualized on campus open spaces and the triggering design indicators which enhance these experiences.

Keywords: Learning Theories, Learning Spaces, Campus Open Space Design

ÖZ

BÜTÜNLEŞİK BİR ÖĞRENME MEKANI OLARAK KAMPÜS: KAMPÜS AÇIK ALANLARINDA ÖĞRENME

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Kampus öğrenme mekanları hakkında yapılan son araştırmalar, öğrenciler arasında alternatif öğrenme mekanları arayışı olduğunu ortaya koymaktadır. Araştırmalar sınıf dışında meydana gelen öğrenme deneyimlerinin sınıf içerisinde gerçekleşenlerden daha fazla olduğunu öne sürmektedir. Grup çalışması ve işbirliği metotlarının önem kazanmasıyla, dersleriyle ilgili işleri tamamlamak için öğrenciler küçük gruplar halinde öğrenmeye yönelmektedir. Bu deneyimler, literatürde 'enformel öğrenme' olarak geçmektedir. Keza, kampus açık alanları, öğrencilerin enformel öğrenme için tercih ettiği mekanların başında gelmektedir.

Bu çalışma, kampus açık alanları tasarımının öğrencilerin öğrenme deneyimleri üzerindeki etkilerini araştırmaktadır. Ek olarak, çalışma öğrenme ve öğrenmenin gerçekleştiği mekan arasında önemli bir bağ olduğunu savunmaktadır. Çalışma, hem teorik çerçeveyi hem de bir örnek kampusu kapsamaktadır. Teorik çerçevede, farklı öğrenme yaklaşımları ve öğrenmeyi açıklayan başat unsurlar incelenmektedir. Öte yandan, kapalı ve açık öğrenme mekanlarında öğrenmeyi etkileyen mekansal tasarım indikatörleri açığa çıkarılmaktadır. Örnek kampus çalışması, ODTÜ kampusunda seçilen örneklem alanlarda yapılan analizlerle, kampus açık alanlarında meydana gelen öğrenme deneyimlerini ve bu deneyimleri tetikleyen tasarım kriterlerini ortaya çıkarmaktadır.

Anahtar Kelimeler: Öğrenme Teorileri, Öğrenme Mekanları, Kampus Açık Alan Tasarımı

To my mother and father…

…for all their love and support...

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LIST OF ABBREVIATIONS

JISC: Joint Information Systems Committee

METU: Middle East Technical University

NIBS: National Institute of Building Sciences

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CHAPTER 1

INTRODUCTION

1.1 The Definition of the Problem

Over the past two decades, a great deal of research has focused on how learning environment affects students' learning. Majority of these research studies concentrated on the design of indoor academic settings, particularly in campus universities. These include faculty buildings, laboratories, library and IT spaces where academic staff and students come together. Researchers like Oblinger (2005), Johnson and Lomas (2005) argued that the emergence of new methods of teaching and learning, based on improved understanding of cognition; fostered the evolution of the notion of these academic spaces. Today, the teaching and learning process in a university campus is a mix of formal and informal interactions that takes place in different space through the campus (King, 1996; Deluze and Guattari, 1988). Therefore learning space design has gained a different dimension that needs to be considered in the planning of university campuses.

Campus space is composed of academic as well as non-academic sections including sports areas, shopping centers, student accommodation and social facility zones where the social life takes place. This study defines these spatial components as the "*public spaces"* of campus settings, allowing learning through experience and social interaction. Furthermore, it argues that "*public spaces"* affect student's learning attitudes. Strange (1996) states that the features like size, layout and design of spaces

blend to create campus environments that effect, in different ways, the behavior of students. He adds on that all manmade features on campus have an influence on student's attraction to and pleasure with the physical setting. On the other hand, in line with many scholars (Acker and Miller, 2005; Oblinger, 2005; Chapman, 2006; Illeris, 2007) there is an interaction between people and environment. As the design of a space affects the human behavior; human behaviors reshape the function of the spaces. Spaces may be designed for a specific function in the campus, but campus users may attach different purposes to it.

Within this context, space can also enhance or hinder students' learning. Oblinger (2003) and Schroeder (2004) claim that today's students learn differently than they did before. Students started to look for alternative learning spaces. Acker and Miller (2005) add on that, in order to meet the changing learning concepts, new ways of learning like lifelong learning and organizational effectiveness have occurred. These new approaches generated the concept of *informal learning.* Recent studies show that there is an increasing concern on the notion of *informal learning* in the campus. All these studies explore that the learning in a campus environment cannot be limited only to formal spaces like classrooms, laboratories, lecture halls and the like. For instance, a courtyard in a faculty may serve as an *informal learning* space where students study or prepare projects. Students need more *"public spaces"* where they can feel themselves away from the severe and often gloomy ambiance of formal spaces. In other words, learning does not just happen in classrooms, it also occurs outside the lecture hall.

New strategies for providing effective learning have led to rethinking the usage and design of learning spaces. But it is still inadequately studied how "public spaces" should be produced in the spatial design process of a campus. Learning space designers must now consider the instructional implications of these spaces. Therefore, further investigation on the significance of spatial design to enhance learning is required.

The literature review presents that the research studies conducted on space-learning relations are mainly concentrated on the closed learning areas such as classrooms, laboratories. This research focuses on how the spatial design and quality of "open public spaces" on campus affect students' learning attitudes. Respectively, I will explore, in what way the formation of open public spaces influence students' attitude of learning; in the central core of campus, in dormitory zones and in the study areas between faculty buildings.

1.2 Significance of the Study

Managing the space in which learning takes place is a critical subject that has been discussed in recent years (Montgomery, 2008; Kenney and Dumont, 2005; Dugdale, 2009). One leading argument is that space where learning takes places can impact upon the extrapolating within education and upon the dynamic of learning (Montgomery, 2008). Considering that students have different learning goals and expectations, they require different learning needs which necessitate the production of different kinds of spaces on campus (Montgomery, 2008; Kenney and Dumont, 2005). In this respect, some institutions provide more learning-center activities in libraries and classrooms in dormitories to support community and promote the educational requirements of different student groups (Kenney and Dumont, 2005).

Moreover, increasing interdisciplinary study and research on campus bring new importance to the physical arrangements of spaces for these activities (Kenney and Dumont, 2005). Since the educational curriculums in many institutions have turned into more integrated or joint programs in recent years, students from different interest areas feel the need to work through collaboration. These interdisciplinary studies stimulate new academic relationships and interactions; thus students seek more collaborative and immerse experiences (Dugdale, 2009).

On the other hand, with the emergence of new learning ways generally based on technological development learning become possible to happen anywhere on the

campus (Jamieson, 2003; Dugdale, 2009). Mobile devices like notebooks, laptops or data storage devices give opportunity to students to carry out learning experiences from indoor spaces to any other alternative spaces on campus. With wireless internet connection it is now possible to reach any internet based source of data on different spaces.

However, as Jamieson (2003) states, the changing in the way of teaching and increase on the campus has influence on educators' role, increase students responsibility for their own learning, change the interaction and communication ways of student. In this context, campus places should provide both individual places and spaces offering various options for students to work in different ways (Jamieson, 2003).

On the other hand, in recent years, campus planning became a current issue in Turkey. With the published law NO: 5467 in 2006, law NO: 5662 in 2007 and law NO:6005 in 2010 many new universities are constructed. In order to sustain the sufficient academic space and social spaces including accommodation, cultural, sport and recreational activities; State Planning Institute gave directions to design new campuses for each new university.

This study is critical at a moment in which Turkey is engaged in construction of new campus universities for many provinces. Considering students' tendency to search for alternative ways of learning, public space design becomes a prominent issue in the design process of all these new campuses.

3. Structure of the Thesis

The thesis has a gradual structure, starting from theoretical framework of learning and learning theories; and continuing with case study of a campus and learning spaces. In this context, Chapter 1 presents the definition of the problem and provides rationale of the thesis.

Chapter 2 provides an overview of the study of learning. Firstly, chapter presents the definition of learning and the prominent principles for different learning theories. Chapter gives an overview of some principles of approaches that facilitate the groundwork for the application of learning theories to education. By providing a framework for understanding learning and some background theories, this chapter ends with ascertainment of when the notion of place gained significance in learning.

Chapter 3 presents the relationship between learning and the space where learning takes place. Initially, chapter presents the literature review about different types of learning spaces. Subsequently, the review continues with the previously determined design attributes for outdoor and indoor learning spaces. Finally, the chapter ends with a chart that shows the design attributes and the potential results in the act of implementation of these design attributes.

Chapter 4 presents the methodology of the thesis. Initially, chapter provides an overview of the used research methods in this study. Later on, chapter continues with the presentation of variables investigated thoroughly literature review. Subsequently, the selection criteria of case campus and respondents to be interviewed are presented. Finally, chapter ends with the data collection and data analysis techniques used during the research process.

Chapter 5 is the analysis chapter which consist content analysis, multiple regression analysis and site analysis according to the indicators obtained from literature review and interview entries. Later on, chapter continues with the discussion of the research findings.

Chapter 6, as the conclusion part of the thesis, consists campus open space design principles posed through the results of analysis and observations of students' practices.

CHAPTER 2

WHAT IS LEARNING?

This chapter provides an overview of the study of learning. Initially, learning is defined and examined in settings where and how it occurs. Different learning approaches are examined and prominent principles for each theory are defined. An overview is given of some principles of approaches that help to establish the groundwork for the application of learning theory to education. By providing a framework for understanding learning and some background theories, this chapter ends with ascertainment of when the notion of place gained significance in learning.

2.1 Definition of Learning

In the field of psychology and education, learning is commonly defined as a process that assembles cognitive, emotional, and environmental impacts and experiences in order to develop or change someone's skills, values or conception of the world (Biggs, 1987; Hartley, 1998; Illeris, 2000).

However, learning takes place in many ways. Sometimes it is intentional, as when students obtain information presented in the classroom or when they search information on the internet (Slavin, 2006). Sometimes it is unintentional, as when students evaluate the previous course when they are in a tea break. All sorts of learning are going on integrated all the time.

Illeris (2007) states that a great part of learning takes place almost entirely in schools and other educational institutions. School learning in other words 'educational learning', is a learning process that occurs in educational institutions depending upon planned curriculums designed for an assigned aim. However, learning is not a simple fact that can be explained only by 'educational learning'.

Illeris (2007) defines 'everyday learning' as learning that actualize informally and actually unplanned in everyday life. He claims that one person unconsciously enters another's life without intending to learn anything and may get many new ideas that he or she did not know already. His definition of 'everyday learning' actually refers to unintended learning experiences that occur coincidentally; therefore it concerns the context in which the learning actualizes.

On the other hand, whatever the learning type is actualizing, Carmean and Heafner (2002) state that learning has different extents which change according to the conditions that it is experienced. Table 2.1 presents deeper learning principles classified under five extents of learning as; social, active, contextual, engaging and student-owned.

Table 2.1 Deeper Learning Principles

LEARNING IS…	**WHEN…**
Social	It involves cognitive apprenticeship. It promotes reciprocity and cooperation among students. It offers prompt feedback. It encourages contact between students and faculty. It emphasizes rich, timely feedback.
Active	It is engaged in solving real-world problems. It is intertwined in judgment and exploration. It is situated in action. It uses active learning techniques.

Table 2.1 (Continued)

Active	Practice and reinforcement are emphasized. Involvement in real-world task is emphasized.
Contextual	New knowledge builds on the learner's existing knowledge. New knowledge is integrated into the learner's world. Knowledge is applied by the learner. New knowledge is demonstrated to the learner. Students have a deep foundation of factual knowledge. There is an awareness that students come to the classroom with perceptions about how the real world works. Students understand facts and ideas in the context of a conceptual framework. Learning is concrete rather than abstract.
Engaging	It respects diverse talents and ways of learning. It communicates high expectations. It is done in high-challenge, low-threat environments. It emphasizes intrinsic motivators and natural curiosities.
Student-Owned	Students organize knowledge in ways that facilitate retrieval and application. Students take control of their own learning: noting failures, planning ahead, apportioning time and memory to tasks. It emphasizes time on task. It emphasizes learner independence and choice. It allows time for reflection. It emphasizes higher-order thinking (synthesis and reflection)

Source: Carmean, C. and Haefner, J. (2002), Mind over Matter: Transforming Course Management Systems into Effective Learning Environments, November/December 2002 EDUCAUSE

As the learning definitions mentioned above indicate, learning is a comprehensive and complex matter. In order to understand and describe learning adequately, learning must be examined with an experienced-based research through constructing the relationship between learning and psychology (Illeris, 2007). Whatever the learning type actualizes, there are some external factors that can be seen either as physical or sensational variables. These variables are called stimuli in the literature. The challenge for educators is how to present students with the right stimuli on which to focus their attention and mental effort so that they will acquire important skills (Slavin, 2006). Therefore, this becomes an initial problem for place makers to create places that provides right stimuli for students to encourage their concentration and psychological affords.

2.2 Learning Approaches

There are different learning theories that explain how learning happens as a process. This part presents these theories as behaviorist, cognitive, humanist, social and constructivist learning theories. Formerly, these five learning approaches are examined in terms of how they view learning process. Table 2.2 indicates how different learning approaches interpret the basic definition of learning. Latter the prominent principles for each learning approaches are identified. Main purpose of this identification is to create a principle chart which shows the prominent principles for each learning approach. Table 2.3 indicates the relationship between learning and some fundamental factors like the role of learner, the role of educator, the role of environment, importance of feelings, conversation with people, experience and the role of space. At the end, Table 2.3 presents learning approaches which consider and emphasize the significance of space, relation between space and learning experiences.

Table 2.2 Learning Definitions

Learning Approaches	**Definition of Learning**
Behaviorist Approach	… a conditioned individual response to stimuli
Cognitivist Approach	… the individual application of mental processes
Humanistic Approach	…a product of individuals' perception and experience
Social Approach	…the product of shared experiences in a range of social learning
Constructivist Approach	revolves around the construction of meaning

Source: Jordan, A., Carlile, O. and Stack, A., (2008), Approaches to Learning; a guide for teachers, Open University Press, McGraw Hill, p: 79

Although **behaviorist approach** is originated in the field of psychology, behaviorist's ideas have many impacts on education; in particular, on understanding basic skills and core subject knowledge (Keegan, 2008). Some of the prominent principles of the approach are also useful in establishing and maintaining learning environments. Environments designed based on behaviorist approach are usually *lecture-based, teacher-focused, and structured* and use a system of reward and punishment to promote learning (Akinsanmi, 2009). Akinsanmi (2009) states that learning institutions created to support behaviorist approach were characteristically fenced in multi-storey single buildings. The layouts of classrooms in those institutions are not flexible. For instance, desks are usually laid out in traditional classroom layout which is designed in rows and columns. Therefore, teacher becomes the only focal point where the information is sent out. These kinds of learning spaces presume students as mechanisms that take and storage the given information as sets of data.

However, the thoughts, feelings, and behaviors of higher-level species, such as human beings, are far more complicated than the behaviorist approach originally presumed.

Considering educational learning process, behaviorist approach cannot account for a well grounded explanation for learning itself.

As distinct from behaviorist approach, **cognitive approach** encompasses the study of mental processes such as sensation, perception, attention, encoding and memory (Jordan, Carlile and Stack, 2008, p: 36). Cognitivists believe that cognition occurs inside the *'black box'* of the brain and learning results from organizing and processing information effectively (Jordan, Carlile and Stack, 2008, p: 36). Therefore, if educators be aware of how learners process information, they can plan learning experiences that optimize this activity. Likewise, if learning space designers understand the environmental factors that optimize learning activities, they can design more effective learning spaces that encourages and enhance mental processes in term of learning. Akinsanmi (2009) states that "learning environments created with this approach encourage curiosity, provide inquiry–oriented projects and present knowledge in staged scaffolding". Moreover, spaces designed with cognitivist approach provide opportunities for the students to interact with the outdoors periodically, supporting the explorative approach of the learning theory (Akinsanmi, 2009).

Humanistic approach recognizes the uniqueness of each individual's perception, experiences and approaches to learning (Maslov, 1954; Rogers, 1959; Huitt, 2001). As distinct from behaviorist and cognitivist approaches, emotions and feelings are two important terms for humanist approach. Humanistic approach claims that since humans are emotional beings, emotions have great influence on their receiving and reacting ways to information from the environment. Therefore learning is student centered and personalized. Students have active role in learning while educators have a role of facilitator. Thus, learning environments designed with humanistic approach provides more segmented learning places that encourage individual learning.

Social learning approach has some similarities with behaviorist and cognitivist approaches, especially in terms of the relation between environment and learning. But,

as distinct from behaviorists, they argue that people can learn new information and behaviors by watching other people. (Bandura, 1975; Merriam and Caffarella, 1991; Ormrod, 1999) They define observational learning as a process that considers the role of internal, mental proceses in human behavior. Their argument refers that the way that learning as a cognitive activity is influenced by the social factors. Main claim of the approach is that "learning occurs within social spheres and contexts, which inform, develop, deepen and influence individual identity, thinking, learning and meaning-making process" (Jordan, Carlile and Stack, 2008, p: 69). Since the relation between the learner and the social group is the constant factor in social learning approach, spaces that are produced under this approach fosters the social interaction and collective learning.

Finally, **constructivism** refuses to accept the assumption that the mind is a clear board and argues that learning is a process of constructing knowledge rather than obtaining it. Therefore learner's social, cultural and contextual conditions gains importance (Boyle, 1994). Constructivism argues that the learner constructs knowledge through experience and in accordance with his level of cognitive development (Boyle, 1994). With statement of Akinsanmi (2009), "*learners interpret new information through their contextual experiences and build on their existing knowledge from the conclusions reached during the assimilation of and reflection on new knowledge.*" In other words, constructivism defines learning as an active process of making sense out of experiences, it gives the responsibility of learning to the learner and emphasizes the significant role of social interaction and reflection on the learning process (Sample, 2000; Ataöv, 2007; Akinsanmi, 2009). Therefore the demand of space which promotes dialogue and communication comes to the agenda.

Considering the prominent principles of each learning theory, Table 2.3, on the next page, presents the summary of the roles of learner and environmental factors, importance of feelings, conversation with people, experiences and the role of space on learning.

Table 2.3 Learning Theories and Prominent Principles

Approach to Learning	Behaviorist	Cognitive	Humanistic	Social	Constructivist
Role of Learner	Passive receptor of information	Active processor of information	Active constructer	Active constructer with others	Active constructer with others
Role of Educator	Active	Facilitator	Facilitator	Facilitator	Facilitator
Role of Environment	Active	Facilitator	Passive	Facilitator	Facilitator
Importance of Feelings	Not usually considered	Not usually considered	Usually the part of learning process	Not necessary but can influential	Not necessary but can influential
Conversation With People	Ignored	Ignored	Not usually considered	Usually the part of learning process	Usually the part of learning process
Experience	Ignored	Ignored	Ignored	Ignored	Usually the part of learning process
Role of Space	Ignored	Ignored	Ignored	Not necessary but can influential	Usually the part of learning process

2.2.1 The Behaviorist Approach to Learning

Even though behaviorist approach emerged in the field of psychology, behaviorism presents many influences on education, especially in terms of understanding basic skills and core subject knowledge (Keegan, 2008). The approach of using positive and negative reinforcements to obtain desired behaviors of students is also useful in establishing and maintaining learning environments. Therefore, in terms of finding the influential components of this approach on the learning environments, how the behaviorist approach of learning tries to explain learning process becomes a significant issue.

The behaviorist approach of learning seeks scientific explanations for simple behaviors. Therefore, behaviorists used experimental methods to study behavior in relation to environment. Behaviorists explain how people learn, under two processes; as **classical conditioning** and **operant conditioning**.

Sammon (1999) states that, in **classical conditioning**, people learn to associate two stimuli when they occur together, such that the response originally emerged by one stimulus is transferred to another. The person learns to produce an existing response to a new stimulus. For instance, Watson & Rayner (1920) made an experiment by placing a young boy (Little Albert) on a mattress on a table in the middle of a room. They place a white laboratory rat near Albert and allow him to play with it. At first, while the rat was turning around Albert, he was trying to catch rat without showing any fear. After a while Watson and Rayner made a loud sound behind Albert's back by striking a suspended steel bar with a hammer when the baby touched the rat. As it was expected, this time, Little Albert cried and showed fear as he heard the noise. After several such pairings of the two stimuli, when he was again stayed alone with the rat, he became very distressed. He cried, turned away from the rat, and tried to move away. “Apparently, the baby boy had associated the white rat (original neutral stimulus, now conditioned stimulus) with the loud noise (unconditioned stimulus) and was producing the fearful or emotional response of crying (originally the

unconditioned response to the noise, now the conditioned response to the rat)." (Wikipedia, Little Albert Experiment)

The experimental works of Pavlov, Watson & Rayner has inspired researchers like E. L. Thorndike and John B. Watson (Slavin, 2006). They linked behavior to physical reflexes. They viewed most behaviors as a response to stimuli in the environment. John B. Watson (1913) argued that since the inner experiences that were the focus of psychology were unobservable, it could not be thoroughly studied. Therefore, he concentrated only with behavior. His studies have resulted with *the stimulus-response model.* This model supposes that a learner is essentially passive, responding to environmental stimuli. In other words, the environment shapes one's behavior; what one learns is determined by the elements in the environment, not by the individual learner.

Since he found classical conditioning limited, Skinner developed the theory of **operant conditioning**, the idea that we behave the way we do because this kind of behavior has had certain consequences in the past. Like Watson, however, Skinner denied that the mind or feelings play any part in determining behavior. Instead, our experience of reinforcements determines our behavior. (DeMar, 1989) In operant conditioning, people learn to perform new behaviors through the consequences of the things they do. As Sammon (1999) stated, consequence can be reinforcing in two ways: either the person gets something good (positive reinforcement) or they avoid something bad (negative reinforcement). On the other hand, when a behavior is subjected to a punishment, the possibility of that behavior being repeated in future lessens. Whereas classical conditioning only allows the person to produce existing responses to new stimuli, operant conditioning allows them to learn new responses.

Grippin and Peters (1984) summarize that there are three main assumptions in behaviorist approach. "(1) The study usually focuses on observable behavior, (2) the environment shapes behavior and (3) punishment & reinforcements are essential in the learning process." On the other hand, Slavin (2006) summarizes the principles of

behavioral learning as; the role of consequences, reinforces, punishers, shaping, extinction, maintenance and the role of antecedents.

Table 2.4 Prominent Principles of Behavioral Learning Theory

PRINCIPLES	**DEFINITIONS**
Consequences	Pleasant or unpleasant conditions that follow behaviors and affect the frequency of future behaviors
Reinforcer	Any consequence that strengthens a behavior
Punishers	Consequences that weaken behavior
Shaping	The teaching of a new skill or behavior by means of reinforcement for small steps toward the desired goal
Extinction	The weakening and eventual elimination of a learned behavior as reinforcement is withdrawn.
Maintenance	Continuation of behavior
Antecedents	Events that precede behaviors

Source: Adopted from Slavin, R. E. (2006), Educational Psychology: Theory and Practice, 8th Edition, Pearson Education, USA

Slavin (2006) states that; the most important principle of behavioral learning is that behavior changes according to its immediate **consequences**. He states that pleasurable consequences strengthen behavior and unpleasant consequences weaken it. If students enjoy learning by doing experiments in laboratories, they will probably try it more

often. If they find making experiments difficult, they may choose other ways of learning instead. At that point, pleasurable consequences are called reinforces.
A **reinforcer** is defined as any consequence that strengthens a behavior (Slavin, 2006). Schunk (2008) claims that; "students typically find reinforcing such events as teacher praise, free time, privileges, stickers and high grades."

Punishers decrease the future likelihood of responding to a stimulus. For instance, a student seated in the back of the classroom may behave badly often. Teachers can change the discriminative stimuli by moving the disturbing student to the front of the class (Schunk, 2008, p: 51).

The term **shaping** is used in behavioral learning theories to refer to the teaching of new skills or behaviors by reinforcing learners for approaching the desired final behavior (Bigge and Shermis, 2004; Driscoll, 2000 in Slavin, 2006, p: 146).

Extinction involves the decline of response strength because of non-reinforcement For instance; students who raise their hands in class but never get called on may stop raising their hands (Schunk, 2008).

As the principles above reveal, the weakest point of behavioral approach is that behaviorism is a one-dimensional approach to behavior. It does not consider internal influences such as moods, thoughts, and feelings. Moreover, behaviorist approach only explains the learning by the use of punishments or reinforcements but it does not account for other types of learning. The behaviorists are not concerned with how or why knowledge is obtained, but rather whether the correct response is given or not. Therefore, learning environments designed with a behaviorist approach usually presents a layout that makes easy for educators to give direct response to students. The traditional classroom layout in which student desks are settled in rows and columns and the teacher's table in front of the board is a typical learning space that can be an example of behaviorist approach.

To sum up, considering educational learning, behaviorist approach does not provide flexible learning environments. Learning places designed based on behaviorist approach put teacher to the main point of focus and arrange all interior elements facing teacher's desk in one after another rows.

2.2.2 The Cognitive Approach to Learning

Where behaviorists put environment as the initiatory power of learning, Gestalt psychologists like Kurt Koffka, Max Wertheimer and Wolfgang Köhler, interested in the individual's mental processes, internal harmony, consistency among his opinions, attitudes, knowledge and values. In other words, they were concerned with cognition, the act or process of knowing. (Bruner, 1956; Sahakian, 1970; Smith, 1999) Many psychologists criticized that behaviorist approach focuses too much on single events, stimuli and overt behavior. Especially Gestalt psychologists argued that perceptions or images should be approached as a whole rather than as a sum of the component parts. They were concerned with cognition, the act or process of knowing (Smith, 1999). But it is not fair to say cognitive psychologists completely discount the findings of the operant and behaviorally oriented scientists; they believe that there are also cognitive events involved in how people learn.

Cognitivism advocates that, people are rational beings that require active participation for learning, rather than giving respond to environmental stimuli. People cannot be identified as programmed animals; they have the talent of thinking which helps them to take action. Changes in behavior are observed, but only as an indication of what occurs in the learner's head. Cognitivism regards the learner's mind as computer; learner takes the information in, processes it and produces outcome. (Learning Theories Knowledgebase, 2009)

Cognitive approach focuses on understanding human perception, thought and memory. It defines learners as active processors of information and assigns critical roles to the knowledge and perspective that students bring to their learning (Bruning,

Schraw, Norby and Ronning, 1999). The cognitive approach suggests that the learner controls learning. Teachers and the learning environment have a facilitator role on the learning process. In other words, learners do not require reinforcement or punishment to be motivated in learning process. Learner can complete his training with his talent of cognition and self motivation. If learner does not have any motivation to learn the new material to begin with, the cognitive theory claims that reinforcement will not change their level of enthusiasm for learning. Therefore, it is important to provide efficient conditions that encourage and enhance students' learning motivation. Table 2.5 presents the explanations of prominent principles of cognitive learning which provides a more detailed understanding of learning process from a cognitivist view.

Table 2.5 Prominent Principles of Cognitive Learning Theory

PRINCIPLES	**DEFINITIONS**	
Perception	A person's interpretation of stimuli	
	Figure-Ground	All objects stand with reference to a background
	Proximity	Elements that are close together
	Similarity	Elements that look alike
	Common Direction	Parts displaying the same compositional patterns
	Simplicity	Legible parts and wholes
	Closure	Parts enclosing a void
Attention	Active focus on certain stimuli to the exclusion of others	

Table 2.5 (Continued)

Short-term memory	The component of memory in which limited amounts of information can be stored for a few seconds
Long-term memory	The components of memory in which large amounts of information can be stored for long periods of time

Source: Slavin, R. E. (2006), Educational Psychology: Theory and Practice, 8th Edition, Pearson Education, USA;
Günay, B., 2007, Gestalt Theory and City Planning Education, METU, Journal of Architecture, (24:1), 93-113

Perception, in other words pattern recognition, refers to attaching meaning to environmental inputs received through the senses. Gestalt theory supposes that people use principles to organize their perceptions. Some of the most important principles are figure-ground relation, proximity, similarity, common directions, simplicity, and closure (Koffka, 1922; Köhler, 1926, 1947/1959, in Schunk, 2008, p: 143). The principle of **figure ground** supposes that any perceptual field may be subdivided into a figure against a background. Such leading features as size, shape, color, and pitch distinguish a figure from its background (Schunk, 2008, p: 143). Similar elements (figure) are contrasted with dissimilar elements (ground) to give the impression of a whole. The principle of **proximity** postulates that elements in a perceptual field are viewed as belonging together, according to their closeness to one another in space or time (Schunk, 2008, p: 143). The principle of **similarity** supposes that things which share visual characteristics such as shape, size, color, texture, value or orientation will be grouped perceptually (Soegaard, 2010). The principle of **common direction** implies that elements appearing to compose a pattern or flow in the same direction seem as a figure. The principle of **simplicity** states that people organize their perceptual fields in simple, regular features and tend to form good Gestalts comprising symmetry and regularity (Schunk, 2008, p: 144).

The word **attention** is heard frequently in educational settings. Paying attention to instructions or directions is a commonly seen problem for students. Jordan, Carlile and Stack (2008) define attention as the cognitive process of selectively concentrating on one thing while ignoring others. As Schunk (2008) stated attention is a necessary prerequisite of learning and teachers can promote attention to relevant material through the design of the classroom activities.

Short-term memory is limited both in capacity and duration. Slavin (2006) defines short-term memory as a storage system that can hold a limited amount of information for a few seconds. Another term for short-term memory is working memory (Anderson, 1995; Ericson & Kintsch, 1995; in Slavin, 2006). It emphasizes that when thinking about something stops, it disappears from short-term memory.

Long term memory is a storage system that can hold great amount of information for long time periods. Since some theorists argue that we may never forget information in long-term memory, rather, we might just lose the ability to find the information without our memory; the term permanent memory is used instead of long-term memory (Byrnes, 1996; in Slavin, 2006).

Cognitivism presents a scientific approach to learning and offers a coherent understanding of the process involved. It could be argued that its focus on learning as an individual mental event ignores social processes and embodiment. Its treatment of teaching as a technical-rational activity ignores the element of reflective practice and artistry involved (Jordan, Carlile and Stack, 2008, p: 51).

Souza and his colleagues (2000) claim that learning environments produced with a cognitivist approach motivates students to join; let them to show initiatives and feel good about it; let them interact with the object of study and finally allow them to guess the object's rules, patterns of behavior and its relations with their reality.

On the other hand, Schank (2008) suggests many cognitive features striving to construct ideal learning environments, some of which are; *"a) exploration of the*

perceptive realm; b) working with emotions, trying to motivate the students; c) let the students himself determine his own rhythm of learning; d) lead the pupil to thinking and to making up rules about the situations just experienced; e) bring the object of study closer to the pupil's own reality through simulations; and f) guide the student into exploring diverse possibilities, so he may build different perspectives on what is being studied" (Souza et al. , 2000).

2.2.3 The Humanistic Approach to Learning

Humanistic approach to learning involves a move away from traditional behaviorist theories and practices towards a perspective that recognizes the uniqueness of each individual's perception, experiences and approaches to learning. (Maslov, 1954; Rogers, 1959; Huitt, 2001) Emotions and feelings are two important terms ignored in behavioral and cognitive approaches. On the contrary, humanistic approach argues that humans are emotional beings and emotions affect their receiving and reacting ways to information from the environment. Therefore influence of emotions and feelings need to be considered in studying learning process.

The main goal of this approach is to develop self-actualizing persons. (DeCarvalho, 1991; Patterson, 1973). Humanistic approach argues that learning is student centered and personalized. The educator acts like a facilitator (Learning Theories Knowledgebase, 2009). Therefore students should have an active role in learning instead of being thought passively. In that way, they will be more stimulated toward their own learning. Valet (1977) puts the priorities of humanistic education as "the development of emotive abilities, the shaping of affective desires, the fullest expression of aesthetic qualities, and the enhancement of powers of self-direction and control." Table 2.6 presents the explanations of prominent principles of humanistic learning.

Table 2.6 Prominent Principles of Humanistic Learning Theory

PRINCIPLES	DEFINITIONS
Affective Domain	all behaviors associated with feelings and emotions.
Self-actualization	someone's desire for self-fulfillment
Moral Development	the process through which children develop proper attitudes and behaviors toward other people in society

Source: Reilly, R. R. and Lewis, E. L. (1991), Educational Psychology: Applications for Classroom Learning and Instruction, Maxwell Macmillan, International Editions, pp:197-205

Affective domain includes all behaviors associated with feelings, emotions, values, interests, appreciations, aspirations, moral, character. Therefore affective domain plays an important role on students' development. Considering the aim of development inner direction and self-control of students, the affective domain can not be ignored. Decisions and responsibility in almost any area of life are based on interests, beliefs, attitudes, and values which are defined as affective domain (Reilly and Lewis, 1991). This is where humanist psychology comes to scene since it concentrates on the total person (Combs, 1973; in Reilly and Lewis, 1991).

Self-actualization in humanistic approach refers to someone's desire for self-fulfillment, in other words his tendency for being actualized in what he has potentials (Reilly and Lewis, 1991).

Moral development is the process through which children develop proper attitudes and behaviors toward other people in society, based on social and cultural norms, rules, and laws. Piaget (1965) argues that students define morality individually through their struggles to arrive at fair solutions. Within this concept, Piaget (1965)

suggested that educators have a significant role since they should allow students to discover their personality through problem solving rather than indoctrinating students with norms. Unlike Piaget, Kohlberg (1966, 1975) focuses on the process of reasoning behind the behavior rather than on the behavior itself, and he found that there were several levels and stages for such moral judgments, closely paralleling Piaget's stages of cognitive reasoning (Reilly and Lewis, 1991).

Reilly and Lewis (1991) state that from a humanistic view, learning environments must be able to develop healthy self-concepts, satisfy each students' needs for security, foster respect for self or others, encourage uniqueness and diversity and finally allow freedom of choice and individual responsibility.

One of the main criticisms to humanistic approach was that humanism is sometimes believed to be a highly self-centered, or selfish, approach to life. Criticisms stated that it would be impossible to create an integrated society, with individuals who deal with only personal growth or development (Hiemstra & Brockett, 1994). Scientists like Lamont (1965), Maslow (1970) and Lindeman (1988), refuted that criticisms by claiming that; in order to create a well integrated society in a long term period, individual development and satisfaction are essential in short term period. Humanism does not merely support developing selfish individuals that only wonder about their expedience. For example, humanists believe that, rather than traditional grading systems which make students compete in a platform, cooperative learning is much more efficient in classrooms. Cooperative learning facilitates learning together and improves interpersonal relationships. Therefore, students do not compete with each other and concentrate only on their learning responsibilities (Rogers & Freiberg, 1994; Gizir, 1996).

Briefly, the main aim of humanistic learning approach is to develop self-motivated students who may go on learning throughout life in a self-directed manner. Depending on this argument, it can be inferred that learning in terms of humanistic approach, is not restricted by strict environmental forces, rather learner is free to complete learning

wherever he wants by the use of self-motivation and ability of assisting mental growth.

2.2.4 The Social Approach to Learning

Social learning approach has many common points with behaviorist approach, especially in terms of the relation between environment and learning. Like behaviorists, social learning theorists believe that classical and operant conditioning have important influence on people's behavior. However, they do not limit learning with these two processes. The social learning approach takes into account the cognitive factors that mediate between stimuli and responses. It considers thinking processes which is not regarded in behaviorist approach. Sammons (1999) states that social learning theory can explain behaviors that emerge without the person that produces them being directly conditioned. Social learning theorists add on that people can learn new information and behaviors by watching other people (Bandura, 1975; Merriam and Caffarella, 1991; Ormrod, 1999). They define observational learning as a process that considers the role of internal, mental proceses in human behavior. Table 2.7 presents these prominent principles of social learning theory.

Table 2.7 Prominent Principles of Social Learning Theory

PRINCIPLES	DEFINITIONS
Modeling	Imitation of others' behavior
Observational Learning	Learning by observation and imitation by others
Vicarious Learning	Learning based on observation of the consequences of others' behavior
Self-regulated Learning	Rewarding or punishing one's own behavior

Source: Slavin, R. E. (2006), Educational Psychology: Theory and Practice, 8th Edition, Pearson Education, USA

Observational learning consists of imitation or **modeling**. In this process, learning occurs when individuals observe and imitate others' behavior. There are four component processes affected by the observer's behavior following exposure to models. These components are attention, retention, motor reproduction and motivation (Bandura, 1975). Ormrod (1999) considers social learning theory as a bridge or transition between behaviorist learning theories and cognitive learning theories. While behaviorists say that learning has to be represented by a permanent change in behavior, social learning approach claims that changing in behavior is not necessary for learning. Because, people can also learn through observation alone.

In **vicarious learning**, students learn according to their observations on the consequences of someone's behaviors. The social learning theory argues that individuals imitate or copy modeled behavior from observing others, environment, mass media etc. Moreover, there are studies on how people learn from observing others when engaged in group endeavors. This type of observational learning is labeled as 'intent participation' (Rogoff, Paradise, Correa-Chavez and Angelillo, 2003; in Hays (2006), p: 153).

Zimmerman (2002) defines **self-regulation** as the process that someone uses to activate and sustain his thoughts, behaviors and emotions in order to achieve his goals (Zimmerman, 2002; in Woolfolk, 2007). Woolfolk (2007) states that the concept of self-regulated learning integrates much of what is known about effective learning and motivation.

Moreover, social learning approach argues that social life and psychological life interact as part of learning, so that learning can not be considered as a purely individual activity (Jordan, Carlile and Stack, 2008, p: 75). In contrast, it occurs in social institutions or social groups. As it is seen in Figure 2.1, there is a dynamic and reciprocal relationship in which social environment, action and individual interact. Individual characteristics are created by both actions in the environment and interactions between groups. Woolfolk (2007) summarizes the influential forces under

three categories as: (1) Personal factors like beliefs, expectations, attitudes, knowledge; (2) environmental factors like resources, consequences of actions, other people and physical setting; and (3) behavior like individual actions, choices, preferences.

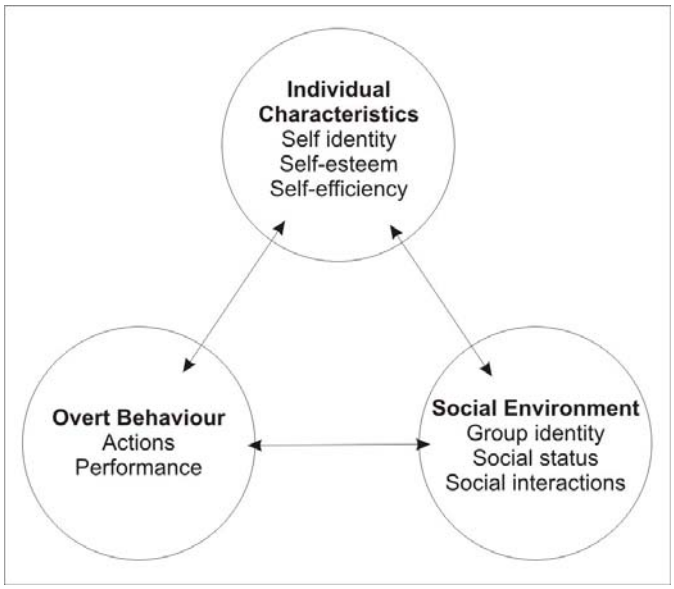

Figure 2.1 Reciprocal Determinism

Source: Bandura (1984:24), in Jordan, A., Carlile, O. and Stack, A., (2008), Approaches to Learning; a guide for teachers, Open University Press, the McGraw-Hill Companies; p:75

The first critique to social learning theory argues that it completely ignores individual's biological state. It rejects the differences of individuals due to genetic, brain, and learning differences (quoted from Isom, 1998 ; from Jeffery, 1985: p.238). Secondly, social learning theorists do not thoroughly talk about social space where the social interaction and communication take place. Considering that in this model behavior results from the interaction of people in the environment, a notion of social space needs to be investigated.

On the other hand, social learning approach also invites reflections on the limitations of the educators' role on learning. Theory gives importance on learner's own agency in engaging in learning; teacher and the classroom setting only minor parts of the students' learning (Jordan, Carlile and Stack, 2008, p: 79).

2.2.5 The Constructivist Approach to Learning

Constructivism takes a psychological and philosophical point of view arguing that individuals structure or construct much of what they learn and understand (Bruning et al., 2004; in Schunk, 2008). The theories and researches of some important researchers like Piaget, Vygotsky, the Gestalt Psychologists, Bartlett and Bruner develop the main roots of constructivist learning approach. There is not one single type of constructivist theory, but most of these theories commonly argue two points that; (1) learners are active constructers of knowledge and (2) social interactions have important role on this construction process (Woolfolk, 2007).

The constructivist approach concentrates on the learner rather than the teacher. The learner gains an understanding of features and characteristics of the environment by interacting. He conceptualizes and finds his own solutions to problems. Learning is an active process in which the learner uses sensory input and constructs meaning out of it (Thanasoulas, 2005; Hein, 1991).

Since learning is a social process, learning is sincerely related with learner's connection with other human beings, his teachers, his relatives or friends. As Dewey points out, traditional learning system isolates learner from all social interaction and only focused on one to one interaction between learner and the objective material to be learned. Conversely, progressive education considers the social aspect of learning and uses conversation, interaction and dialogue with people.

As Schunk (2006) states, constructivism is not a unified theory but rather has different perspectives presented in Table 2.8. Exogenous constructivism emphasizes reconstruction of the external world. It assumes that environmental factors influence

individual's knowledge construction through experiences. In contrast to exogenous constructivism, endogenous constructivism refers to the coordination of cognitive actions (Bruning et. al., 2004; in Schunk, 2008). Knowledge construction does not totally originate from external factors, rather it derive from the cognitive activity of abstraction. In the middle of these two different approaches, dialectical constructivism argues that knowledge construction can be explained neither with environmental factors nor mental structures. In this frame, the exogenous and dialectical perspectives are relevant to explore how learning environments influence individual's learning.

Table 2.8 Perspectives on Constructivism

PERSPECTIVE	**PREMISES**
Exogenous	The acquisition of knowledge represents a reconstruction of the external world. The world influences beliefs through experiences, exposure to models and teaching. Knowledge is accurate to the extent it reflects external reality.
Endogenous	Knowledge derives from previously acquired knowledge and not directly from environmental interactions. Knowledge is not a mirror of the external world; rather it develops through cognitive abstraction.
Dialectical	Knowledge derives from interactions between persons and their environments. Constructions are neither invariably tied to the external world nor wholly the workings of the mind. Rather, knowledge reflects the outcomes of mental contradictions that result from one's interactions with the environment.

Source: Schunk, D. H., (2008), Learning Theories; an educational perspective, Pearson, Merrill Prentice Hall, p: 238

Table 2.9 presents the prominent principles of Constructivist Learning Theory.

Table 2.9 Prominent Principles of Constructivist Learning Theory

PRINCIPLES	**DEFINITIONS**
Cooperative Learning	instructional approaches in which students work in small mixed-ability groups
Conversational Learning	a process whereby individuals construct new meaning and convert their collective experiences into shared knowledge through interaction
Experiential Learning	individually construction of knowledge through intentional tendencies and experiences

Source: Slavin, R. E. (2006), Educational Psychology: Theory and Practice, 8th Edition, Pearson Education, USA

Constructivists argue that **cooperative learning** and cooperative problem solving groups facilitate generative learning. (Wilson, 1996; Jones, 2002) Group working helps students to discuss and re-evaluate the information that they gained in the formal learning process. Moreover, as Wilson (1996) points out, students have more tendencies to take on the additional risk required to handle difficult, sophisticated problems when they have the support of other friends in the group. It is seen that designers especially in United States, are affected by the constructivist theories and changed their design approach to classrooms. Many classrooms in the United States have designated spaces for small group work, as well as arrangements for whole class discussions. Elementary classrooms often include small group reading areas, mathematics centers, and science stations. Middle and high schools have moved away from unmovable desks to seating arrangements that are flexible and allow for small

group work (Jones, 2002). These alterations are increasingly becoming widespread through higher education like colleges and universities.

Conversational learning refers to a process whereby individuals construct new meaning and convert their collective experiences into shared knowledge through interaction (Ataöv, 2007). Ataöv adds on that conversational learning is built on the premise of participation, continuous learning and change. Baker et al. claim that there are five dialectic dimensions that define the boundaries of the space within which conversational learning occurs (Ataöv, 2007). As Figure 2.2 presents, in order to label a process as conversational learning, all these dialectics are needed to be processed in harmony. Although there is not any specific study about sorting of these, Baker et al. (2005) argue that one missing dialectic can cause fail in completion of conversational learning.

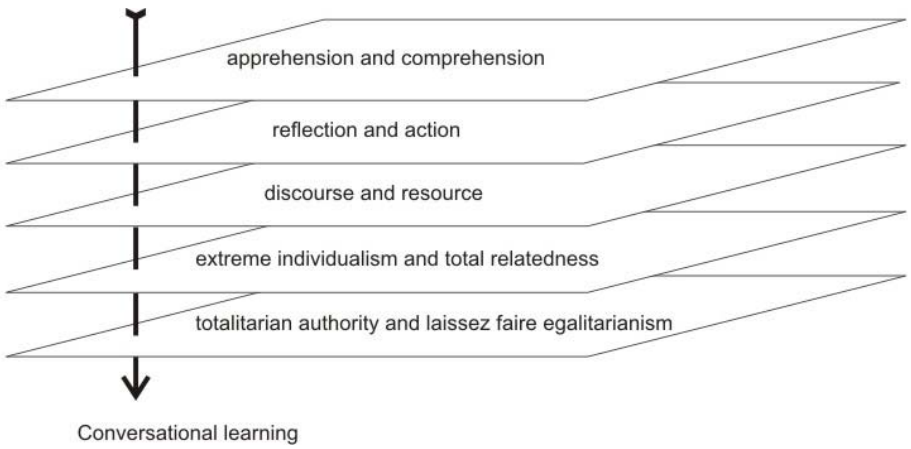

Figure 2.2 Dialectic dimensions that define the boundaries of the space within which conversational learning occurs

Source: Baker et al. (2005) ; in Ataöv, A., (2007), Continuous Learning Processes in Creating the Public Realm, Proceedings of the Institutions of Civil Engineers, Municipal Engineers 60, September 2007, Issue ME3, pp: 135-143

Experiential learning refers to a process whereby individuals construct new knowledge through their experiences. The term experiential is used therefore to differentiate experiential learning theory both from cognitive learning theories which emphasize cognition over affect, and behavioral learning theories which deny any role for subjective experience in the learning process (Sternberg and Zhang, 2001).

Chapman (2006) describes campus as 'a tapestry of sensory, cognitive, and intellectual experiences' which have meanings for themselves and reinforce one another to have meaning. He adds on that experience is intentional in design and organization of the place, in the offerings and activities that make up campus life as means of energizing the learning process.

As Brown and Long (2006) indicated, the emergence of the constructivist learning paradigm had led to a focus on learning rather than teaching it. It allows designers to revise the academic spaces and to look for alternative learning spaces that enhance or facilitate the learning in the campus. If learning is not limited with scheduled academic spaces and times, the campus as a whole provides a powerful learning space.

Crawley and Imrich (2004) argue that, if the constructivist model reflects how people learn, a more human-centered design of learning space is a positive change. Therefore, design of learning spaces should not only be in planners' or architects' control. Academicians and the students, as the user of the campus, should be included in the design process and have a role of assistant near architects, planners or designers. Add on this, Brown and Long (2006) defines academicians and students as the product experts while the architects and designers are the space development experts.

Considering that constructivist theory shifts the focus to learner and his interaction with the environment, the space where learning occurs gains importance. The design of the space is directly linked to the learning activities and opportunities that supporting interaction between people. Therefore, in order to use cooperative groups

to enhance the learning in a university campus, suitable learning places that are convenient for gathering and cooperation need to be considered. The enhancement of experiential learning in higher education can be achieved through the creation of learning spaces that promote growth producing experiences for learners (Kolb and Kolb, 2005).

To sum up, learning environments designed based on constructivist approach are encouraging co-operative and experimental learning. Educators have the role of facilitator rather that just instructors. Akinsanmi (2009) states that; the brain-based learning theory, one of the recent learning theory that grew out of constructivism, proposes that people learn better in a challenging, safe, comfortable, social and enriched environment (Caine and Caine, 1991; in Akinsanmi, 2009). Brown and Long (2006) argue that constructivist paradigm supplants knowledge transmission as the guide for learning spaces, encouraging more thoughtful space planning.

CHAPTER 3

LEARNING SPACES

This chapter presents the relationship between learning and learning spaces in which it takes place. Initially, the chapter presents the literature review related to different types of learning spaces. Later on, the review continues with the previously mentioned design attributes both for outdoor and indoor learning spaces defined in previous researches. Finally, the chapter ends with an ascertainment of a principle chart which presents the design attributes and the prospective results in case of truly implementation of these attributes.

3.1 Contextual Views of Space vs. Learning

The physical environment is a major component factor in people's learning experiences since human beings learn through their senses (Jarvis, 2006). Jarvis (2006) argues that individuals' perceptions of the environment are generally structured within the social context within which individuals live.

Jameison (2003) states that place of teaching and learning have an essential role in how the process is experienced by the participants. Space has a performative side for whoever uses it. Space works on its occupants by prohibiting, deciding what may occur, setting up the rules and implying a certain order (Pouler, cited in Scheer and Preiser, 1994, p. 175; in Jameison, 2003).

Kurt Lewin brings a more analytic definition assuming both person and environment as interdependent variables and he translates his argument into the formula of B= f (p, e); means behavior is a function of person and environment (Kolb and Kolb, 2005).

Chapman (2006, p:32) explains why place matters with his argument: *"place is the incubator of the processes that make up the multiple kinds of learning that occur within and beyond campus borders, the intellectual inquiry, the social interaction, the civic engagement, and the cultural enrichment that attends to these experiences."*

3.2 Types of Learning Spaces

King (1996), Deluze and Guattari (1988) argue that learning takes place both in formal and informal settings, and it takes places either directly or indirectly.

Eraut (2000) defines formal learning space as spaces where a previously described learning framework or a schedule is applied in order to provide students to gain specific tasks (Hall, 2009). He adds on that, although educators and students together frame the rules that support activity in this space, they can improve levels of personalization and ownership, supported by personal self reliance (Hall, 2009). Major formal learning settings on campus generally include the classrooms, laboratories, auditoriums, performance rooms, computer laboratories, design studios and libraries. The common point of these learning spaces is that they are all indoor learning spaces and the learning in these spaces takes place directly and intentionally.

On the other hand, literature defines informal learning spaces as spaces where education is directed and owned by the student; depending on individual study, non-institutional timetabled education and collaborative learning that take place away from traditional formal education (Leona et al, 1996; Hall, 2009; Livingstone, 1999).

While learning takes place intentionally in formal learning spaces, it might take place either intentionally or unintentionally in informal learning spaces. Table 3.1 presents

the differences between formal and informal learning under three titles as definition, learning spaces and examples.

Table 3.1 Differences between Formal and Informal Learning

	Formal Learning	**Informal Learning**
Definition	Learning which is totally institutional and planned	Learning which is mainly experiential and non-institutional
Learning Spaces	• classrooms • laboratories • auditoriums • performance rooms • computer laboratories • design studios • libraries	• outdoor study areas • cafeterias • dormitories • areas between faculty buildings • student union • student clubs • campus open spaces
Examples	• lecture based learning • workshops • conferences & seminars	• conversational learning • self-directed learning • performance planning • learning from others

3.2.1 Indoor Learning Spaces where Formal Learning is carried out

Formal learning is a process that usually done in a specific schedule. Therefore, formal learning necessitates some rules for students to obey. In such spaces students will be expected to follow the given lecture in silence and to concentrate on a topic in a limited time period. Therefore, formal learning spaces have the ambiance of authority that often make learners feel like they are governed or controlled by academicians.

The formal learning spaces on campus can be identified as the classrooms, laboratories, auditoriums, performance rooms, computer laboratories, design studios and libraries in general. These formal spaces are usually controlled by parameters such as scheduling requirements, set hours of use, set number of seats and predetermined learning activity patterns such as lectures, discussions or experimenting (Johnson and Lomas, 2005).

Deleuze and Guattari (1988) and Savin-Baden (2008) examined learning spaces from a different perspective as; smooth and striated cultural spaces. Considering their studies, formal learning spaces can be characterized as spaces with a strong sense of organization and bounded. Learning in such spaces happens through course attendance in strictly defined learning places like lecture theatres and classrooms.

3.2.2 'Public Spaces' where Informal learning is carried out

Leona et al. (1996) state that the goals or purposes of the most informal learning contexts tend to be broader than those emphasized in formal learning spaces. Additionally, Livingstone (1999, p.51) defines informal learning as *"any activity involving the pursuit of understanding, knowledge or skill which occurs outside the curricula of educational institutions, or the courses or workshops offered by educational or social agencies."* Therefore, rather than curriculum there are other external factors emerging from daily experience and the educational influences and resources in peoples'environment, from family and neighbors, from work and play, from the market place, the library and the mass media (Conner, 2004-2009). For instance, with a constructivist view of theory, Vygotsky (1962, 1978) and Bruner (1986, 1990) promote that communication and dialogue are two main key factors in the formation of learning. Based on that theory, spaces that are convenient to dialogue and debate between students can be called as social learning spaces where informal learning occurs.

Pascarella and Terenzini (1991) state that students' out-of-class experiences shape the way of their personal development during the university education. Although research studies examining these non-academic experiences have increased recent years, it is not well known how students' out-of-class experiences influence their learning attitudes (Terenzini et al., 1999). Light (2001) has conducted a research study on students' learning experiments. He asked students to think of where their most memorable learning goes. The result was totally different than what Light was expected; 80% of the students notified a situation or an event outside of the classroom. Moreover, a search study of Pascarella and Terenzini (1991, 2005) resulted that what students do during the 80%-90% of their time that day spent out of classes, have great impact on their learning and success. (Statistical research examples are quoted from Brown and Ward; cited in Kramer, 2007).

According to Conner's work which is done with organizations, there are far more opportunities for informal accidental learning than any other single type of learning. The diagram below shows the schematic distribution of learning type ratios.

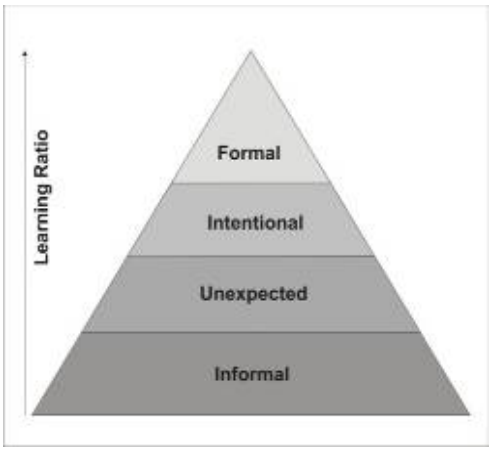

Figure 3.1 Schematic diagram shows the learning ratio decreases from down to up

Source: Conner, M. L. (1997-2009) "Informal Learning", www.marciaconner.com/intros/informal.html

According to the U.S. Bureau of Labor Statistics, more than 70% of learning experiences in the workplace are eventuate informally or accidentally, not structured or enforced by an employer or a school. This kind of learning is pervasive, continuous, and extremely social. It happens wherever people do their work. It can be either in a shop floor or around a conference table. "Public spaces" comprise observing others, asking for clarification during the act of doing, group discussion and debate (Acker and Miller, 2005).

Literature review shows that; although there is an increase in the awareness of the influence of "public spaces" on informal learning, there is not a set of certain criteria in terms of design principles of these spaces. However, considering studies of Deleuze and Guattari (1988) and Savin-Baden (2008), formal learning spaces can be identified as smooth learning spaces. They describe these kinds of spaces as open, flexible and contested areas where students are always on the move. Students find the chance of evaluating knowledge and ideas proffered by lecturers and in doing so create their own stance toward knowledge. So, based on that justice it is not fair to say learning space is not defined. It becomes defined by student who is the user of the space. It can be inferred that students are main actors in the emergence of informal learning concept.

3.3 Significance of "Public Spaces" on Campus

Kegan (1994) claims that, people grow best where they constantly experience an ingenious blend of challenge and support. What Kegan implies by ingenious blend is that, creating and maintaining learning spaces designed in a well balanced challenge and support is quite difficult. He states that although educational institutions have been quite successful in challenging students, they can not show the same performance in providing support to students. Baker, Jensen, and Kolb (2002) utilize from works of Henri Nouwen (1975) and Parker Palmer (1983, 1990, 1998) to describe this challenging and supportive learning space as one that welcomes the foreigner in a hospitable atmosphere where *"students and teachers can communicate*

with each other without fear and allow their respective life experiences to be their primary and most valuable source of growth and maturation" (Nouwen, 1975: 60).

Considering Kegan's argument on what educational institutions provide for students, the originating point of the campus planning concept is to provide the physical setting that are suitable for formal learning activities in a university. However, research studies and observations on many campuses reveal that much of the education of students occurs outside when they are away from formal learning spaces (Marcus and Wischemann, 1998). In other words, students have a tendency of benefiting more effectively from alternative learning spaces rather than from formal learning areas. This fact gives us the clues of presence of external factors that affect students' learning attitudes.

The richness of alternative spaces of a university environment is directly related to its campus plan. If campus plan is flexible for the reproduction of adequate space that fulfills the major necessities of students; it can provide effective reinforcement services that affect students' moods, well-being, comfort, motivation and other psychological or physical states directly influencing their learning processes. Central core of campus, students' living spaces and formation of faculty buildings are three main concerns of a campus plan. All of these alternative spaces are defined as "public spaces" in that study, because they define spaces that accommodate shared-usage, potentially significant places for informal learning.

First of all, a dynamic campus centre which can entirely provide all necessities of students in terms of catering, cleaning, health etc. is a primary component that a campus can contain in its body (Shanka and Taylor, 2005).

Secondly, living space of students becomes a formative tool on what students do in their extracurricular time (Hansen and Altman, 1976; Godshall, 2000). Therefore providing optimal living environments for students becomes a critical issue needed to be considered .

Thirdly, the design of open spaces between faculties has a power of sustaining open air study areas for students. As Marcus and Wischemann (1998) state, a great deal of the causal mobility, entertainment and study between classes takes place outdoors, when the weather permits.

3.3.1 The "Heart" of the Campus

The "heart" of a campus can be identified as the central core where engagement of students is highly condensed by the help of social facilities. If the whole campus is assumed as a small city, the heart of the campus should undertake the functions that a city holds in its centre. The central campus utilities can be defined as shopping, entertaining, gastronomic and social facilities that students can meet their daily needs.

Considering that the heart of the campus signify a focal activity zone, it should invite people from different faculties with various knowledge and interest areas. Therefore, it is a critical challenge for campus designers in terms of creation and maintenance of a "heart" that attracts a variety of students and satisfies and sustains them in their efforts to achieve daily life requirements.

Shanka and Taylor (2005) state that students living in campus set off formation of a confined market that contains various commercial enterprises mainly made up from food and beverage outlets. The number and size of these outlets varies according to students' demand to buy meals and refreshments in a timely manner. Capacity and accessibility to "heart" of the campus can be a challenge for any student. Therefore site selection, accession routes, size and density of central facilities become prominent issues that directly affect students' daily life in the campus.

3.3.2 Dormitory Areas

Researchers have examined the design of interior spaces in student's residential halls in order to increase their quality, for over a decade. In recent times, a new interest has occurred as the result of research that showed student maintenance could be

interrelated with the quality of physical spaces on campus (Hansen and Altman, 1976). Therefore the design of residential hall has been revised in a way that promotes community, interaction and communication (Godshall, 2000). The production of public spaces that fosters common usages has gained more meaning.

On a residential campus, most of students have the problem of choosing convenient living place. However, providing proper dormitory services is fundamental for the quality of student's daily life and learning activities. First of all, the proximity of dormitories to the central zone or academic buildings influences student's behaviors. The location and direction of the dormitory site determines the routes that students prefer to use in order to reach academic departments. Moreover, the time spent for moving from residential site to academic zone is directly interconnected with the distance between these two sites. Therefore, site selection of accommodation areas is directly effective on how students circulate in the campus.

Moreover, living in a shared environment with limited boundaries is another issue that affects student's daily life and behaviors. Therefore, the amount of space for each individual and the design of shared areas in residential sites need to be considered by planners and designers. Feaver, Wasiolek and Crossman (2008) state in their book that there are some common roommate complains that most of students residing in campus housings. Different study habit of a student can also influence negatively one of other roommates. One may prefer studying at nights while other can study more efficient in the earlier time of the day. Likewise study habits, hygiene, different bedtime rituals, tidiness are some other common problems that can occur in shared accommodation options. In order not to cause such kind of problems or not to be stay away from one of these conditions neither of students uses the room as a primary place of study. Sometimes an extreme situation that hinders student's ability to perform in his classes can occur. At that point, considering a master plan process of a campus, preparation of the architectural program of student housing units includes the measurement of rooms, studying units, TV and leisure time rooms, cafeteria etc. directly affects student

residential life in the campus. How much space should be reserved for each of these areas is directly related with the needs of students. The required proportion of space figures out the size of residential zone in the spatial plan.

3.3.3 Outdoor Study Areas

Today's students and academicians look up on a recreation area as an essential part of a campus, both in terms of social amenity and wellness facility (Kenney *et al*, 2005). Kenney at al. (2005) describe these areas as "revamped" places which are increasingly seen as "the new student unions, the largest and swankiest meeting places on campus and the school's biggest magnets for recruitment and retention." According to the 1981 Berkeley survey which interrogate student's preferences in terms of easy access to these outdoor areas, majority of students voted for "open spaces and greenery" rather than "malls and plazas" (Marcus and Wischemann, 1998). This research study reveals that distances to communal facilities, the location of maintenance and disposal equipment, and the marking and lighting of walkways can all create quick impressions of comfort or risk. Opportunity for the development and expression of personal identity often lie in the flexibility students enjoy in shaping and arranging the spaces they use.

On the other hand, small spatial attributes around the faculties can also offer alternative study areas for students. For instance, Marcus and Wischemann (1998) assert that major building entries can be designed as spaces, where students can study between classes or at lunch time, close to their home base or in familiar territory. They argue that open lawn areas appear to be most favorite outdoor area for casual studying. Such spaces provide a lot of place for students where they do not feel themselves bordered with some physical sets. There are different variables that effect students' preferences for choosing a favorite space. The following diagram presents the distribution of these variables.

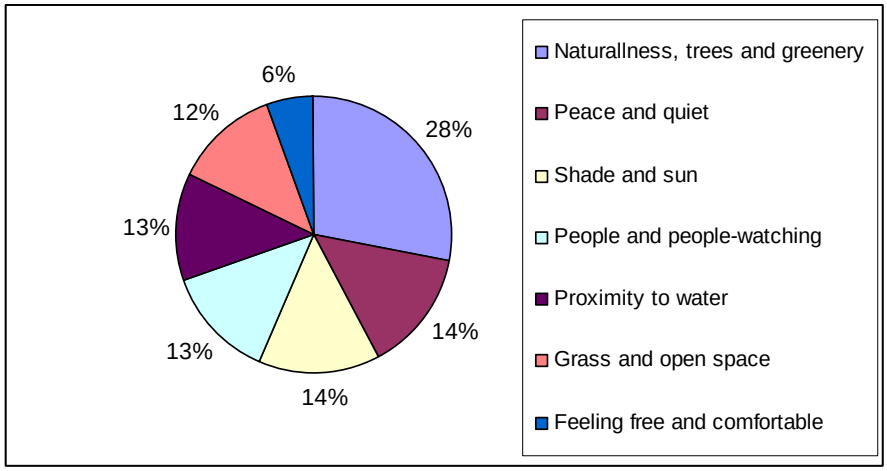

Figure 3.2 Distribution of variables that makes open spaces favorite for students
Source: Marcus and Wischemann (1988)

Figure 3.2 presents that the naturalness, trees and greenery of open spaces between faculty buildings is the most significant variable that attracts students to use open spaces.

3.4 Design Indicators for Indoor and Outdoor Learning Spaces

This section, initially presents the literature review findings about design indicators for outdoor learning spaces. These indicators are identified by students on a campus, based on most commonly used public spaces. Later on, in order to dig out more spatial design indicators, section continues with the findings of the review on indoor learning spaces. The examined variables in this chapter are personal collection of the author compiled from the outcomes of literature review.

3.4.1 Design Indicators for Outdoor/Public Learning Spaces

Literature review presents that a student campus needs spaces designed to generate informal learning spaces which fosters interaction, collaboration, physical movement and social engagement as primary elements of the students learning experiences (Jameison, 2003; Halsband 2005; Dugdale, 2009). Although there is not a wide

literature on how open spaces should be design in order to foster learning on campus, there are some concepts that enhance learning on open campus spaces.

3.4.1.1 Interaction

Kolb and Kolb (2005) argue that people naturally make meaning from their experiences through conversation. Brown and Long (2006) add on that social interactions such as debate, discussion and group working have an influential role on students' learning experiences. Considering a traditional campus learning environments, spontaneous conversation among students usually interrupts the silence in the classroom at the end of the lecture or in break time. Although it is not the learning type that teachers intend, these conversations can turn into a beneficial interaction in which students share knowledge or gain new information (Kolb and Kolb).

The existence of shared public spaces like cafeterias, dining halls or student union on a campus increases the interaction between students (Halsband, 2005). Shared public places gives opportunity for students to meet new people, who they do not already now, or to meet and take part in a group activity planned beforehand.

Acker and Miller (2005) argue that informal learning spaces support diverse conversations and reflection and study about content presented in formal learning spaces. Therefore, encouraging students to linger, meet and talk informally out of classrooms creates opportunity for students sharing knowledge either intentionally or unintentionally. As Oblinger (2005) states, learning is a social issue which requires interaction and feedback among students. Therefore, learning spaces should enable students to (1) know each other and engage in dialogue, (2) work on group projects, (3) interact in a variety of ways and (4) present their work to each other and take feedbacks (Oblinger, 2005).

Considering campus open spaces as the major public areas where informal learning takes place, interaction between students becomes one of the significant design issue

that needs to be well thought-out. It is essential to emphasize that he design indicators like general layout, site selection, size, sub-spaces etc. affects the way of interaction between students on any informal learning space.

3.4.1.2 Collaboration

With parallel to developments and alterations in pedagogy, group working has been encouraged by educators and more collaborative team work takes place outside the formal learning environments (Dugdale, 2009). Students who are attuned to this new trend, started to seek for alternative informal study areas. Dugdale (2009) denominates these alternative spaces as social learning spaces in which students get the chance of learn new issues in a more informal environment.

Group working has a triggering affect on motivation which is one of the encouraging conditions for learning. Katzell and Thompson (1990) state that working in a group with diverse members make someone observe and absorb new attitudes, behaviors or knowledge from other members of the group (Charles and Peter, 2002). Katzell and Thompson (1990) also argue that concept of extrinsic reinforcement, including financial rewards, personal recognition, and self-management programs are also some other motivational mechanisms in students' learning (Charles and Peter, 2002).

3.4.1.3 Social Engagement

Brown and Long (2006) argue that the traditional layout of amphitheatres and classrooms has rarely provided for social engagement among students. Jamieson (2003) states that, in order to enhance social engagement on a campus, there is a need for social spaces such as student commons, cafeterias and other hospitality areas.

Campus open spaces are one of the most favorite spaces where students feel more pleasured and comfortable (Marcus and Francis, 1998). They add on that, these favorite spaces tended to be green spaces where natural elements are dominant compared to man-made elements. The main reason why students prefer campus open

spaces is their power to lessen students' stress and render the intensity or boredom of the classrooms, or other indoor learning spaces (Marcus and Francis, 1998).

Brown and Long (2006) state that learning can be enhanced and made more meaningful if students are given the chance of interactivity, multiple roles and social engagement like group work, discussion boards.

3.4.1.4 Multiple Experiences

Jemieson (2003) states that campus environment should provide learning spaces which contain the possibility for multiple and constructing experiences. Spaces which are '*softer, less rigid, more open to the indeterminableness of experience*' and where the character of the space is formed by the *'shape and identity of the relationships created within it'* (Ceppi and Zini, 1998; in Jamieson, 2003).

Marcus and Francis (1998) claim that, informal and formal areas should be able to provide opportunity for a great variety of needs, from quiet study to people watching, to waiting for a friend etc. Dugdale (2009) and Brown and Long (2006) argue that food facilities can be a powerful attractor for social learning, providing destinations for diverse campus groups to cross paths and connections.

Marcus and Francis (1998) claim that, as a campus open space design principle, it is essential to provide seating, benches, and tables for studying, eating and conversation for students. Brown and Long (2006) also add on that factors such as availability of food and drink, comfortable seating elements, furniture that supports a variety of learning activities are emerging as critical in the design of learning spaces.

On the other hand, campus open spaces are one of the most popular spaces that students prefer to relax and blow of steam (Marcus and Francis, 1998).

Finally Oblinger (2005) states learning also involves real world problems through which students practice and feedback from others. Therefore, learning space should

enable students to (1) work together to discuss real world problems, (2) debate, research and inquire, and (3) engage in simulations, role playing (Oblinger, 2005).

3.4.1.5 Sense of Campus

Chapman (2006) calls 'sense of place' as a personal phenomenon, having as much to do with individual's own experiences and cognitions as with the physical environment. With the right approach, not only the formal academic buildings but also the entire campus can be designed as a learning space (Brown and Long, 2006).

Chapman (2006, p:24) defines campus as *"a tapestry of sensory, cognitive, and intellectual experiences that are meaningful in and of themselves, and that can profoundly reinforce one another. Experience is intentional in the design and organization of the place, in the offerings and activities that make up campus life and as means of energizing the learning process."* Therefore, although campus designers have some intentions while they are designing learning spaces, students as the users of these spaces may give some different meanings to different spaces in reference to the activities they do.

Considering open campus spaces as the major public areas where informal learning takes place, creating the sense of being on a part of a campus becomes critical in terms of open space design.

3.4.2 Design Indicators for Indoor Learning Spaces

This section examines the design indicators of indoor learning spaces. Indicators are compiled under titles of 'layout', 'flexibility', 'comfort', 'safety', 'color', 'size' and 'accessibility' The main idea of this section is to find out the indoor space design indicators and check whether they are acceptable or operative for campus open spaces.

Traditional design perception of classroom or lecture hall was featuring teachers as compelling mechanism that give information to students who just sit, listen or take notes during the lecture. In recent years, educators, researchers, and students are

discovering the benefits and advantages of cooperative, active, and engaged learning (Miller, 2008). Therefore, university administrators and design professions started to rethink the general layout of classroom and found out new ways that encourage collaborative and well-conducted learning spaces. On the other hand, studies have shown that learning is an emotion-based activity (Panju, 2008). Thus, a further consideration should be presented to increase emotional competences. This section points out the key parameters that influence design of formal learning spaces. Table 3.3, on the next page, summarizes the findings on design indicators and their influence on students.

Table 3.2 Indoor space design indicators and their influence on students

INDICATOR	PRIMARY INFLUENCE ON	OTHER INFLUENCES ON	OPTIMAL RESULT	SOURCE
'Layout'	Engagement	Collaboration Interaction Dialogue	The act of sharing in the activities of a group	O'Hare (1998) Scanlon (1999) Gavienas (2004) Miller (2008) Atherton (2009)
'Flexibility'	Creativeness	Easy movement Rearrangement	Having the ability or power to create	Cropley (2001) Acker and Miller (2005) Read (2007) Williams and Veomett (2007)
'Comfort'	Motivation	Engagement Pleasure Peace of mind	Internal power to move towards a desirable target (probably success)	Wurtman (1975) Earthman (2004) Acker and Miller (2005) JISC (2006) (Miller, 2008) (Paradis, 2008)
'Safety'	Sense of Well-being	Encouragement Trust	Satisfaction and confidence in personal levels of health and happiness	Holley and Steiner (2005) Acker and Miller (2005) Panju (2008)
'Color'	Students' Mood	Performance Creativity Cognitive ability	Encouraging atmosphere that gives the sense of ambition and enthusiasm	Sinofsky and Knirck (1981) Stone and English (1998) Pytel (2006) Daggett et al. (2008)
'Size'	Stress Level	Motivation Morale	Maintenance without anxiety or fear	Morphet (1972) Glover and Law (2000) Brown and Knowles (2007)
'Accessibility'	Attendance	Presence	Fewer instances of lateness or absenteeism	Morphet (1972)

3.4.2.1 "Layout" and Student Engagement

Group work, discussion and debate between students increase the social interaction between students. And, layout of formal learning rooms directly affect levels of interaction and engagement (Rosenfield et. al., 1985; Atherton, 2009). Engagement and active learning foster persistence of students. But, the traditional design of classroom and lecture halls had rarely provided for social engagement among students (Brown and Long, 2006).

Astin (1999) took attention that the discovery of cooperative, active, and engaged learning at colleges requires active learning classrooms. The theory of student involvement encourages educators to focus less on what they do and more on what the student does. Thus, the learning process is directly related with the time and energy that students devote and the motivation that they can derive. Since the way of students' tables or desks arranged is effective on learning, designers are looking for different types of settling in classrooms in order to increase student involvement. The following diagram shows the most commonly used classroom layouts and the interaction ways of students.

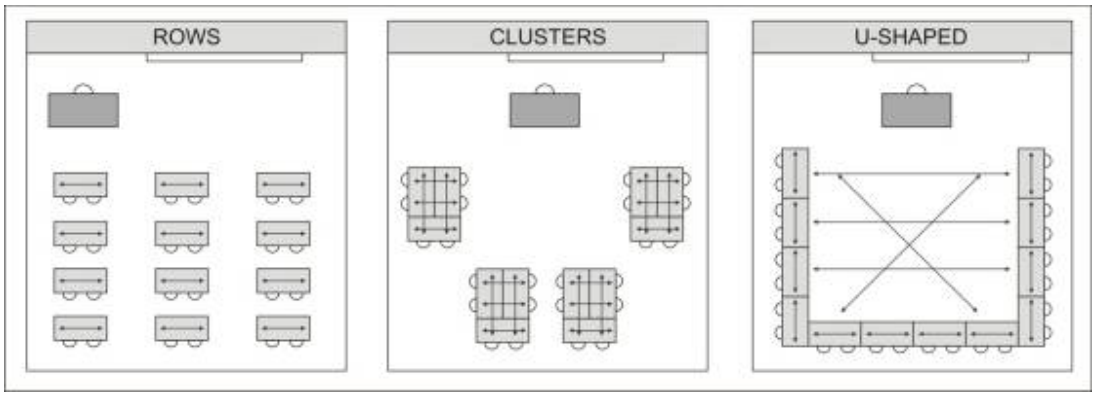

Figure 3.3 Interaction ways according to different classroom layouts

Source: Personal Rendering

Classroom designed in rows presents a very compact arrangement and provides less interaction between students. It only lets students to have discussions in pairs. Higgins et al. (2005) state that, in rows arrangement, students' involvement to the lecture depends on their position in the classroom. They argue that there is an action zone which involves the front and down the middle of the room, is more favorable for involvement.

Clusters provide more varied and aesthetically pleasing arrangements. It allows more than two students to sit and do group work in collaboration. Seating students in small clusters in the classroom or at group work tables tends to foster individual and small group instructional activity. In addition, these arrangements foster communication among groups of students and the teacher is placed in a situation of circulating among groups to work with the class.

Atherton (2009) and O'Hare (1998) state that for whole-group discussion, the U-shape layout is the most effective one. U-shaped layout allows students to see and interact each other at least by eye-contact. It keeps students within formal conversational distance.

Atherton (2009) describes four essential points that should be considered in the design of the layout of classrooms. (1) Unobstructed line of sight and visual distance to teacher and instructional displays on wall. (2) Adequate movement space around desk and intense traffic areas. (3) The activity space requirements of students. (4) The nature of student interaction.

On the other hand, the relationship between students and instructor is essential in effective learning especially where the culture of the school provides antagonistic interaction (Scanlon, 1999). Design of formal learning spaces can increase the level of student and teacher interaction. For instance, when teachers can move around the class freely and easily connect with the student who has any problem, the level of interaction increases considerably. Astin (1999) states that regular interaction with

faculty, is more strongly related to "satisfaction with college than any other type of involvement". Add on that, Miller (2008) states that students who are in interaction with their teachers more likely to express satisfaction overall with their college experiences. In other word, the more interaction between student and teachers, the much more success.

Gavienas (2004) measured preferences of seating arrangements and he deduced that seating closed to the teacher's desk provide more interaction between student and teacher rather than those in the back rows in the classroom. Therefore, assuming that teacher or instructor as a source of information, it can be referred that the proximity to the information resource influence the interaction and thus it affects learning implicitly.

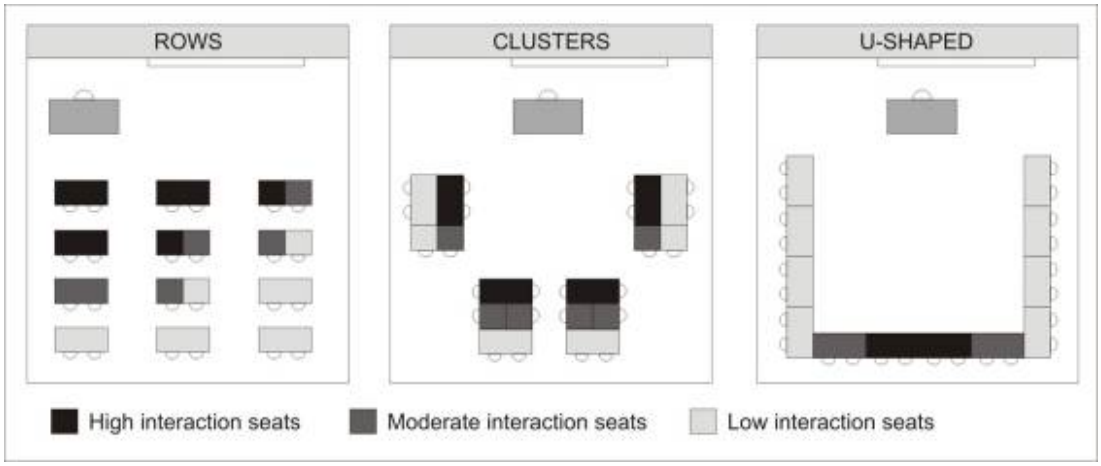

Figure 3.4 Rate of interaction between teacher and students according to seating layout

Source: (McCroskey and McVetta; in Gavienas, 2004)

O'Hare (1998) claims that the instructors should be able to walk within conversational distance that allows him to reach any seat in the classroom. Moreover, he adds the

layout of the classrooms should let instructor to manage a discussion from the center of the room, not just from his desk or in front of the blackboard.

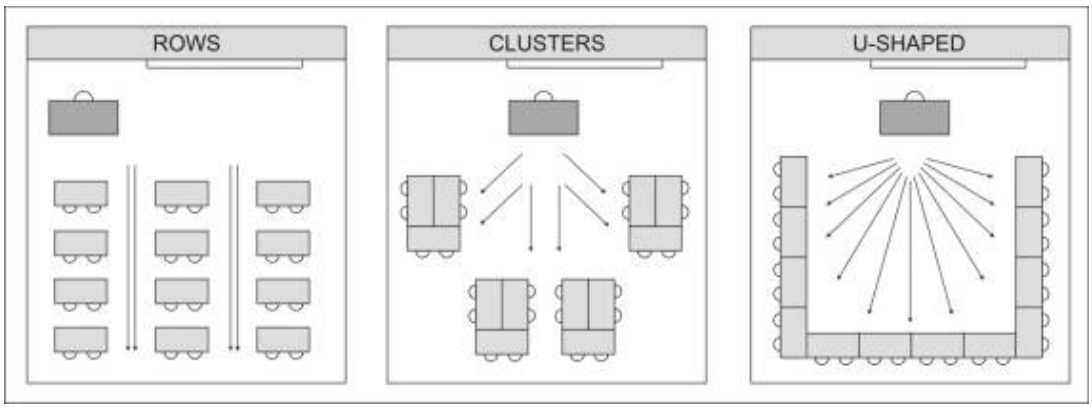

Figure 3.5 Interaction between teacher and students according to different classroom layouts

Source: Personal Rendering

3.4.2.2 "Flexibility" and Creativeness

Flexibility in being able to move and adjust the layout of the classroom is an important point that affects students' learning. Read (2007) states that the order of the furniture in classroom should offer some flexibility which gives the opportunity for movement and rearrangement. In this manner, students will be able to redesign their education environment in the most convenient way that they can benefit. Having the freedom to make decisions about physical space will help students to learn respect for their classmates and their classroom. It will help them create, think and understand and it will help them to learn about the kinds of spaces in which they learn best. (Williams and Veomett, 2007, pp:176)

Williams and Veomett (2007) add on that classrooms need to be large enough for students to spread out and see all of the possibilities. They argue that small desktops do not always provide enough room to work. Therefore, the arrangements of desks or other materials in the class should be flexible to give freedom to students to create their own learning spaces.

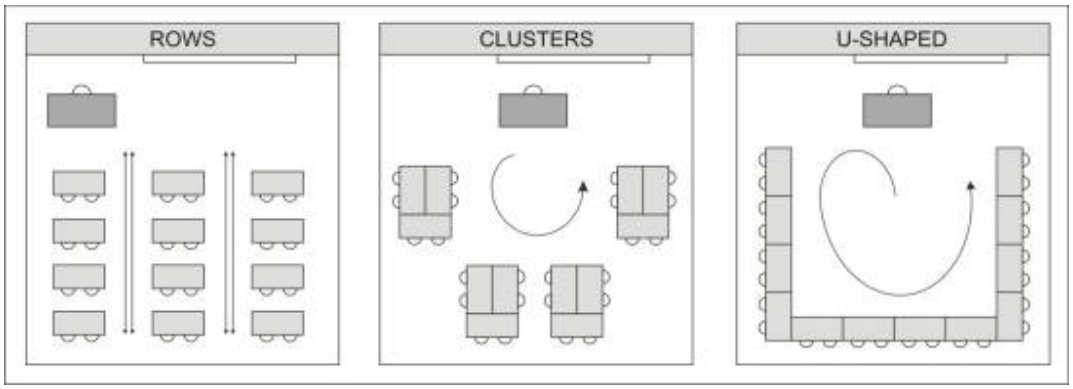

Figure 3.6 Mobility environments according to different classroom layouts
Source: Personal Rendering

In most universities, there are common classes used by students from different departments of different faculties. Therefore as Oblinger (2005) stated, it is not feasible to have dedicated space for each class. Contrary, a more functional way is to design flexible spaces that are susceptible to rearrange for different classes within a short time period.

Cropley (2001) points out that creativity requires acceptance of differentness. In other words, the learning environment should be able to adapt to any change that is done for increasing the productivity of students. According to WBDG Staff of the National Institute of Building Sciences (2009), flexible learning spaces needs to be adaptable as students' needs will change daily. They suggest that these spaces should contain modular furniture which is light and suitable for easily rearrangement. NIBS describes

these spaces as "generally located in areas with standard column grids and single story levels with flat floors. Movable partitions typically help to further subdivide the space as well as provide added projection surfaces."

Acker and Miller (2005) point out another dimension of flexibility; the technological developments. Designers should take into account that technology changes very fast and the equipments that can be used in the class vary in long term periods. Li and Gao (2009) states that entrance of information technology into the education field has greatly enriched the opportunity of teaching and learning modes. Therefore, technology development and dependence on the newly invented learning devices requires flexible learning spaces that can be modified in future. Acker and Miller (2005) agree on that it is much easier to replace furniture or improve equipment rather than demolishing the structures and building new one.

Considering that flexible learning environments foster creativeness of students, the design of formal learning spaces requires a more flexible approach that are away from defining rigid boundaries. The creativeness of students does not necessarily need to be encouraged by creativity programs or instructors' extra efforts. Contrary, the learning environment should allow students to create original ideas, by providing an atmosphere away from anxiety.

3.4.2.3 "Comfort" and Motivation

Learning spaces can motivate and engage the students by letting them know what role they are expected to play in the learning process. '*Well designed learning spaces have a motivational effect'.* (JISC, 2006, p.4). Both in terms of physically and psychologically, comfortable learning spaces promote a sense of well-being, keep minds focused, and limit distractions (Miller, 2008).

Although comfort is an immeasurable phenomenon, people become distracted when they feel uncomfortable. Being comfortable in a space depends on the variables like lighting, furnishing and noise level.

First of all furnishing is an important facility that helps in providing a comfortable and functional environment for students in formal learning spaces. Acker and Miller (2005) point out that well-built and well-furnished learning space increases space utilization and learning results with satisfied students. It is important to differentiate furniture according to the type of teaching being done in the classroom. For example, furniture in an urban design studio should be completely different from that of an integrated technology room.

Another variable that comfort rests on is lighting in the learning space. There is not an agreement among researchers on which form of lighting is the most suitable for the classroom. In relation to student achievement it is argued that day lighting offers the most positive effect (Earthman, 2004; Heschong Mahone Group, 2003) as daylight produces biological effects on the human body (Wurtman, 1975).

Finally, noise level is a supplementary matter that contributes attaining comfort of learning environment. Vallet and Karabiber (2002) point out that noise and room acoustical features are the main descriptors of acoustical comfort in learning spaces. Good acoustics in a learning environment fosters verbal communication, which requires silence and minimum reverberation (Paradis, 2008). Paradis (2008) classified the possible noise factors as (1) noise coming from outside the school, (2) noise in hallways, (3) noise coming from other classrooms, (4) noise of mechanical equipments and (5) reverberation in the classroom itself.

3.4.2.4 “Safety” and Sense of Well-being

Classrooms, laboratories, auditoriums and other formal learning spaces defined at the beginning of the chapter require physical specifications that provide secure learning environment for students.

On the other hand, safety does not only mean physical safety but also refers to prevention from psychological disturbances. For instance, Holley and Steiner (2005) define a safe classroom as a space that allows students to feel secure enough to take risks, honestly express their feelings, and share and explore their knowledge, attitudes and behaviors. In a safe learning space students develop trust in the lecturer, exhibit positive behavior, and sense that learning is encouraged and nurtured (Panju, 2008 and Koplow, 2002). Panju (2008) claims that students can learn easily when they feel safe, noticed and confident. On the contrary, learning becomes impossible when they are feeling fearful, ignored or lack of confidence.

The research study done by Holley and Steiner (2005) points out that the students’ opinions about physical environmental characteristics of a safe space. During the research, two main questions are addressed to a sample group of students. The first question was querying students' perspectives about the characteristics or behaviors of instructors, peers, themselves, and the classroom physical space that contribute to safe and unsafe classroom spaces. The second was questioning students' perspectives about the impact of safe classrooms on their own learning. Almost all of students stated that seating arrangement in the class is one of the major factors that influence the safety of classroom. They indicated that seating layouts like circle or square which lets students to see each other are most powerful layouts. Students also pointed out that the size of the classroom and appropriate lighting are also essential for creating safety in the classroom.

As Acker and Miller (2005) stated, activity rather than isolation increases student safety in the campus. They add on that well-designed spaces invite activity. In other words, well-designed spaces make students feel themselves in safe.

3.4.2.5 "Color" and Students' Mood

A visual stimulus in the environment often affects the student's ability to attend and even affects activity in the classroom. The color of the learning environment is one of the stimuli that have influence on students. There are many studies that focus on the effect of color on individuals' mood and performance (Sinofsky and Knirck, 1981; Stone and English, 1998; Kennedy, 2005; Pytel, 2006; Read, 2007)

Sinofsky and Knirck (1981) found that color has an influence on student attitudes, behaviors and learning. Stone and English (1998) indicate that change in mood may in fact be the result of color in the environment. They also claim that color can affect performance in the work place. Pytel (2006) concretized all these arguments with more scientific information that colors send signals to the brain out of our conscious. And how it affects our thinking and feeling changes; some colors may help us to focus while some others distracts.

Daggett et al. (2008) indicate that color in the learning space provides an unthreatening environment that enhances visual processing and decreasing stress. They also describe color as a challenging factor that forces brain development through visual stimulation and pattern seeking.

As Pytel (2006) states the green color inspires the creativity. Therefore green is an appropriate color for an art room or a creative writing classroom. Pytel (2006) defines blue as the color of academics and light blue as a good overall classroom color. Sasson (2007) adds on that the soothing characteristic of light blue reduce the number of behavior outbursts and discipline problems facilitating perhaps with classroom management on a creative level. Pytel (2006) points out that light pink and rose are also soothing colors that would be suitable for a Behavior Disorder classroom or a

kindergarten room. Dunn and Dunn states that since the colors pale yellow and almond are not irritating anyone, they would be suitable for a general color for school hallways (Sasson, 2007)

Daggett et al. (2008) claim that color variety reduces boredom and passivity. Therefore, in order to create variety of different learning spaces, classrooms should be paint with different types of colors according to the function that the rooms will be used for. However, the number of colors that is used for painting a room should be controlled and the amounts of colors should be balanced in a formal learning space. For instance, using more than six colors in a learning space obstructs students' cognitive abilities. (Daggett et al., 2008)

3.4.2.6 "Classroom Size" and Stress Level

The size of the learning space influences the ambiance of lecture and motivation of both teachers and students. Brown and Knowles (2007) state that stress affects the quality of cognitive processing of students, it disrupts students' ability to process information effectively. Nfer Press release 1998 suggested that large classes (over 30) undermine teacher's morale and adversely affect the quality of education received. Moreover, Glover and Law (2000) define overcrowding as a factor in raising stress levels that are detrimental to the learning situation. The ratio between the number of students and the area provided for education in the classroom affects the stress level and motivation indirectly. Therefore, providing enough space for each individual student is a critical issue that affects the efficiency of learning.

The size of the cafeteria and of the music is also probably a factor in determining whether those rooms are to be used for other than lunch or music respectively (Morphet ,1972)

Head teachers say that good teachers can teach large classes but at the expense of decreased motivation, self-esteem and morale.

3.4.2.7 “Accessibility” and Persistence

As Morphet (1972) stated; basement, attic or other poorly located rooms are likely to have poor lighting or poor heating. The fact that more than half of the cafeterias, many of the shops and households arts room, and occasionally some of the other classrooms are located in the basement must be given important consideration in interpreting the low percentage of utilization found in many buildings.

Therefore, learning spaces which does not provide easy access canalize students to skip classes or present irregular attendance at courses.

CHAPTER 4

METHODOLOGY

This section presents the methodology of my research which is carried out with 60 university students at the Middle East Technical University, in order to discover the role of open space design on students' learning experiences on campus open spaces. Respectively, this thesis explores the following main research question; **how does the spatial design of campus open spaces affect students' learning experiences?** This research question aims to help reveal possible campus open space design indicators that may have influence on students' learning on campus. Furthermore, this will help explore students' experiences in certain public sections on campus and test the existing theoretical arguments. In this context, this thesis carries out both exploratory and quasi-experimental research methods.

The research question comprises three sub-questions: how learning is experienced in public space, what the spatial design indicators of learning in public spaces on a campus are and whether the spatial design indicators of formal academic spaces (indoor spaces) affect learning in campus public spaces. Table 4.1, on the next page, presents these three minor questions and the research approach, data collection and analysis methods and techniques for each of these three minor questions.

Table 4.1 Research Design

Minor Questions	**Research Approach**	**Data Collection**	**Data Analysis**
1. How learning is experienced in public space?	Exploratory	Open-ended questionnaire	Content Analysis
2. What are the spatial design indicators of learning in public spaces on a campus?	Exploratory	Open-ended questionnaire	Content Analysis
3. Do the spatial design indicators of formal academic spaces (indoor spaces) affect learning in campus public spaces?	Quasi-experimental (testing)	Likert Scale Ranking	Multiple Regression Analysis

Research design of the study is composed of six sections which give input to one another. These sections include: (1) review of research approaches (2) variables, (3) case study, (4) respondents, (5) data collection and (6) data analysis.

In the 'review of research approaches' section I presents the research approaches that I used in this thesis. In the 'variables' section, I discuss how I utilized the findings of literature review to derive some of the variables used in my research. In the 'case study' section, I explain the selection criteria of case campus. I also give details for the selected sample areas from the case university campus. In the 'respondents' section, I clarify the selection of respondents who will be interviewed during the research. In the 'data collection section', I give information about the survey technique which I used to fulfill both the exploratory and quasi-experimental characteristics of the study. And finally, the 'data analysis' section I explain the data analysis methods and techniques that I used to analyses the collected data.

4.1 Review of Research Approaches

4.1.1 Quasi-experimental Research

Campbell and Stanley (1966) primarily introduced the term quasi-experiment to make a distinction between the randomized experiment in which participants are randomly selected and the experiments in which the random selection of participants offers benefit for the researcher (Pitts et al., 2004).

Babbie (2007) also states that quasi-experimental research is distinguished from truly experimental researches primarily by the lack of random assignment of subjects to an experiment. Quasi-experimental research tries to reveal the relationship between independent and dependent variables in naturally occurring situations. In other words, the main idea of this research is to check whether there is a casual relationship with a limited control on factors that might affect the outcome (Kahraman, 2008).

Considering that the main aim of a quasi-experimental research is to investigate cause and effect relations, this approach enables researcher for greater understanding of program features and practice (Bradley, 2009). Since there is a loss of control in the quasi-experimental design, the research had the responsibility of deciding what and when to measure (Dawson, 1997; in Bradley 2009).

Literature review presents that quasi-experimental design have the advantage of convenience and practicality but also have the disadvantage of reduced internal validity (Ross and Morrison, 2008; Bradley, 2009). Therefore, to increase the utility of quasi-experimental design to the research, researchers should study in conjunction with other research approaches and with nontraditional supplementary ways of collecting and analyzing results (Ross and Morrison, 2008). Within this concept, the following section presents the exploratory research which set off the major part of this thesis.

4.1.2 Exploratory Research

As the term exploration evokes, exploratory research explores the effective attributes and their relation with a dependent event or a case. Literature review does not presents a single definition about exploration in social sciences. However, Stebbins (2001) makes the most comprehensive definition as:

"Social science exploration is a broad-ranging, purposive, systematic, prearranged undertaking designed to maximize the discovery of generalizations leading to description and understanding of an area of social or psychological science."

Roseman (1977) states that researchers use the exploratory research in conditions when there exists a lack of information on a specific topic; or a lack of ability or resources to locate relevant facts because of the diffuse nature of the problem. Moreover McKenzie & Danforth (2009) adds on that exploratory research enables to obtain better understanding of a concept or to help shape up the definition of a problem. It also provides identification of essential variables to be studied. Exploratory research can take several forms: pilot studies, experience surveys, secondary data analysis, pilot studies case analysis, and focus groups (McKenzie & Danforth, 2009).

In brief, the objective of exploratory research is to find out the influencing factors and their links by studying how a particular process takes place (Blessing et al., 1998).

4.2 Variables

In the theoretical part of my thesis, I reviewed the literature to bring out the attributes that enhance students' learning experiences on campus open spaces. Although, comparatively little analysis have been devoted to the learning that occurs in the wide range of informal learning environments especially on campus open spaces; literature review reveals that (1) interaction, (2) studying in groups, (3) socialization, (4) multi-functionality and (5) the state of belonging to campus are prominent variables that enhance learning experiences on campus open spaces.

Since the campus open space literature does not give wide-ranging attributes in terms of design criteria, I also reviewed the literature on indoor learning spaces. I bring out the attributes that enhance learning in indoor spaces like classrooms, laboratories, studios etc. I used these predefined attributes as variable in my research to explore students' learning experiences on campus open spaces. Via testing these variables, I aim to establish relation between indoor space variables and learning on campus open spaces.

Eventually, an examination of variables coming from campus open space literature and indoor learning environments helped me to create a set of parameters that can be queried for campus open spaces. (1) layout, (2) flexibility, (3) comfort, (4) security, (5) color, (6) size, (7) accessibility, (8) interaction, (9) studying in groups, (10) socialization, (11) multi-functionality and (12) the state of belonging to campus.

On the other hand, by asking open-ended questions to respondents, I aimed to explore perceived attributes of learning on campus open spaces, the perceived attributes that enhance learning on these spaces and the expected perceived learning attributes found out the learning attributes occurred on the in the open-ended question.

4.3 Case Study

Before selection of a sample campus, I have reviewed the literature in order to reveal essential circumstances that make a campus to be called as the best human design with the highest success rates. After bring out the significant circumstances, I have examined the universities of long standing in Turkey. Findings show that Middle East Technical University provides all criteria described in literature. Therefore, with the support of my personal experiences, which covers an eight years observation and practical application, I have selected Middle East Technical University as the case campus.

When literature is reviewed, Halsband (2005), Marcus & Francis (1998) and Strange & Banning (2000) describe some fundamental criteria that turn a campus into a place that invites people to participate in the thoughtful creation of communal environment.

First of all, Halsband (2005) states that the best university campuses are places that have been designed over long time of periods. In this respect, with its more than fifty years design period, Middle East Technical University stands as a potent candidate of a detailed designed campus.

Secondly, Halsband (2005) states that best university places speak to us of continuing care. In this sense; METU, with its dormitory capacity for approximately 6000 students, provides a continuing care for students. Students benefit from a shopping area, banks, post office and many eating places. METU campus also provides a wide variety of sports facilities; including gymnasiums, tennis courts, basketball and football fields, jogging trails, olympic-size indoor swimming pool, and an outdoor swimming pool for students.

Thirdly, as Marcus and Francis (1998) mentioned, traffic has an important role on how outdoor spaces are used since it affects stationery users either directly or indirectly. Therefore, providing pedestrian friendly environment and encouraging walking and cycling is essential for a well designed campus. In this sense, METU campus with its adequate walking space, buffer between pedestrian alley and traffic presents a considerable case.

Furthermore, Halsband (2005) claims that best university campuses should present harmony of nature, landscape and architectural design. In this sense, METU with its 4500 hectares of campus includes 3043 hectares of forest and Lake Eymir which is a powerful element available for students for rowing, fishing, picnicking and general recreational activities. Moreover, buildings on METU campus have a unique architectural language. Architectural design is respectful to natural elements on campus.

Moreover, although faculties and programs are critical issues for every university, there are some other components that have a significant role on students learning and satisfaction (Strange and Banning, 2000). It is significant to provide well-designed open spaces and diversity of open activities like METU campus provides to its users.

Finally, METU strives to maintain a high standard of education by international standards and it attracts many high school students to continue their graduate studies in its system.

Table 4.2 Conformity Table of Selected Case Campus

CRITERIAS	**CONFORMITY FOR METU**
Existence period	more than 50 years
Continuing care	shopping area, banks, post offices, eating places, sport facilities
Segregation of pedestrian and vehicles	Pedestrian-oriented traffic
Harmony of nature, landscape and architectural design	4500 hectares forest, rich open spaces, a unique architectural language
Motive learning environments	Student friendly and learning supportive

On the other hand some other universities like Istanbul University, Istanbul Technical University, Boğaziçi University, Gazi University, Marmara University, Ege University and Karadeniz Technical University have also a historical background which is more than 50 years. But none of these universities accommodate all criteria on the Table 4.2 as METU present in its campus.

4.3.1 Selection of Sample Areas

As literature review presents, there are three significant 'public spaces' where informal learning is experienced in a campus environment. These areas are campus heart, dormitories and open study areas between faculty buildigns. In order to collect data from each type of these categories, I have selected different sample areas for each title.

Considering that the method of direct observation plays a curious and unique role in the behavioral science (Altmann, 1974), while identifying the relevant sample areas, I have used observational research method. In this respect, before selecting the sample areas, I have reformulated the main research question. Main research question of this study focuses on the learning experiences on campus open spaces. Therefore I selected the most commonly used open public spaces where students gather and actualize activities that can generate or enhance their learning experiences. Depending on my personal observations and eight years of experiences during my undergraduate and master studies in METU campus, I have determined the sample areas as in Figure 4.1.

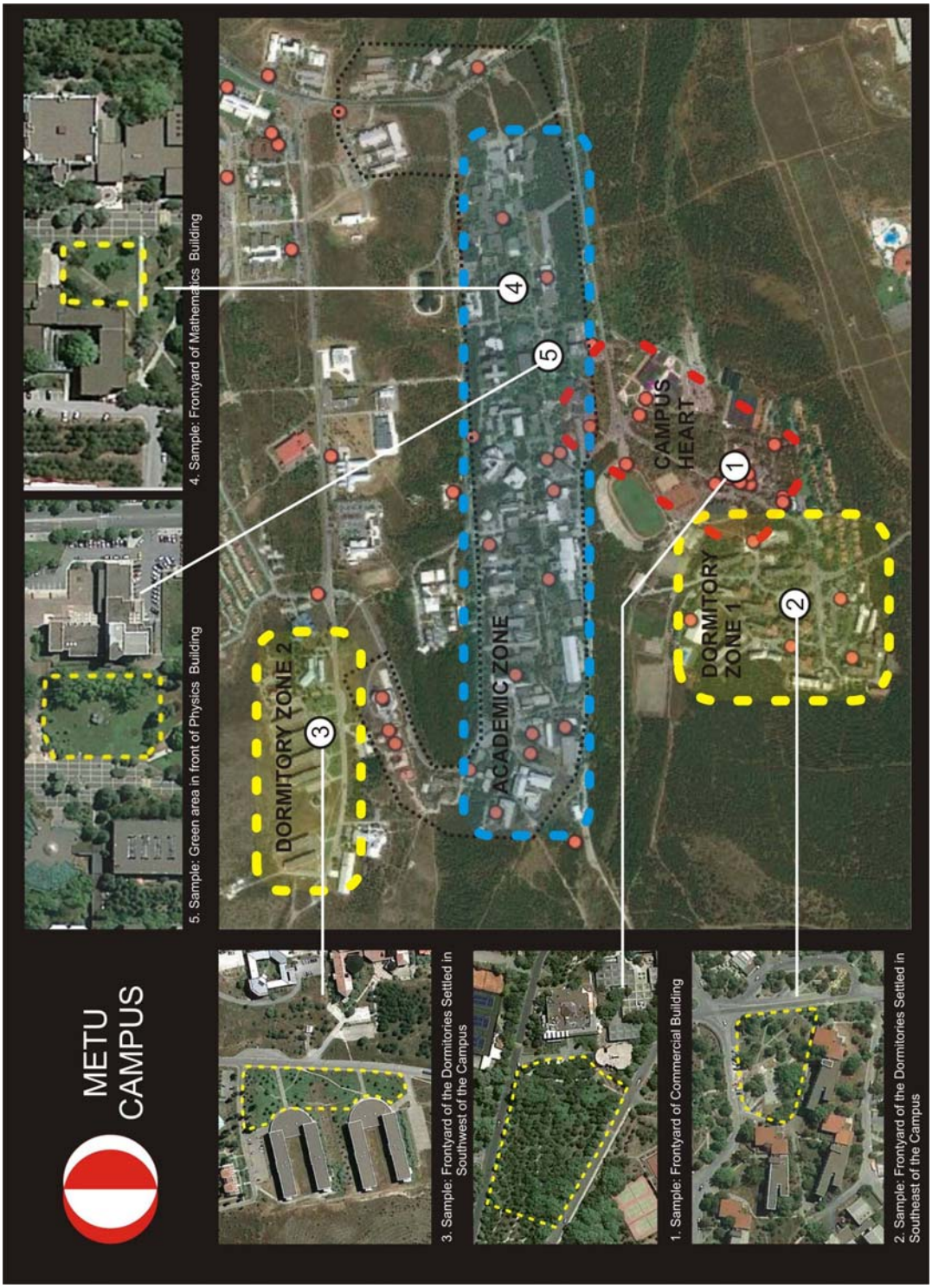

Figure 4.1 Selected Sample Areas from METU Campus

4.3.1.1. Campus Heart

Sample Area 1:

Literature review presents that campus heart is the central core where engagement of students is highly condensed by the help of commercial facilities. These facilities are range from shopping, entertaining activities to gastronomic and social facilities. In this context, selected Sample Area 1 fulfills the requirements of a campus heart. Area is located in front of the shopping center including banks, post office and many eating places around it. Moreover, students are able to find a tailor, a hairdresser and a barber around the site. There are many pedestrian routes directly comes from academic settings and goes into this area. Therefore, area has a very multifarious user profile. Heart of campus has various facilities that make it attractive for students to come from every part of the campus.

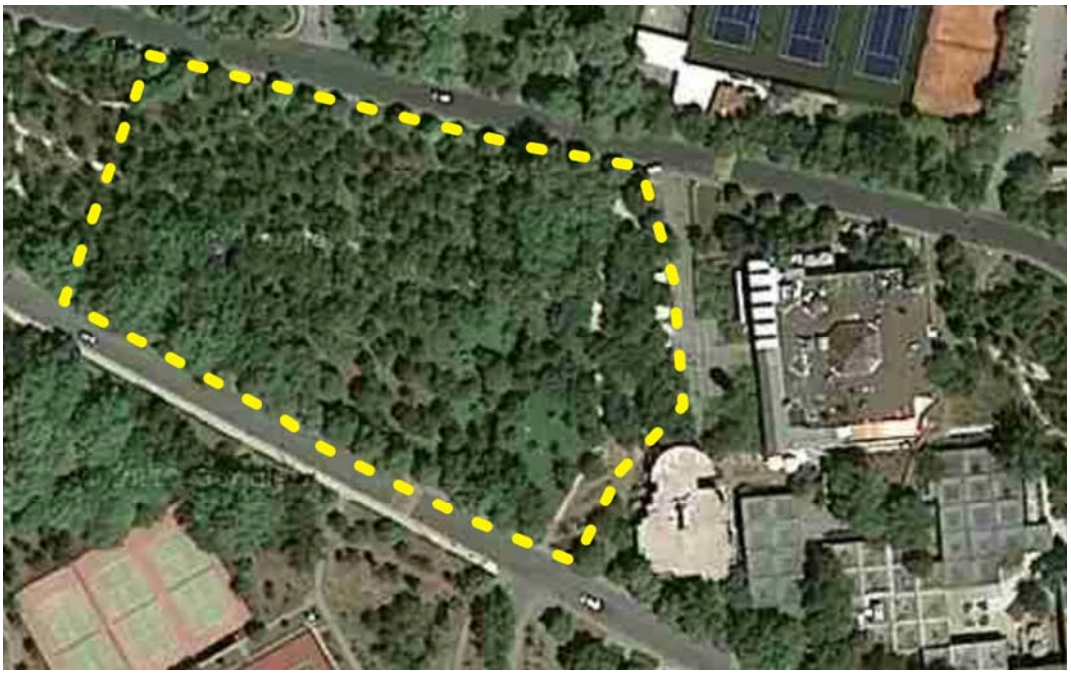

Figure 4.2 Heart of METU campus

Source: Google Earth

Figure 4.3 Panoramic View of 1st Sample Area

Source: Personal Archive

Although the campus heart includes many facilities that are done in indoor spaces, there is a wide open space in front of the main shopping center. This open space is well forested that gives shadowy spaces for different activities like resting, sitting, studying etc. As it is seen in Figure 4.3, area is furnished by some urban elements which give opportunity for sitting in groups and makes collaborative works. Moreover, there is a small creek flow across the open site.

4.3.1.2. Dormitories

Sample Area 2:

First dormitory zone is located on the southeast of the campus. The zone presents an absolute residential characteristic with nine dormitory blocks and three private guesthouses settled in the zone. The total accommodation capacity of the zone is approximately 5000 people.

Area is totally segregated from academic zone but it is still in a walkable distance in 10-15 minutes. Since this dormitory zone is very close to campus heart, students are able to reach whatever they need in a short time of period.

Students also have chance to easily access other public usages like swimming pool, sport hall, open sport areas etc. Moreover, the main bus station of the campus is settled in the middle of this dormitory zone.

As it is seen in the Figure 4.4, sample area 2 is selected from front yard of the dormitories that are settled on the road which goes directly to the sport hall and swimming pools. Sample area is covered by grass and some short landscape elements. There are some trees that make shadowy areas to sit or rest under but there is not any urban furniture which can foster this kind of activities. There is a small basketball field near the sample area.

Figure 4.4 South-east Dormitory Zone

Source: Google Earth

Figure 4.5 Panoramic View of 2nd Sample Area

Source: Personal Archive

Second dormitory zone is located on the southwest of the campus. Since the southwest of the campus mainly serves for academic residential blocks and METU village, this dormitory zone is designed as an extension of residential area of whole campus. The zone includes three dormitory blocks which host approximately 2000 students in total.

Area is totally segregated from academic zone and compared to first dormitory zone it is quite far away from academic units. In order to reach to campus heart, students need to use public transport services or university rings. Because of its location, students who accommodate in these dormitories have a problem of accessibility to central facilities and other social activities that are organized on the southeastern part of the campus.

As it is seen in the Figure 4.6, sample area 3 is selected from front yard of the dormitories that are settled on the main road. Sample area is covered by grass and some short landscape elements. There are not enough trees that create shadowy area to sit or rest under. Moreover, there is not any urban furniture which may enhance different types of activities like sitting, eating, studying etc.

Figure 4.6 South-west Dormitory Zone

Source: Google Earth

Figure 4.7 Panoramic View of 3rd Sample Area

Source: Personal Archive

4.3.1.3. Open Study Areas

Sample Area 4:

Sample Area 4 is composed of the front yard of the Mathematics building. Area is located on the main pedestrian alley and it faces the library building. Since library is a public space which is used by many students from different departments of the university, the open space in front of serves as an open public space.

Sample area 4 is totally segregated from traffic circulation, which enables students to move in a safe environment. There is not any urban furniture on the site but it is covered by grass which enables students to sit and deal with different things.

Figure 4.8 Open Study Area in front of Mathematics Building

Source: Google Earth

Figure. 4.9 Panoramic View of 4th Sample Area

Source: Personal Archive

Sample Area 5:

Sample area 5 is located in front of Physics building and it is on the cross-section of all pedestrian routes from different parts of campus. Therefore, this sample area is one of the most public open spaces in the campus by visitors from various departments. Since it is located on the main pedestrian alley, area is accessible for most of the students. On the other hand, many joint courses from different faculties are conducted in the buildings around this open space.

Different than the sample area 4, two sides of the area facing the rectorate and library buildings are sloppy. The slope gives the opportunity of segregation from the main pedestrian alley and also it enables people to lie down in a more vertical position.

Figure 4.10 Open Study Area in front of Physics Building,
Source: Google Earth

4.4 Respondents

Findings from literature indicate that people construct new meaning and transform their collective experiences into shared knowledge through interaction (Ataöv, 2007). Furthermore, research consistently indicates that interaction is one of the basic

conditions that enhance learning (Kolb and Kolb, 2005; Acker and Miller, 2005; Brown and Long, 2006). Thus, respondents were selected from groups sitting together, interacting or engaging in dialogue. For the sample areas that I could not find sitting groups, I choose students that pass by in the sample areas.

In each sample area, I used sequential sampling to determine the respondents for interview. I conducted one-to-one interview with the voluntary female and male students passing by from the sample areas. Since the questions for each respondents are same and they answer the questions unaware of each other, this method provides the opportunity of cross checking the answers from respondents.

I have carried out the survey with 60 students. I watched over to equal distribution of male and female participants and I have interviewed with 30 male and 30 female students. Table 4.3 presents more detailed gender distribution according to different sample areas.

Table 4.3 Distribution of Respondents for each Sample Areas

	Sample Areas	**Number of Participants**		
Campus Heart	Sample 1	20 students	10 M	10F
Dormitories	Sample 2	10 Students	5 M	5 F
	Sample 3	10 Students	5 M	5 F
Study Areas	Sample 4	10 Students	5 M	5 F
	Sample 5	10 Students	5 M	5 F
TOTAL	**5 Sample Areas**	**60 students**	**30M**	**30F**

I also took into account the diversity of students' academic departments. The more variety in terms of academic background, the more divers learning experience on campus. Table 4.4 presents the distribution of respondents according to their academic departments. 27% of respondents are enrolled in a discipline of social sciences. Likewise, 27% of respondents are enrolled in a discipline of natural sciences. Students from engineering departments constitutes one quarter of all respondents. The rest quarter of respondents are enrolled in preparatory school of English language, architecture, planning and some other departments. Appendix B also presents more detailed information about gender and academic department for each respondent.

Table 4.4 Distribution of Respondents according to Academic Backgrounds

Academic	**Number of Respondents**	**Ratio %**
Social Sciences	16	27%
Natural Sciences	16	27%
Engineering	15	25%
Prep. School of English	7	12%
Architecture and Planning	4	7%
Others	2	3%
TOTAL	60	100

4.5 Data Collection

In this research, I used in-depth interview technique to collect data on open campus spaces. The purpose of the in-depth interview application was to collect data on students' in-depth understanding, evaluation and experiences on campus open spaces.

In order to explore the relevant clues that might be helpful to answer the minor question of this research, I have prepared a questionnaire which I used during the in-depth interviews. This questionnaire consists of two parts which are open-ended questions and Likert scale ranking questions (See Appendix A for the original questionnaire).

First part of the questionnaire consists of open-ended questions. The first question, *"What kind of learning experiences do you experience on this open space?"*, aims to find out the experienced learning attributes on campus open spaces. Second question, *"What do you do for these learning experiences?"*, also aims to encourage participants to reveal further insights to their spatial and non-spatial experiences. The third open-ended question, *"What are the spatial indicators that enhance your learning experiences on this open space?"*, aims to reveal spatial learning indicators. The sub question of the third question, *"Are there any other attributes come to your mind? There can also be non-spatial attributes."*, aims to reveal further attributes both spatial and non-spatial. And finally, the last question, *"If you were the designer, how would you design this open space?"*, aims to find out expected perceived attributes that enhance learning experiences on campus open spaces.

Second part of the questionnaire consists of likert scale ranking questions. These ranking questions aim to test the pre-determined design indicators from the literature. Participants rate the effectiveness of indicators that are presented in the literature by Likert scale (1 indicating "not at all"; 7 indicating "a lot"). At the end, I test whether indoor spatial design indicator which are compiled from literature have also influence on learning on campus open spaces.

I paid attention to make interviews in the same time intervals for each interview days. I determined two time intervals one of which is "12:00-13:30" when students are in lunch break, and the other is "15:00-17:00" when students are already experienced learning in indoor spaces during the day. However, for the dormitory zones, I conducted the survey after 17:00, when the courses are finished and students move to

dormitory zone. I collected all the data in two weeks and the average time for each student to complete the survey was 20 minutes.

4.6 Data Analysis

The data collection of this research is comprised of two types of data. First is the subjective response of participants derived from the open-ended questions. The second is the Likert scale ranking values from the ranking of the indicators.

For analyzing the first group of data, I used content analysis method. Literature defines content analysis as the systematic, objective, quantitative analysis of message characteristics (Neuendorf, 2002, p:1). As Krippendorf (2004) argues that content analysis views data as representations of text, images and expressions that are created to be seen, read, interpreted and acted on for their meanings, and must therefore be analyzed with such issues in mind. In this respect, I decided to use content analysis in order to collect the gathered data under specific content titles. Neuendorf (2002) states content analysis summarizing rather than reports all details concerning a message set. Therefore, classifying the responses from students under content tittles helped me to reveal the commonality of variables. Classifying the data and calculating the frequency of mention gives the list of variables expressed by respondents according to significance on learning experiences, which is one of my aim to reveal with this research.

In the analysis of second group of data which is composed of values that respondents ranked according to Likert scale, I used multiple regression analysis method. Multiple regression analysis is a statistical technique that analyses the casual relationship between a single dependent variable and several independent variables (Kahraman, 2008). The objective of multiple regression analysis is to predict how the changes in independent variables affect the depended variable. In other words, this analysis investigates the effects of (X) and (Y) on a dependent variable (Z) which is shown in a equation of "$\mathbf{Z} = b_1\mathbf{X} + b_2\mathbf{Y} + b_0$" (Aiken, L. S. and Stephen G. W., 1991). The test of

the b_1 and b_2 coefficients are easily accomplished and inform the researcher whether the variables X and Y have a non-zero linear relationship to dependant variable Z. The b_0 coefficient represents the regression constant.

CHAPTER 5

RESEARCH FINDINGS AND DISCUSSION

In the first part, I present the in-depth results came up from open ended questions in the open space questionnaire. To do that, first of all, I explored different learning attributes that are experienced in open spaces. Secondly, after investigating the experienced learning attributes on campus open spaces, I examined the perceived attributes that enhance learning experiences on these open spaces. Thirdly, I investigated the students' expectances of learning attributes which they thought the attributes can foster learning on campus open spaces.

In the second part, I present the regression analyses done in order to find out the relationship between both spatial and non-spatial attributes and learning on campus open spaces. Firstly, I conducted a multiple regression analysis to verify the convergence between the tendencies of the generated variables of learning and the ones of the predefined variables. Secondly, I conducted a multiple regression analysis to reveal how much pre-defined perceived attributes, coming from indoor literature, explain the learning experience on campus open spaces. Thirdly, I conducted a multiple regression analysis to reveal how much the expected perceived attributes, defined by students, explain the learning experience on campus open spaces.

5.1 Learning Experiences and Prominent Factors that Affects these Experiences on Campus Open Space

Since the existing literature does not presents sufficient information about how the learning is experienced on campus open spaces, I constructed an exploratory research method in order to fill this information gap. In order to answer the first minor research question of thesis; 'how learning is experienced in campus open spaces, I have directed four open-ended questions to participants (see Appendix B).

First of all, before revealing the prominent attributes that fosters learning on open campus spaces, I queried the experienced learning types on these open spaces. The aim of the first open-ended question in the questionnaire was to reveal the experienced learning activities. Therewith, the second question aims to tease out the participants in order to get more clues about what they do in terms of learning on open spaces.

The results show that the most frequently mentioned learning experience on campus open spaces include (1) group discussion, (2) individual studying, (3) tutoring/consulting each other, (4) relaxing, (5) coincidental meetings, (6) chatting, (7) sharing current daily issues, (8) observing surrounding areas and (9) others.

Secondly, in order to find out the reason why students prefer open campus spaces rather than indoor areas, I have queried the perceived attributes that makes open spaces attractive for students. In this sense, third question of the questionnaire seeks the spatial attributes that enhance learning on campus open space. When examining from the urban design context the perceived spatial attributes are the main target group that I intend to reveal. But it would not be coherent to disregard non-spatial or emotional factors that have influence on learning experiences. Therefore, the sub-question under the third question in questionnaire seeks the non-spatial attributes influential on learning. Eventually, the spatial design of a space and the emotional acts experienced on that space are synergistic issues that cause to arise each other.

The results show that the most frequently mentioned perceived attributes of learning on campus open spaces are include (1) presence of nature, (2) fresh air, (3) ability for easy movement, (4) silence, (5) natural color, (6) lack of rigid physical boundaries, (7) auto-control, (8) natural lighting, (9) spaciousness, (10) social diversity, (11) urban furniture and (12) segregation from traffic.

Thirdly, the fourth question of the questionnaire seeks the components that provide the most appropriate environment for learning on campus open spaces. Students give responses depending on their imaginations and requirements. Therefore the results of this section give clues for future design requirements and recommendations for designers.

The results show that the most frequently mentioned expected perceived attributes of learning on campus open spaces are in order of; (1) comfortable and flexible furniture, (2) shadowing, (3) lighting, (4) natural elements, (5) other factors, (6) basic daily requirements, (7) segregation from traffic, and (8) silence.

5.1.1 Learning Attributes

Before revealing the spatial and non-spatial attributes that enhance learning on open campus spaces, I investigated different learning attributes that are experienced in open spaces. Within this concept, the first and the second questions in the questionnaire aimed to find out different learning attributes that are experienced in campus open spaces. These learning experiences are not only limited with academic learning but also include daily learning, observational learning, coincidental learning etc.

Participants described their learning experience in four general categories of behavior. The first refers to ‘academic learning’ and its relevant activities including studying, tutoring/consulting each other, and group discussion. The second group refers to ‘social and conversational’ activities including coincidental meeting and sharing current issues. The third group refers to ‘observing’ as an activity that individuals can perform alone and silently. The last is ‘relaxing’, a retrieving emotional dimension.

As Table 4.1 presents, with a ratio of 17%, ‘group discussion’ is the most mentioned learning experience on campus open spaces. Subsequently, with a ratio of 16% ‘individual studying’ came forward as the second most mentioned experience. Afterwards, ‘tutoring/consulting each other’ comprises 15% of all mentioned learning experiences. Distribution ratios indicate that, top three most frequently experienced learning activities constitutes almost a half (48%) of all learning activities, and they are directly related to academic learning.

On the other hand, while ‘social and conversational’ activities including coincidental meeting and sharing current issues constitute 22% of all activities; 14% of all mentioned concepts refer to ‘relaxing’ as a retrieving emotional dimension. Finally, the 6% share of total distribution represents the ‘observing surrounding areas’ and other learning activities.

Table 5.1 Content groups of learning experience.

Content Groups	**Frequency of mention**	**%**
Group discussion	37	% 17
Individual studying	34	% 16
Tutoring/consulting each other	32	% 15
Relaxing	30	% 14
Coincidental meetings	25	% 12
Chatting	25	% 12
Sharing current daily issues	22	% 10
Observing surrounding areas	8	% 4
Others	4	% 2
TOTAL	217	% 100

In line with previous research findings (Katzell and Thompson, 1990; Jameison, 2003; Halsband, 2005; Dugdale, 2009), this study reveals 'group discussion', 'individual studying', 'tutoring-consulting each other' and 'observing surrounding areas' as experienced learning activities on open campus spaces.

On the other hand, different from other research, this study also shows that 'coincidental meetings', 'sharing current daily issues', 'chatting' and 'relaxing' play a role in students' learning experience. The following sample quotations from respondents account for the content groups of learning experiences on open campus spaces.

Table 5.2 Sample quotations for 'coincidental meetings'

'coincidental meetings'
"In any case, I meet with an acquaintance of mine during the day." (Female, Sociology)
"While we are sitting in groups, some of our friends passing through alley can notice and join us." (Male, Genetics)
"Especially before the exams it is usually possible to find some of my friends who is making his last looking over the topics." (Female, Environmental Engineering)
Source: Personal Research

Table 5.3 Sample quotations for 'sharing current daily issues'

'sharing current daily issues'
"We can learn daily news from our friends." (Female, Sociology)
"I am studying on public administration and we usually have discussions on political issues especially when we came here." (Female, Political Science and Public Administration)
Source: Personal Research

Interview results present that campus open spaces, especially the ones located on the main pedestrian routes, are convenient spaces for 'coincidental meetings'. These meetings usually results with a transaction of information or knowledge. As quotations in Table 5.2 and 5.3 shows, the shared matter in these meetings can either related to academic issues or daily news and recently arisen events. This finding also support what Illeris (2007) define as 'everyday learning'; the entrance of one person to another's life unintentionally to learn something.

Table 5.4 Sample quotations for 'chatting'

'chatting'
"While we are memorizing biological terms we make some emulating from our daily talk. It become more enjoyable and provides easily to sticking in the mind." (Female, Biology)
"Criticizing our tutors make us to pour out our feelings and relax at least before the next course." (Female, Psychology)
Source: Personal Research

According to face to face interview inference; since students have to obey the curriculum or programs required by formal learning system, students are in a way of searching more informal learning methods. This finding corresponds with what Acker and Miller (2005) claims in terms of informal learning. They also argue that students develop new ways of learning which they can behave more independed without controlled by an authority. 'Chatting' is one of the activities that play a role on students informal learning activities. Students indicate that gained learning experiences in informal chatting platform are much more long lasting than the ones in formal classrooms. On the other hand, Table 4.4 also indicates that 'chatting' has a relaxing impact on students in terms of mental relief.

Table 5.5 Sample quotations for 'relaxing'

'relaxing'
"When I am studying in indoor spaces, after a while I feel like the walls hang over me." (Female, Sociology)
"Indoor spaces sometimes give the feeling of that I am encaged." (Male, Petroleum and Natural Gas Engineering)
"While I am studying on open space, I sometimes give small resting breaks and I have the opportunity to observe what is going on around." (Female, Psychology)
Source: Personal Research

The findings of the content analysis also reveal that 'relaxing' has an important role on students' learning experiences. This result corresponds with the study of Marcus and Wischemann (1998) which reveals that more than one fourth of students prefer natural and green spaces for relaxation in a campus. Table 4.5 shows that, campus open spaces provide both physical and mental relaxation. Considering that during the lecture hours students are hold in rigid patterns like stable seating in amphitheaters or wooden desks in classrooms, campus open spaces provide students the chance of behaving according to their desires after lectures. On the other hand, students fell more relaxed mentally, especially after spending in average six hours in the gloomy atmosphere of indoor learning spaces. Thus make them recharge their mind for the future learning experiences.

5.1.2 Perceived Attributes of Learning

The third question of the questionnaire aimed to find out perceived attributes of learning in campus open spaces. These attributes includes not also spatial but also emotional and other non-spatial variables.

The content analysis reveals four general content groups: layout and furniture, natural elements, location, and individual experience. 'Layout and furniture' consists of the

ability for easy movement, the lack of rigid physical boundaries, spaciousness, seating, and bower. 'Natural elements' include the presence of nature in general, natural lighting and color, silence, and fresh air. 'Location' refers to the segregation from traffic. 'Individual experience' involves emotional and social components of learning experience including relaxation, pleasantness, discharging and social diversity.

As Table 5.6 presents, with a ratio of 21%, 'presence of nature' is the most mentioned learning attribute on campus open spaces. Subsequently, with a ratio of 18% 'emotional factors' came forward as the second most mentioned attribute. Afterwards, 'fresh air' comprises 16% of all mentioned learning attributes. Distribution ratios indicate that; top three most frequently perceived attributes that foster learning, constitutes more than a half (55%) of all perceived learning attributes, and they are entitled under the groups of 'natural elements' and 'individual experiences'.

On the other hand, spatial attributes like ability for easy movement, segregation from traffic, spaciousness, the lack of physical boundaries and urban furniture constitute 18% of all perceived learning attributes. Lastly, the rest 15% proportion includes social diversity, silence and auto-control. However, it is essential to consider that attributes like emotional factors, social diversity, auto-control, silence etc. are interactive variables that are directly related with space. These emotional and non-spatial variables can increase or diversify insomuch the spatial design does allow, or vice versa.

Table 5.6 Content groups of perceived attributes that enhance learning on campus open space.

Content Groups	Frequency of mention	%
Presence of nature	76	% 21
Emotional appraisals	65	% 18
Fresh air	56	% 16
Ability for easy movement	28	% 8
Silence	25	% 7
Natural color	22	% 6
Lack of rigid physical boundaries	19	% 5
Auto-control	19	% 5
Natural lighting	14	% 4
Spaciousness	12	% 3
Social diversity	10	% 3
Urban furniture	5	% 1
Segregation from traffic	4	% 1
TOTAL	356	% 100

Table 5.7 shows the distribution of content groups of perceived attributes that enhance learning on three different campus open spaces. In all sample areas selected from (1) heart of campus, (2) dormitory zones and (3) open study areas, the most frequently mentioned perceived attributes that enhance learning are; 'emotional appraisals', 'fresh air' and 'presence of nature'. There are three attributes which show variation according to sample area.

Table 5.7 Content groups of perceived attributes that enhance learning on three different samples of campus open spaces

	HEART	DORMITORIES	OPEN STUDY AREAS
Content Groups	**Frequency of mention %**	**Frequency of mention %**	**Frequency of mention %**
Emotional appraisals	% 20	% 17	% 18
Fresh air	% 18	% 15	% 14
Presence of nature	% 17	% 29	% 20
Silence	% 10	% 10	% 2
Ability for easy movement	% 9	% 4	% 10
Lack of rigid physical bound.	% 7	% 3	% 5
Auto-control	% 7	% 3	% 7
Urban furniture	% 4	% 0	% 0
Natural color	% 3	% 11	% 5
Natural lighting	% 2	% 3	% 7
Spaciousness	% 2	% 2	% 5
Segregation from traffic	% 0	% 2	% 2
Social diversity	% 0	% 1	% 7
TOTAL	% 100	% 100	% 100

Firstly, although ‘silence’ constitutes 10% of all mentioned attributes in the sample areas of heart and dormitories, the ratio of its mention declines to 2% in open study areas. The main reason under that fall is the location of the sample areas selected for open study areas. These sample areas are located on the main pedestrian axis which carries thousands of students during the day. Therefore, these areas are not silent as the ones in the campus heart and dormitory zones.

Secondly, as Table 4.7 presents ‘urban furniture’ comprises 4% of the mentioned attributes in the sample areas of campus heart. Students uses urban furniture in the sample areas in order to come together, sit, discuss, study, chat or share something. On the other hand, ‘urban furniture’ does not present any proportion for the dormitory zone and open study areas. Main reason of this gap is the lack of urban furniture in dormitory zones and open study areas. There is almost not any furniture in these sample areas.

Thirdly, the attribute of ‘social diversity’ presents a difference between three sample areas. As Table 4.7 presents, the frequency of mention ‘social diversity’ is very close to zero per cent, in sample areas of campus heart and the dormitory zones. Besides, it comprises 7% of all mentioned attributes in open study areas. The main reason of that gap is again the location and the boundaries of the sample areas selected for open study areas. Since the sample open study areas are located on the main pedestrian alley, students from different departments with different backgrounds coincide or come together in these open spaces. On the other hand, the lack of boundaries and direct connection to main alley increases the circulation and interaction. The reason why the ratio of ‘social diversity’ is so low in sample areas of campus heart, is the boundaries which are determined by long trees that hide the open space from the lively core of the heart.

In line with previous research findings (Marcus and Francis, 1998; Oblinger, 2005; Acker and Miller, 2005; Brown and Long, 2006), this study reveals ‘segregation from traffic’, ‘color’, ‘emotional appraisals’, ‘urban furniture’, ‘spaciousness’ and ‘social diversity’ as perceived content groups that enhance the learning experience in campus open space.

On the other hand, different from other research, this study also shows that ‘presence of nature’, ‘fresh air’, ‘silence’, ‘ability for easy movement’, ‘lack of rigid physical boundaries’, ‘natural lighting’ and ‘auto-control’ play a role in students’ learning

experience. The following sample quotations from respondents account for the content groups that enhance the learning experiences in open campus spaces.

Table 5.8 Sample quotations for 'presence of nature'

'presence of nature'
"Being in touch with soil absorbs my negative energy." (Female, Mathematics)
"Grass provides us a comfortable environment for sitting, lying, resting etc." (Male, Prep. School)
Source: Personal Research

Table 5.9 Sample quotations for 'fresh air'

'fresh air'
"Open air has a soothing impact." (Female, Physics)
"Fresh air makes me concentrate more easily, especially while I am reading long texts." (Male, Prep. School)
"I prefer open spaces in order to refresh my mind in the breaks between lectures." (Male, Mining Engineering)
Source: Personal Research

The results of content analysis presents that 'presence of nature' and 'fresh air' are constitute 37% of all mentioned attributes of learning on open campus spaces. This finding corresponds with previous study which reveals that nature has an important role in human health and well-being, and that park and nature reserves play a significant role by providing access to nature for individuals. The quotations from respondents presented in Table 5.8 and 5.9 reveals that nature and fresh air play a vital role in students' relaxation, mentally relief and finding peace. During the interviews,

almost every participant defined or indicated fresh air and natural elements as the main two reasons which make campus open spaces more comfortable.

Table 5.10 Sample quotations for 'lack of rigid physical boundaries'

'lack of rigid physical boundaries'
"When I am studying in indoor spaces, after a while I feel like the walls hang over me." (Female, Sociology)
"Indoor spaces sometimes give the feeling of that I am encaged." (Male, Petroleum and Natural Gas Engineering)
"While I am studying on open space, I sometimes give small resting breaks and I have the opportunity to observe what is going on around." (Female, Psychology)
Source: Personal Research

Considering that students spend approximately 6 hours in classrooms or laboratories per day, closed spaces with rigid boundaries make them feel like suppressed. Therefore, as the quotations above reveal, most of the students feel the needs for getting out to open spaces where the physical boundaries are not so rigid or monotonous. However, it is essential to underline that boundaries in other words surfaces as Barlas (2006) mentioned; guide, orient and protect the living individuals. Barlas (2006) stated that when the surfaces united into one unit, they offers various affordances. He continuous:

…the combination of surfaces provides for stimuli in the sense of perceptual processes such as olfactory and sonic stimulation as well as visual and haptic stimulation. Horizontal surfaces support movement and locomotion. The combination of vertical, horizontal and sloping surfaces may afford and provide for shelter from the weather, concealment and security. These combinations also provide places for people to get together…

Similarly, the composition of design elements in open spaces can afford a variety of things to students. Therefore, 'the lack of rigid boundaries' does not refer to spaces

that are totally open and empty. In order to guide, orient and offer a gathering place for students it is essential to define the boundaries of open space either with natural elements like trees, bushes or man-made visual elements like sculptures, urban furniture. Combining Barlas's argue and quotations from respondents; while defining the boundaries of open spaces providing flexible surfaces by using softer elements might provide stimuli in the sense of perceptual process and enhance learning experiences.

Table 5.11 Sample quotations for 'auto-control'

'auto-control'
"We don't have to obey any rules like syllabus or curriculum. We can meet and do whatever and whenever I want in that space." (Female, Biology)
"There is nobody like instructors or academic personnel that interfere with us." (Male, Prep. School)
Source: Personal Research

Different than previous studies, this study also reveals that campus open spaces enable students to behave how they feel like to do. Students determine this freedom as auto-control'. Since they have to follow the determined rules and regulations in formal learning areas, especially after lectures most of students prefer campus open spaces where they are not controlled by any authority. On the other hand, while they are studying or making another activity on campus spaces, they plan their time schedule according to their individual agenda. These opportunities provide them to have control of their time-space relations.

5.1.3 Expected Perceived Attributes of Learning

The fourth question of the questionnaire aimed to find out expected perceived attributes of learning in campus open spaces. Respondents indicated the missing and desired design elements on the sample areas.

The content analysis reveals eight content groups: 'comfortable and flexible furniture', 'natural elements', 'shadowing', 'manmade lighting', 'basic daily requirements', 'segregation from traffic', 'silence' and 'others' which include wireless internet access, the reflexive spatial design and atmosphere of home garden.

As Table 5.12 presents, with a ratio of 35%, 'comfortable and flexible furniture' is the most mentioned desired design elements on campus open spaces. Subsequently, with a ratio of 26% 'natural elements' came forward as the second most mentioned component. Afterwards, 'shadowing' and 'manmade lighting' together comprise same proportion (16%) with 'natural elements'. The rest 14% proportion includes 'basic daily requirements', 'segregation from traffic', 'silence' and 'other' components.

Table 5.12 Content groups of expected perceived attributes that enhance learning on campus open spaces

Content Groups	**Frequency of mention**	**%**
Comfortable and flexible furniture	75	% 35
Natural elements	55	% 26
Shadowing	34	% 16
Manmade lighting	22	% 10
Others	12	% 6

Table 5.12 (Continued)

Basic daily requirements	8	% 4
Segregation from traffic	5	% 2
Silence	4	% 2
TOTAL	215	% 100

In line with previous research findings, this study also revealed that 'comfortable and flexible furniture', 'natural elements', 'segregation from traffic' and 'silence' as expected perceived content groups that enhance the learning experience in campus open space.

On the other hand, different from other research, this study also shows that 'shadowing', 'lighting' and some 'other components' have vital role on students' learning experiences on campus open spaces. The following sample quotations from respondents account for the content groups of attributes that are expected to enhance learning.

Students complain about the sunglow and suffocating effects of sun. Therefore, they feel the need for shadowing elements in order to prevent the disturbing effect of direct sun ray. Table 5.13 presents some of the most frequently mentioned statements related to shadowing. On the other hand, students also state that it would be better if campus open spaces were not only usable in good weathers, but also suitable to use in some other weather conditions like rain.

Table 5.13 Sample quotations for 'shadowing'

'shadowing'
"Since the sunlight directly comes to the area, it becomes very hot and uncomfortable to study in open spaces." (Female, Chemistry)
"It could be better if we could use this area also in the rainy weather." (Male, Civil Engineering)
"There are not enough trees which gives shadowy areas." (Male, Mechanical Engineering)
Source: Personal Research

One of the most frequently mentioned complain of students is the darkness of campus open spaces during the night time. As Table 5.14 presents, students do not find the night lighting adequate, and this limits their usage of campus open spaces.

Table 5.14 Sample quotations for 'lighting'

'Manmade lighting'
"Lack of lighting makes it impossible to use that area in the evenings." (Female, Biology)
"After sun sink, this area became very dark and scary." (Female, Sociology)
Source: Personal Research

Finally, there are also some other expectations which students mentioned as a potential factor that enhance the learning experiences on campus open spaces. Some of the quotations related to other factors are presented in the Table 5.15, on the next page.

Table 5.15 Sample quotations for 'others'

'others'
"It could be useful, if we can access wireless internet in open spaces." (Male, Computer Engineering)
"Reflexive design elements can be more useful in terms of learning." (Male, Mechanical Engineering)
"This area can be designed with the atmosphere of a home garden." (Female, Architecture)
Source: Personal Research

To sum up, Table 5.16 shows the distribution of content groups of expected perceived attributes that enhance learning on three different campus open spaces. In all sample areas selected from (1) heart of campus, (2) dormitory zones and (3) open study areas, the most frequently mentioned expected perceived attributes that enhance learning are; 'comfortable and flexible urban furniture' and 'natural elements'. There is two attributes that significantly shows difference according to three sample zones; 'manmade lighting' and 'basic daily requirements'.

Table 5.16 Content groups of expected perceived attributes that enhance learning on three different samples of campus open spaces

	HEART	DORMITORIES	OPEN STUDY AREAS
Content Groups	**Frequency of mention %**	**Frequency of mention %**	**Frequency of mention %**
Comfortable and flexible furn.	% 40	% 32	% 33
Natural elements	% 15	% 26	% 36
Shadowing	% 16	% 18	% 13
Manmade lighting	% 3	% 22	% 4
Others	% 12	% 10	% 6
Basic daily requirements	% 10	% 0	% 1
Segregation from traffic	% 1	% 0	% 4
Silence	% 3	% 0	% 3
TOTAL	% 100	% 100	% 100

Firstly, although 'manmade lighting' is comprises 22% of all mentioned expected attributes in the sample areas of dormitories, the ratio of its mention declines to 3-4% in the sample areas of campus heart and open study areas. The main reason under that gap is the difference between the time intervals that students use open spaces. Considering that during the day time (8am-5pm) most of students are mobilizing in the academic zone or heart of the campus, they do not require manmade lighting in open spaces. However, after 5pm and later students move to dormitory zones and with the sink of sun, open spaces became darker and unsuitable for studying or any other activities.

Secondly, as Table 5.16 presents 'basic daily requirements' comprises 10% of the mentioned expected attributes in the sample areas of campus heart. On the other hand, 'basic daily requirements' presents 1% proportion for the open study areas and it does

not present any proportion for the dormitory zone. The following sample quotations in Table 5.17 account for the content groups of 'basic daily requirements'. The reason why respondents did not mentioned 'basic daily requirements' for the sample areas of dormitories and open study areas is that; these sample areas are very close to the building that are surrounded by them and these buildings provides basic requirements like toilets, canteen, stationary etc.

Table 5.17 Sample quotations for 'basic daily requirements'

'basic daily requirements'
"There should be toilets close to this open area." (Female, Prep. School)
"It could be better if there were portable kiosks or canteens in this area." (Female, Sociology)
Source: Personal Research

5.2 Relationship Between Learning and Campus Open Space

This section presents the findings of multiple regression analysis where the 'learning' is treated as the dependant variable. First multiple regression analysis verifies the convergence between the tendencies of the generated variables of learning and the ones of the predefined variables. Second multiple regression analysis reveals the pre-defined perceived attributes which explain the learning experience on campus open spaces. Third multiple regression analysis reveals which expected perceived attributes, defined by students, explain the learning experience on campus open spaces.

5.2.1. Relationship between learning and generated perceived attributes of campus open space

This section explores the relationship between learning and perceived attributes based on the findings of multiple regression analyses.

As presented in the first part of this chapter, by answering the open-ended questions in the questionnaire, respondents defined perceived attributes that affects learning on open campus spaces. Respondents generated thirteen perceived attributes which are called; (1) ability for easy movement, (2) presence of nature, (3) lack of rigid physical boundaries, (4) segregation from traffic, (5) natural color, (6) natural lighting, (7) emotional appraisals, (8) social diversity, (9) silence, (10) fresh air, (11) urban furniture, (12) spaciousness and (13) auto-control. The main aim of this first multiple regression analysis is to find the relationship between learning and the perceived attributes of learning which are generated by respondents.

I conducted the multiple regression analysis to test the validity of exploratory findings with the findings of previous research. In the model, three of the thirteen attributes made significant contribution to explaining the remaining variance in learning. These attributes include ‘ability for easy movement’, ‘social diversity’, and ‘natural lighting’. The variables made similar contribution to explaining the variance in learning (p’s < 0.05) (See Section C.5. in Appendix C for more results of this analysis). When considered all, they explained 20 percent of variance in learning. Although this shows that other variables also played a major role in explaining the learning experience, the results of this analysis are worth to be reported due to the exploratory nature of the study.

Table 5.18 Results of Regression Analysis of Learning for Indoor & Outdoor Attributes for the overall sample

VARIABLES	R^2	R^2change	b	t	p
Ability for Easy Movement	.098	.098	0.597	2.084	.026
Social Diversity	.162	.064	.726	2.240	.029
Natural Lighting	.223	.060	.699	2.084	.042
(constant)			3-926	18.690	.000

Standard Error = .85
Adjusted R^2= .554
df1=1; df2=57
For model: F = 8.952, p < .01

Then, I analyzed the multicollinearity between variables. Table 5.19 shows low to moderate correlation between the variables of the model (r's < 0.40). This shows that multicollinearity does not constitute significant problem in this model.

Table 5.19 Pearson Correlation for Learning on Campus Open Space

	DV	IV1	IV2	IV3	IV4	IV5	IV6	IV7	IV8	IV9	IV10	IV11	IV12	IV13
Learning	1.000	.313	.133	-.038	-.054	-.028	.234	-.113	.298	-.061	.051	-.024	.237	.242
Easy movement	.313	1.000	.124	.119	.016	.230	.000	-.143	.153	-.249	-.080	-.036	.326	.175
Presence of nature	.133	.124	1.000	.140	-.003	.212	-.290	-.088	.231	-.060	.270	.167	-.006	-.120
Lack of boundaries	-.038	.119	.140	1.000	.218	-.063	-.127	.397	-.012	.117	.090	.047	.172	.117
Segregated traffic	-.054	.016	-.003	.218	1.000	-.065	.000	.124	-.098	.040	.022	-.081	.033	-.159
Color	-.028	.230	.212	-.063	-.065	1.000	-.040	-.224	.025	-.073	.020	-.104	.225	-.063
Emotional	.234	.000	-.290	-.127	.000	-.040	1.000	-.182	-.042	-.017	-.146	-.174	.289	.235
Diversity	-.113	-.143	-.088	.397	.124	-.224	-.182	1.000	.089	-.036	.171	-.095	.046	.258
Natural lighting	.298	.153	.231	-.012	-.098	.025	-.042	.089	1.000	-.209	-.201	-.111	.184	.058
Silence	-.061	-.249	-.060	.117	.040	-.073	-.017	-.036	-.209	1.000	.063	.208	-.225	.061
Fresh air	.051	-.080	.270	.090	.022	.020	-.146	.171	-.201	.063	1.000	.025	-.221	.129
Urban furniture	-.024	-.036	.167	.047	-.081	-.104	-.174	-.095	-.111	.208	.025	1.000	-.151	-.179
Spaciousness	.237	.326	-.006	.172	.033	.225	.289	.046	.184	-.225	-.221	-.151	1.000	.016
Auto-control	.242	.175	-.120	.117	-.159	-.063	.235	.258	.058	.061	.129	-.179	.016	1.000

In line with previous research findings (Earthman, 2004; Heschong Mahone Group, 2003, Wurtman, 1975), regression analysis reveals that 'natural lighting' is a significant variable that affect students learning experiences. Earthman (2004) and Heschong Group (2003) argue that natural lighting offers the most positive effects since it produces biological effects on the body. Quotations presented in Table 5.20 support this positive change on students' body, feelings, concentration etc.

Table 5.20 Sample quotations for 'natural lighting'

'natural lighting'
"I prefer reading or studying under natural day light rather than man-made lighting." (Female, Sociology)
"The white light in amphitheatres becomes disturbing after a while." (Male, Prep. School)
Source: Personal Research

On the other hand, different from other research, this study also shows that 'ability for easy movement' is another significant variable which influence learning on campus open spaces. As the quotations presented in Table 5.21 reveals what make students prefer open spaces is the ability of easy movement. Students state that they are not able to move freely in indoor learning environments since there are limiting elements like desks, tables or other elements preventing the easy movement. Moreover, students able to behave more freely in campus open spaces, since there is not a controlling body which disciplines them to behave in a certain way. Students are able to do any activity like group studying, chatting, consulting each other; either from a position of sitting in a circle to laying e towards a sloppy facade which facilitates to read something.

Table 5.21 Sample quotations for 'ability for easy movement'

'ability for easy movement'
"We are not limited with desks or tables just like in indoor spaces, we can move easily." (Female, History)
"Open spaces offers more wider spaces rather than indoor spaces, therefore different groups of people can make different activities at the same time." (Male, Civil Engineering)
Source: Personal Research

Thirdly, different from previous open space researches, this study also shows that 'social diversity' is also a significant variable which plays a role on learning on campus open spaces. As the quotations presented in Table 5.22 reveals, social diversity offers an interaction of more diverse people and therefore more diverse knowledge, culture and personal savings. Therefore students mentioned 'social diversity' as a triggering factor that increase sharing knowledge and making various activities which enhance learning experiences on campus open spaces.

Table 5.22 Sample quotations for 'social diversity'

'social diversity'
"We can meet with our friend from different departments." (Female, Philosophy)
"Open spaces are appropriate for making different facilities like sitting, studying, resting, lying etc." (Male, Prep. School)
Source: Personal Research

5.2.2 Relationship between learning and pre-defined perceived attributes of campus open space

This section explores the relationship between learning and pre-defined attributes based on the findings of multiple regression analyses.

As presented in the first part of this chapter, literature review revealed that there are both spatial and non-spatial attributes that have influence on students' learning experiences. Both the reviews of literature on indoor and outdoor spaces generated twelve attributes which are called; (1) layout, (2) flexibility, (3) comfort, (4) safety, (5) color, (6) spaciousness, (7) accessibility, (8) interaction, (9) collaboration, (10) socializing, (11) multi-functionality and (12) sense of belonging to campus.

The main aim of this multiple regression analysis is to find the relationship between learning and the pre-defined attributes of learning which are found out from literature review.

First, the multiple regression analyses which revealed how much pre-defined perceived attributes explain the learning experience of students on campus open space show two significant variables. These include 'layout' and 'comfort' The variable of 'layout' made the most contribution to explaining the variance in learning. This is followed by 'comfort'.

Table 5.23 shows the model of learning (*Adjusted* $R^2 = 0.554$, $F = 8.95$, $p < 0.01$). In the model, two of the twelve attributes made significant contribution to explaining the remaining variance in learning. These attributes include 'layout' and 'comfort' (p's < 0.01). When considered all, they explained almost 60 percent of variance in learning. The 'layout' made the most contribution to explaining the variance in learning by 50 percent (See Section C.1 in Appendix C for more results of this analysis).

Table 5.23 Results of Regression Analysis of Learning for Indoor & Outdoor Attributes for the overall sample

VARIABLES	R^2	R^2change	b	t	p
Layout	.501	.501	4.427	3.778	.000
Comfort	.569	.068	.738	8.628	.000
(constant)			-.590	-2.992	.004

Standard Error = .85
Adjusted R^2= .554
df1=1; df2=57
For model: F = 8.952, p < .01

These results also show consistencies with the results of the exploratory research of this study. The content analyses of participants' descriptions on the physical attributes enhancing learning complement these findings by providing clues about the specific layout components. These include 'the ability for easy movement', 'the lack of rigid physical boundaries', and 'spaciousness'. Moreover, the content analyses may imply that comfort can be derived by various emotional dimensions including 'relaxation', 'pleasantness' and 'wellbeing'.

Then, I analyzed the multicollinearity between variables. Table 5.24 shows low to substantial correlation between the three variables of the model (r's < 0.58). This shows that multicollinearity does not constitute significant problem in this model.

Table 5.24 Pearson Correlation for Learning on Campus Open Space

	DV	IV1	IV2	IV3	IV4	IV5	IV6	IV7	IV8	IV9	IV10	IV11	IV12
Learning	1.000	.708	-.082	.075	-.055	.013	.272	-.087	.205	.234	.075	.276	.029
Layout	.708	1.000	.037	.437	.000	.053	.466	-.078	.206	.303	.121	.248	.130
Flexibility	-.082	.037	1.000	.214	.191	-.201	.106	.120	.114	.299	-.008	.217	-.008
Comfort	.075	.437	.214	1.000	.152	.094	.373	.140	.375	.382	.494	.096	.105
Safety	-.055	.000	.191	.152	1.000	-.224	.032	.148	.302	.206	.075	-.131	.172
Color	.013	.053	-.201	.094	-.224	1.000	.161	.123	.156	-.035	.270	-.083	.231
Size	.272	.466	.106	.373	.032	.161	1.000	.273	.078	.102	.163	.089	.464
Accessibility	-.087	-.078	.120	.140	.148	.123	.273	1.000	.164	-.042	.367	-.050	.410
Interaction	.205	.206	.114	.375	.302	.156	.078	.164	1.000	.580	.645	.092	.151
Collaboration	.234	.303	.299	.382	.206	-.035	.102	-.042	.580	1.000	.409	.244	.022
Socialization	.075	.121	-.008	.494	.075	.270	.163	.367	.645	.409	1.000	.146	.243
Multi-functionality	.276	.248	.217	.096	-.131	-.083	.089	-.050	.092	.244	.146	1.000	.000
Sense of Campus	.029	.130	-.008	.105	.172	.231	.464	.410	.151	.022	.243	.000	1.000

Considering the high number of variables in the model and the exploratory nature of this study, I conducted separate multiple regression analyses, one composed of variables derived from the indoor learning literature, the other composed of variables derived from the outdoor learning literature. When conducted with the outdoor variables, the analysis also revealed 'multi-functionality' as a significant variable that explain the variance in learning (*Adjusted R^2 =0.060, F=4.78, p<0.05*). (See Appendix C)

Content analysis results that explain the learning experience also support this finding. Students described their learning experience with respect to divergent activities such as studying, interacting, socializing, and observing. Quotations presented in Table 5.25 reveals that campus open spaces offer students to do diverse activities.

Table 5.25 Sample quotations for 'multi-functionality'

'multi-functionality'
"Open spaces are appropriate for making different facilities like sitting, studying, resting, lying etc." (Male, Prep. School)
"We are free to do whatever we want; eating, drinking, singing, chatting. Nobody interfere us". (Female, Biology)
Source: Personal Research

On the other hand, all these quotations supports Acker and Miller's (2005) argue on 'public space' which is; *"public-space" comprises observing others, asking for clarification during the act of doing, group discussion and debate"*.

5.2.3. Relationship between learning and expected attributes of campus open space

This section explores the relationship between learning and expected attributes based on the findings of multiple regression analyses. As presented in the first part of this chapter, by answering the open-ended questions in the questionnaire, respondents defined expected perceived attributes that affects learning on open campus spaces. Respondents generated perceived attributes which are called; (1) comfortable and flexible furniture, (2) shadowing, (3) night lighting, (4) natural elements, (5) silence, (6) segregation from traffic, (7) basic daily requirements and (8) others.

The main aim of first multiple regression analysis is to find the relationship between learning and the perceived attributes of learning which are generated by respondents.

The multiple regression analysis revealed 'lighting' as the significant variable despite its small contribution. Table 3.1. shows the model of learning (*Adjusted R^2 =0.086, $F=6.55$, $p<0.01$*). When considered all variables, 'lighting' explained 10 percent of variance in learning (See Section C.6 in Appendix C for more results of this analysis).

This reconfirms the significance of lighting in outdoor learning environments. The analysis also shows that multicollinearity between variables does not constitute significant problem in this model (r's < 0.39) (See Table 5.27) (See …Appendix …for more results of this analysis).

Table 5.26 Results of Regression Analysis of Learning for Indoor & Outdoor Attributes for the overall sample

VARIABLES	R^2	R^2change	b	t	p
Lighting	.102	.102	-.440	-2.560	.000
(constant)				22.134	.013

Standard Error = 1.19
Adjusted R^2= .086
df1=1; df2=58
For model: F = 6.554, p < .01

Table 5.27 Pearson Correlation for Learning on Campus Open Space

	DV	IV1	IV2	IV3	IV4	IV6	IV7	IV8
Learning	1.000	-.020	-.319	.118	.155	.073	.119	.095
IV1	-.020	1.000	.074	.273	-.057	-.134	.388	.312
IV2	-.319	.074	1.000	-.072	-.154	-.045	.029	-.387
IV3	.118	.273	-.072	1.000	.022	.029	.095	.041
IV4	.155	-.057	-.154	.022	1.000	-.069	.135	-.096
IV6	.073	-.134	-.045	.029	-.069	1.000	.059	-.127
IV7	.119	.388	.029	.095	.135	.059	1.000	.247
IV8	.095	.312	-.387	.041	-.096	-.127	.247	1.000

5.3 Reflection of Research Findings on Sample Areas

This section presents the site analyses for each sample area with respect to the results of content analysis and the regression analysis. Visual presentations also contain clues from direct observation and self experience in each sample space. Figure 5.1 presents the general legend for all visual presentations.

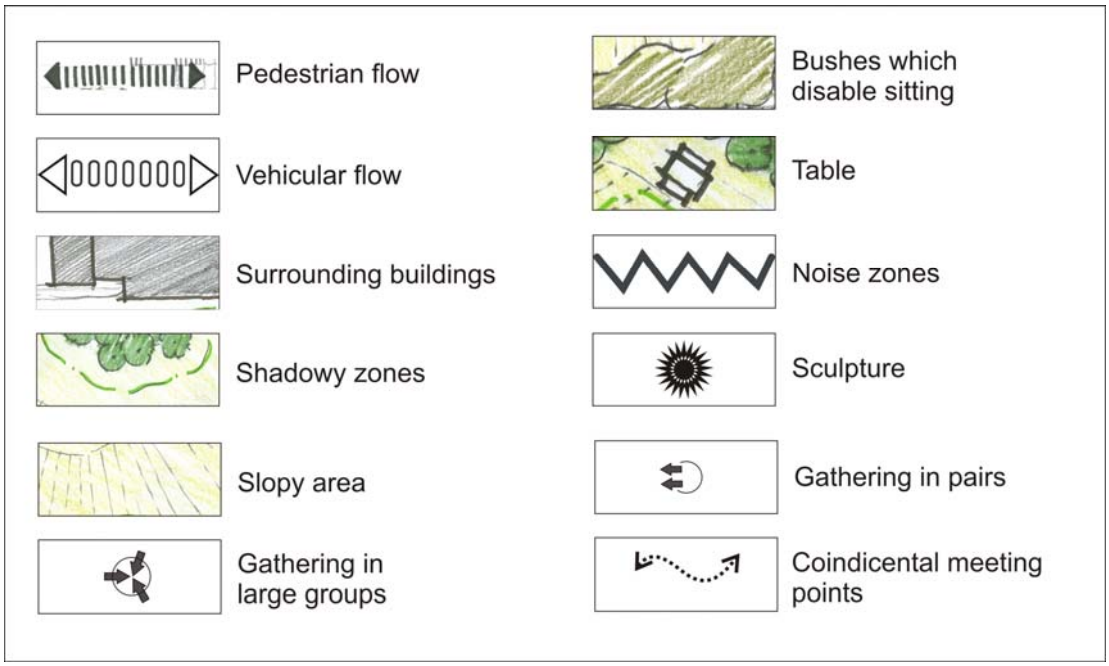

Figure 5.1 Ggeneral legend for visual presentations

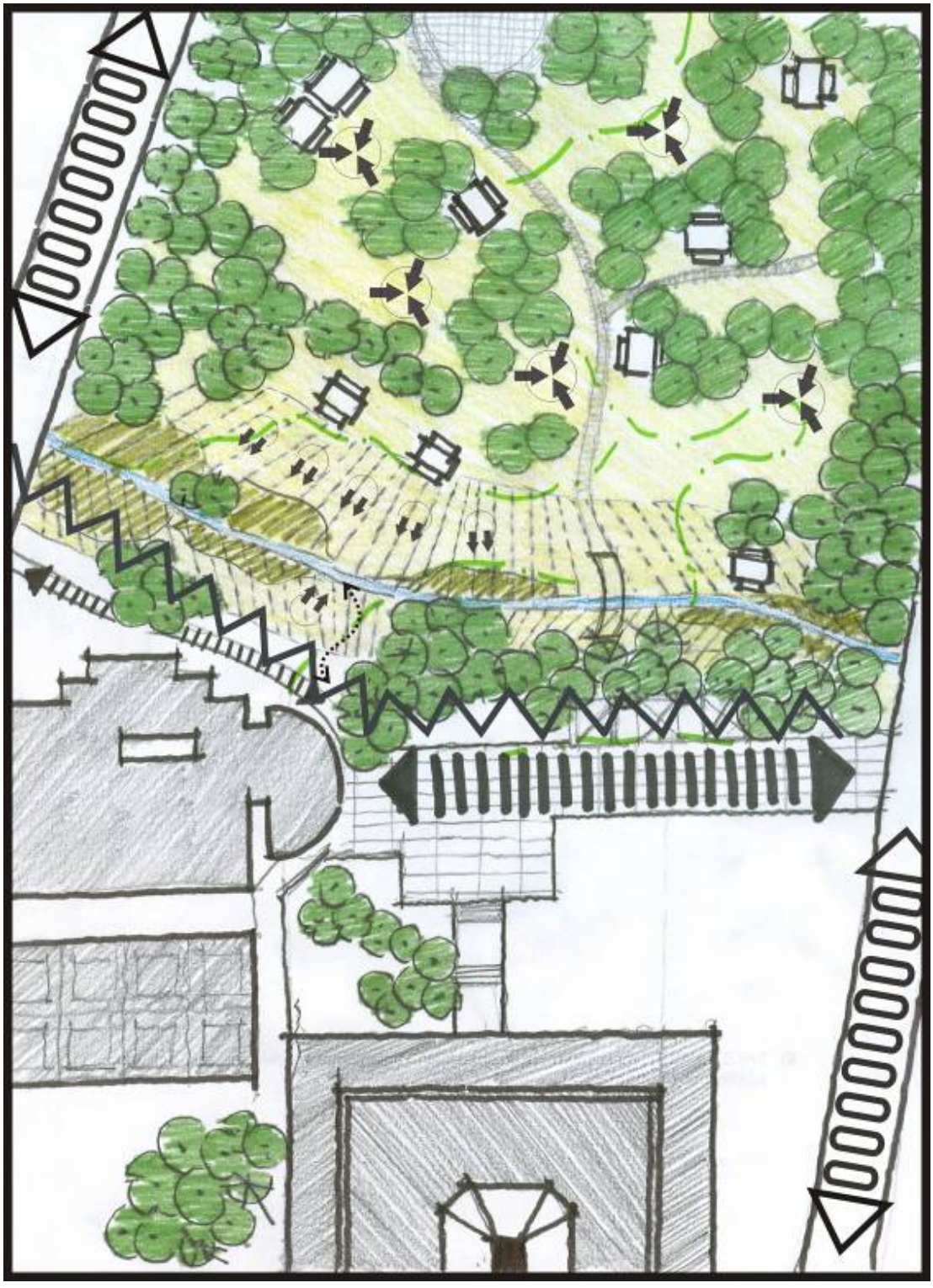

Figure 5.2 Site analysis of first sample area: Campus Heart

As it is seen from the Figure 5.2, a large part of the first sample area is covered by shade trees. I observed that students usually prefer shady areas in order to meet in groups. At the same time, the sitting elements on the site mainly located in these shadowy parts. These urban furniture provide students more comfortable environment to sit, eat, study or do many other activities. However, during the interviews students' indicate that they prefer more flexible and comfortable urban furniture. All these observations correspond with the result of regression analysis which indicate that the 'layout' and 'comfort' as the most contributory variables to explaining the variance in learning.

On the other hand, I observed that students usually prefer to sit in pairs in sloppy part of the area. Because the sloppy part does not convenient for sitting in groups in a circle. Some students also indicate that sloppy part is more appropriate for reading something by lying. These observations also correspond with the results of regression analysis of learning which founds 'ability for easy movement' as one of the constant variable that influence learning on campus open space. Students' indications during the interviews and their behaviors in the open space emphasize the essential of easy movement opportunity.

Lastly, the silence level in the areas decreases when getting closer to the commercial buildings. Therefore, students especially who are studying either individually or in groups prefer to sit in the parts more far way from these buildings.

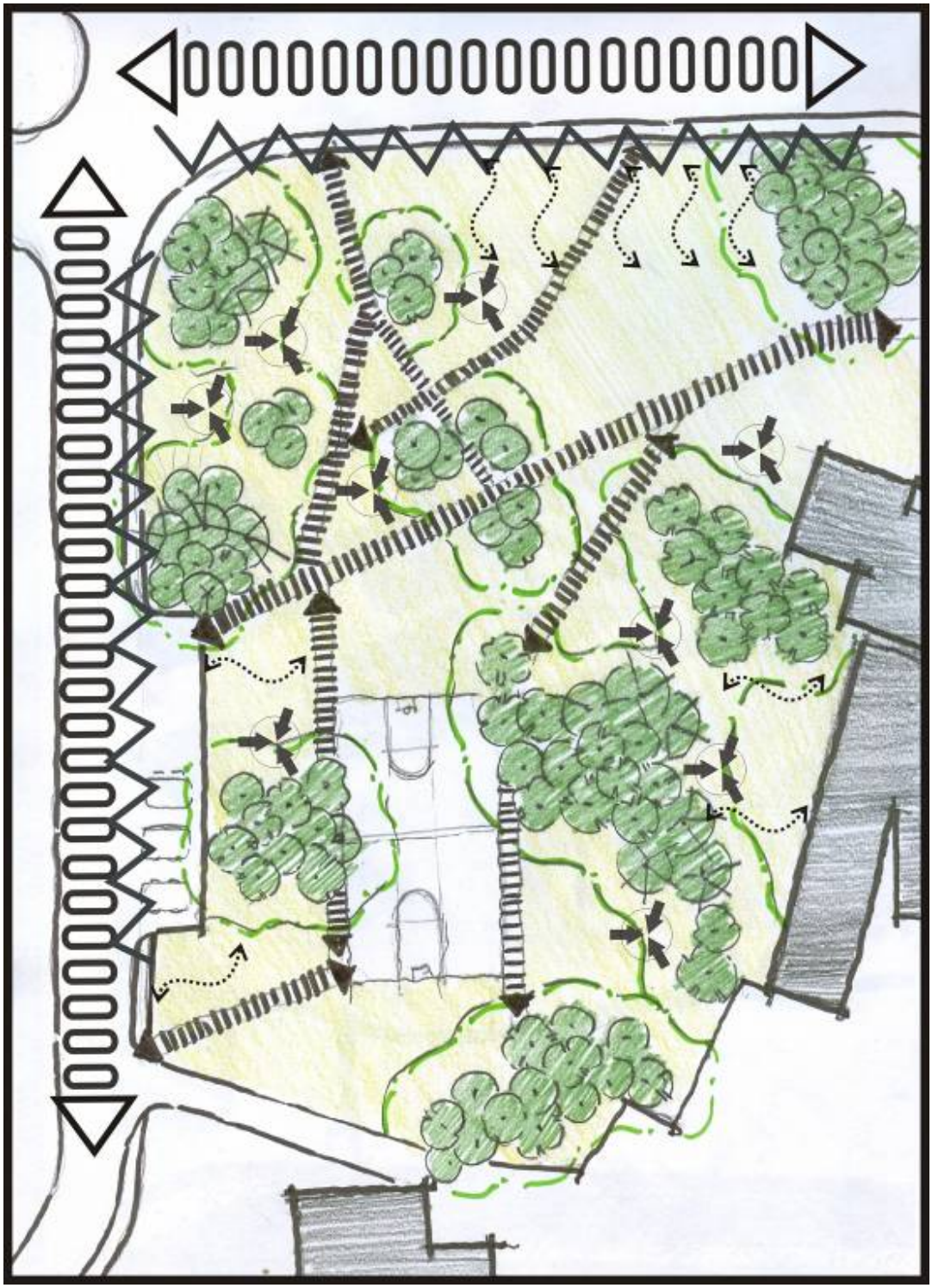

Figure 5.3 Site analysis of second sample area: Dormitory Zone 1

As Figure 5.3 presents, there are many pedestrian routes crossing through the area. Therefore, most of the students stated that it is difficult to concentrate and focus on a specific task due to the disturbance of people passing through the area. Moreover, there is a small basketball court almost in the middle of the area. On the other hand, the boundary of the area is defined by two roads that are connecting different public spaces. Therefore, it becomes difficult to keep silence in that area. However, results of content analysis present that 'silence' is one the significant variable that affects students learning experiences in campus open spaces.

I observed that, most of the students use that area mainly for resting and relaxing rather than studying or other educational factors. Area becomes more crowded especially after 5pm. Because when the academic courses finish, groups of students move to the dormitory zone. From an angle this crowd refers to the 'social diversity'. Different students from different departments find the chance of gathering in same space and share particular values. 'Social diversity' is also one of the variables that present significance in regression analysis.

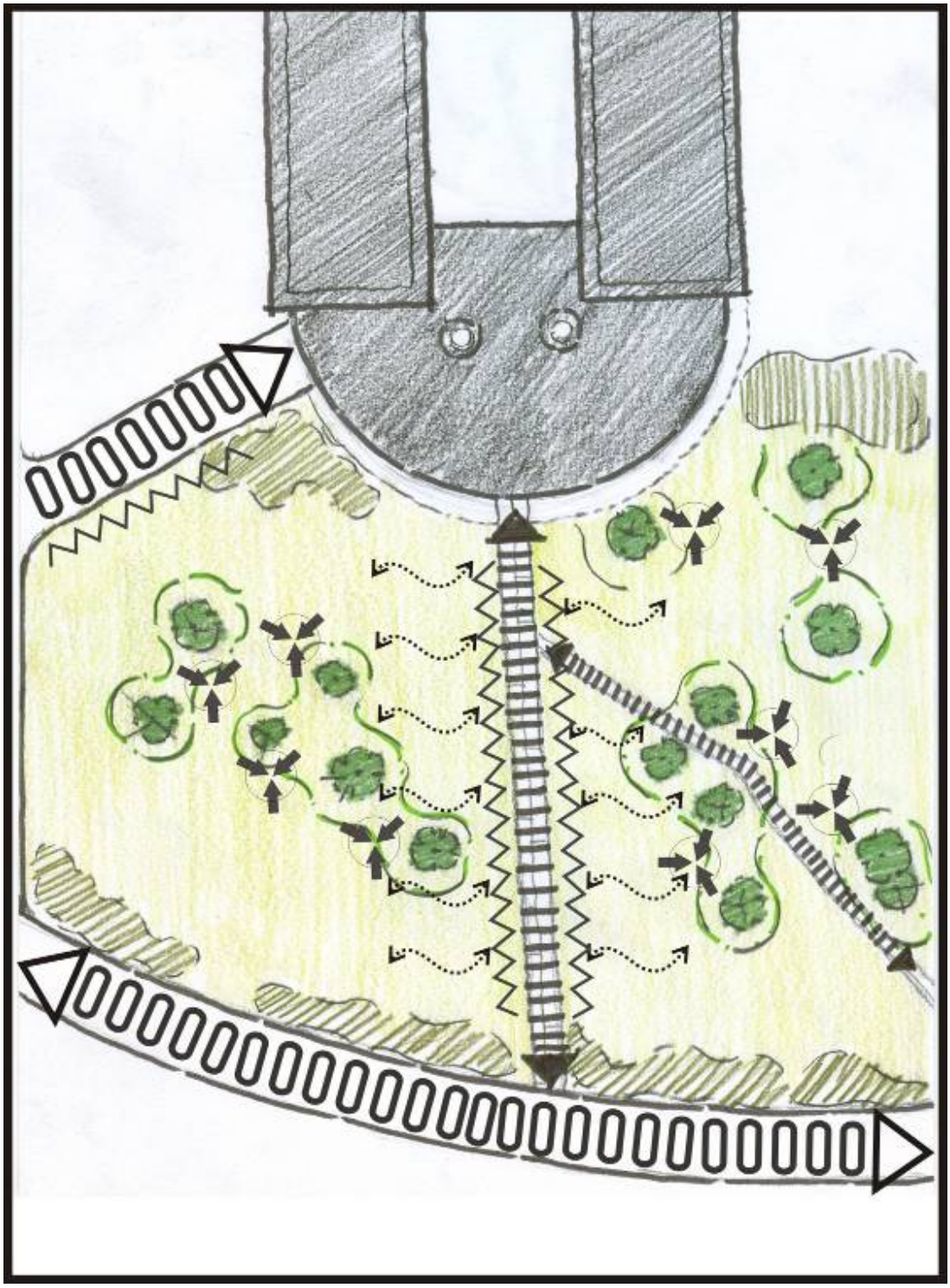

Figure 5.4 Site analysis of third sample area: Dormitory Zone 2

As it is seen in Figure 5.4, the area is not so rich in terms of landscape elements. Therefore, there is lack of shadowy zones in the area. There are some single trees that provide shadow for individual uses; i.e. reading, resting, relaxing etc. I observed that the boundary of the area is not well defined. Add on that, students state that the area does not give the feeling of safe. Especially, during the evenings, since there is not enough lighting it becomes almost impossible to use that open are or any purposes. However, the analysis result show that both 'shadowing' and 'lighting' are constant variables that define students expectations in terms of learning in campus open spaces.

On the other hand, many students complain about the lack of urban furniture. They indicate that urban furniture would create more convenient environment for learning activities like group working, discussion and collaborative works.

Different than the sample area from other dormitory zone 1, third sample area is very silent. Since the dormitories are located far from the academic zone and the central core of the campus, there is not noise of traffic or crowd of people.

One of the other issues that creates problem for students is the accessibility of the area. This area is only used by the students who accommodate in the dormitories close to the site. Since the dormitory zone is not easily accessible, it is almost impossible to see students coming from other parts of the campus to that area just for a specific task done in open space.

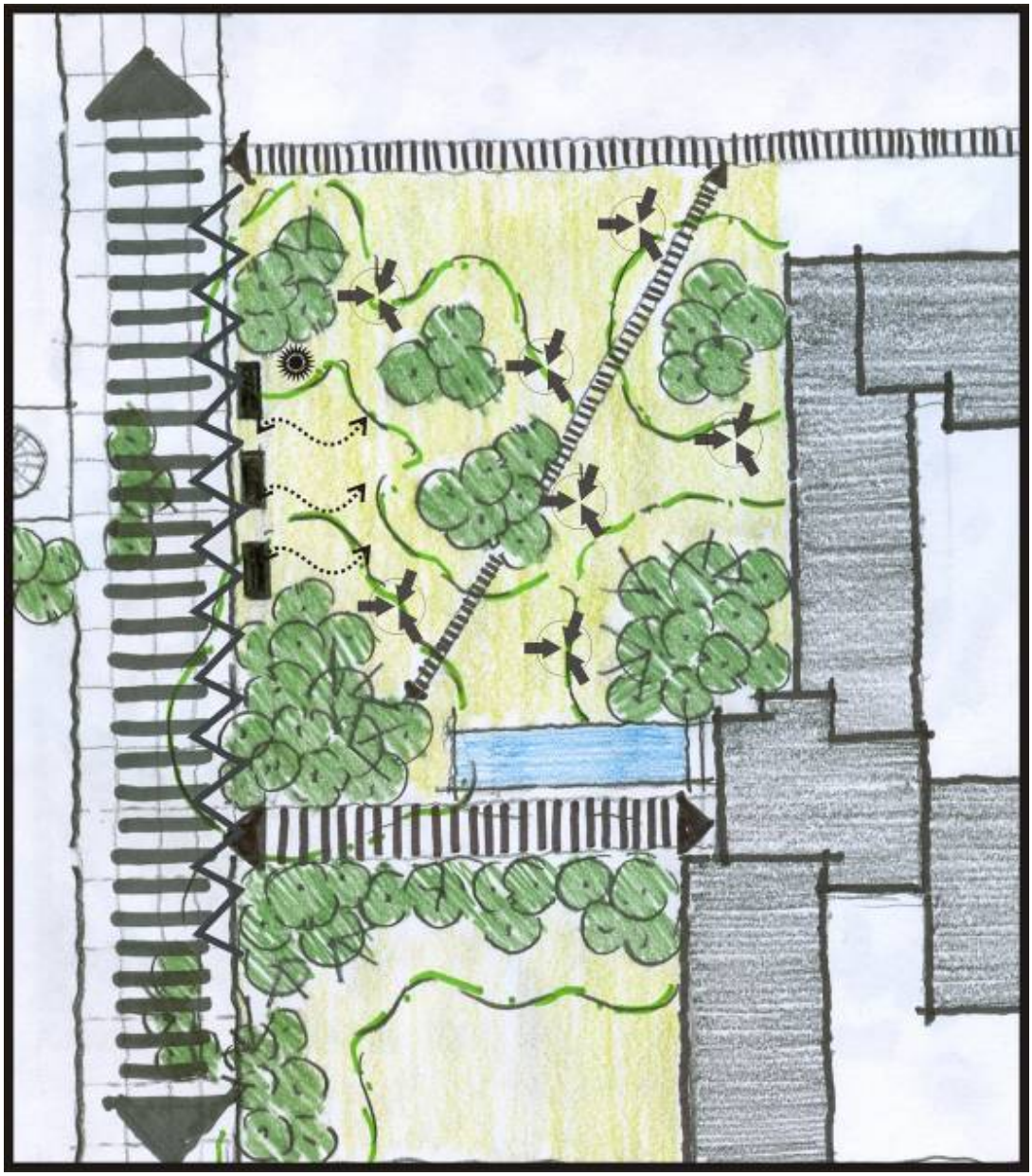

Figure 5.5 Site analysis of fourth sample area: Open Study Area 1

As it is seen in the Figure 5.6, the last sample area is also located on the main pedestrian alley. But with the fixed urban elements around the site, area is separated from the main movement on the alley.

There are groups of trees which provide shadowy zones for students to sit in groups. I observed that students were studying in groups while they are waiting for their classes. I also observed that students were using that open area for resting and relaxing in the break time or after classes finished.

Interview results presents that the grassy cover of the ground provide really comfortable environment for students to sit or lie down. Students also indicated that the water element in the area, the beauty of trees and flowers creates a refreshing ambiance. These indications corresponds with the result of content analysis which revealed that ‘emotional appraisals’ and ‘presence of nature’ are two of most frequently mentioned attributes that enhance learning in campus open spaces.

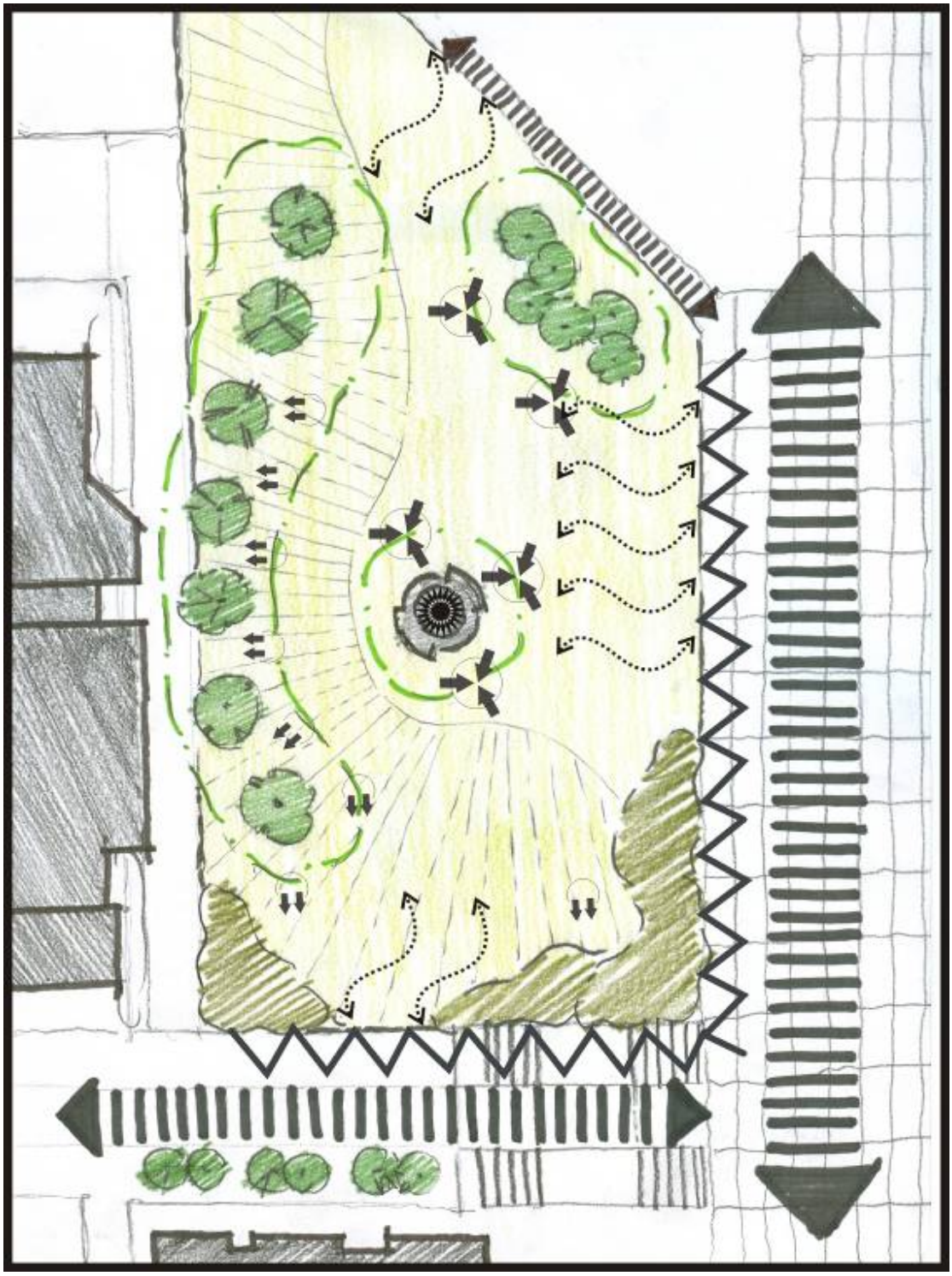

Figure 5.6 Site analysis of fifth sample area: Open Study Area 2

Fourth sample area is located on a very much used part of the main pedestrian alley of the campus. As it is seen in the Figure 5.5, one side of the area is attached to the main pedestrian alley. Therefore this part of the area creates opportunity of coincidental learning between students. On the other hand, since main pedestrian alley accommodates many students from different departments, it is always crowded and noisy. I observed that students sitting and chatting in groups usually prefer the closer parts to main pedestrian alley. Besides, students studying or doing other educational activities in pairs prefer the sloppy site which is quite more silent.

Like in many other sample areas, students complain about the lack of urban furniture. Many students stated that although they would like to study in open air, they do not find comfortable to study on the ground. However, there are many students who stated that being touched to the soil take their negative energy.

Different than other sample areas, there is a sculpture in the middle of the area. That sculpture gives a special character for that zone. It is seen that students usually gather around that sculpture mainly because of its shadow and the visual beauty.

CHAPTER 6

CONCLUSION

This research was mainly an exploratory study, which examined the influence of spatial design attributes on learning on campus open spaces; yet, which also tested the validity of previously defined attributes. The research posed three questions: 1) how learning is experienced in campus open space, 2) what are the spatial design indicators of learning in public spaces on campus open spaces and 3) do the spatial design indicators of formal academic spaces (indoor spaces) affect learning in campus open spaces.

The study gathered the answers of these questions through in-depth interviews supported by a questionnaire. 60 students from various departments answered the questions with regard to the sample areas that are previously determined. These sample areas were representing the 1) campus heart, 2) dormitory zones and 3) outdoor study areas between faculties.

This study pursued both on exploratory and quasi-experimental research approaches. The exploratory part of the study revealed the learning activities which are experienced on campus open spaces, and the perceived attributes that have influence on students' learning experiences on these spaces. In exploratory part, content analysis derived the meaningful categories of students perceptions on learning on campus open spaces. On the other hand, the quasi-experimental part of the study tested the validity of predefined learning attributes both from the literature of indoor and outdoor

learning spaces. In quasi-experimental part, multiple regression analysis identified the significant attributes which effects learning on campus open spaces.

The result showed that the spatial design of campus open spaces have influence on students' outdoor learning experiences.

The first minor research question of thesis was related to the learning activities that are experienced on campus open spaces. Findings of the content analysis showed that the most frequently mentioned learning experience on campus open spaces are in order of; (1) group discussion, (2) individual studying, (3) tutoring/consulting each other, (4) relaxing, (5) coincidental meetings, (6) chatting, (7) sharing current daily issues, (8) observing surrounding areas and (9) others. The regression analysis also revealed that 'group discussion' made significant contribution to students' learning experiences on campus open spaces.

The second minor research question of the thesis was aiming to find out design indicators that affect students' learning experiences on campus open spaces. The content analysis revealed both attributes previously defined in the literature and the new ones: (1) presence of nature, (2) fresh air, (3) ability for easy movement, (4) silence, (5) natural color, (6) lack of rigid physical boundaries, (7) auto-control, (8) natural lighting, (9) spaciousness, (10) social diversity, (11) urban furniture and (12) segregation from traffic. The result of regression analysis also showed that 'ability for easy movement', 'social diversity' and 'natural lighting' are three attributes that made significant contribution to explaining the remaining variance in learning.

On the other hand, the content analysis show that the most frequently mentioned expected attributes of learning on campus open spaces are in order of; (1) comfortable and flexible furniture, (2) shadowing and lighting, (3) natural elements, (4) other factors, (5) basic daily requirements, (6) segregation from traffic, and (7) silence. The regression analysis results present that 'lighting' is the most significant variable that influence learning on campus open spaces.

The third minor research question of the thesis was aiming to test whether the spatial design indicators of indoor learning environments are effective also on the learning experienced on campus open spaces. Regression analysis results revealed that two of the twelve attributes made significant contribution to explaining the remaining variance in learning. 'Layout' and 'comfort' are two significant design attributes that are both influential on indoor and outdoor learning spaces.

6.1 Campus as an Integrated Learning Environment

Although, formal learning places are defined in the literature as the major places where learning occurs, Savin-Baden (2006) states that students spend only fifteen hours per week in class. The rest of students' learning time is spent in the various spaces of campus. Students' experiences beyond the classroom are as critical to their learning and success as the work done in formal learning spaces. (Kramer et al., 2007) This means that learning occurs anywhere in the campus. Therefore, the campus itself can be esteemed as a learning place for students.

For instance, as an urban design student, I can certainly say that my university campus as a whole was a learning laboratory during my study. Faculty of architecture is a magnificent place that is designed absolute for design education at METU. It is one of the best building that a student can get design education both in theoretical and practical terms. During the undergraduate or graduate studies, although students are encouraged to learn by doing 3D models to analyze and feel the topography and other environmental elements, it is totally not enough for understanding and sensing the real environment.

The real learning environment for an urban design student is the outdoor environment where he can observe the way of people move, the way of traffic flows and the way of life goes on. He can put himself in a position that he can feel that he is a piece of the campus. So that he can feel the living environment and do his analysis in a better way, more sensitive to actual life. Depending on my academic learning process, I can claim

that not only the formal learning spaces but also the informal learning spaces where I found the opportunity to see what I learned as theoretical knowledge, have certain impact on learning by experience.

This study revealed that campus open spaces have immense effect on students' emotional state. Therefore, students behaviors and attitudes change according to their emotional conditions. Students feel more supported and motivated to learn something new, especially when they feel themselves free, comfortable and secure. At this point, this research validated that learning is experienced not only in formal learning spaces but also in informal open spaces where students are able to move easily and freely. When examined in terms of design, this study contributed to the literature that the environments where students able to move easily, accommodate diverse student profiles and sustain natural lighting enhance students' learning experiences.

All these design principles are fundamental basis for production of well-designed open space on a campus. Considering that students need to interact and communicate, by, it is essential to take in to account the results of the thesis. What students mentioned during interviews; i.e. their perceptions and expectation in terms of spatial design constitute primary inputs for a campus design process.

6.2 Campus Open Space Design Principles

This section presents the campus open space design principles. The principles include both the literature review, my acquisitions during the professional experience on the campus design field and mainly the way-out findings of my research study. The design checklist is organized in two parts as; macro-scale and micro-scale design principles.

6.2.1 Macro-Scale Design Principles

- Provide the balance between solid and voids in the campus master plan.
- Define and interconnect the campus with a harmony of open spaces and through a pedestrian pathway system.
- Create a variety of open spaces in size, scale, and functions that serve different aspects of campus life including courtyards, back or front gardens, public plazas etc.
- Create a clear link between buildings and open space by locating building entries, facing quads, courtyards, and plaza (Marcus and Francis, 1998).
- Design indoor study areas coordinated with outdoor landscaping to provide visually pleasing connections (Marcus and Francis, 1998).
- Reinforce the quality of campus open spaces by the strong orientation of building fronts and public entrances to open spaces and visual axes.
- Respect visual and circulation corridors that link the campus to its surrounding context in building massing. Where appropriate, use building massing to create enhanced entry to campus, to courtyards, and to open spaces (Marcus and Francis, 1998).
- Make open spaces significant features of the campus by relating them to one another and to buildings as complementary elements.
- Provide a hierarchy of open spaces from primary quadrangles to entry courts and verandas that give individual personality to the various places on campus (Marcus and Francis, 1998).
- Use public art to enhance campus open space and to reinforce direction finding.

6.2.2 Micro-Scale Design Principles

The research has revealed that there are some basic design principles which enhance the learning in open campus spaces. The following principles are derived from student's responses to interview questions and my observations on students' practices.

- Clearly define and articulate open space by the buildings surrounding them.

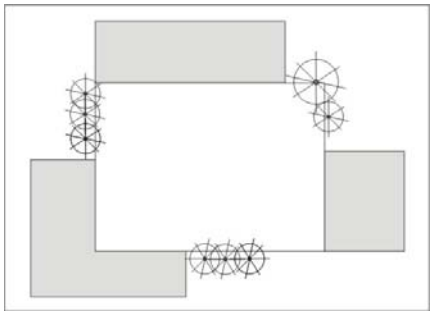

Figure 6.1 Definition of boundaries, Source: Personal Rendering

- Separate some outdoor study areas from the main pedestrian alley by means of distance, planting, level changes, so that people passing by are not too distracting (Marcus and Francis, 1998).

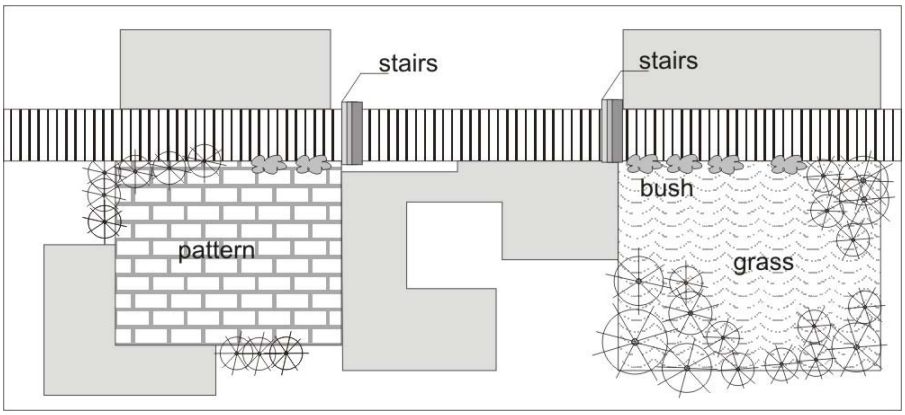

Figure 6.2 Separation of areas, Source: Personal Rendering

- Provide sub-spaces rather single large spaces; this will prevent distraction between separated groups of discussion.

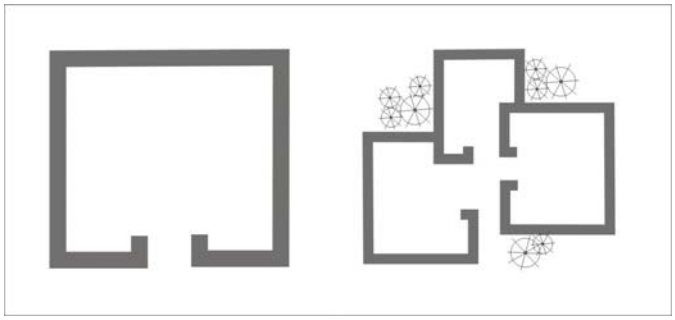

Figure 6.3 Single Space vs. Sub-spaces, Source: Personal Rendering

- Provide good grassy areas pleasant to sit on (Marcus and Francis, 1998).
- Provide comfortable seating, picnic tables or small one-to-one person tables for eating or studying (Marcus and Francis, 1998).
- Provide flexible urban furniture which offers students to move or shape furniture according to their requirements in terms of the activity done on campus open spaces.
- Provide sufficient lighting for reading and studying activities during the evenings.
- Provide silence with the help of landscaping elements.
- Keep the traffic flow segregated from public open spaces.
- Provide sufficient shadowing elements in order to prevent disturbing affects of sun. This can either be provided by using natural elements like shady vegetations, sloppy surfaces or man-made elements like bower, awnings.

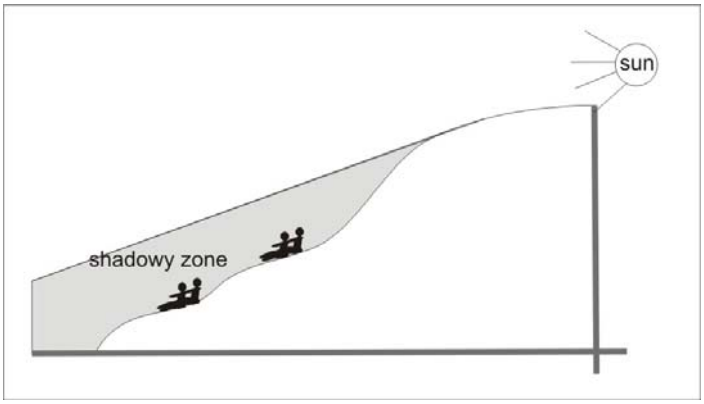

Figure 6.4 Slope as a shadowing element, Source: Personal Rendering

- Reduce the fear of vulnerability to crime especially for the places where criminals might hide (Marcus and Francis, 1998).

6.3 Future Research

This thesis represented a scientific way of approaching to the design of campus open spaces. Consequently, thesis presented the significant design indicators that affect students' learning experiences on campus open spaces. The findings of this thesis are derived from literature review and a scientific research; hence the findings of this thesis are scientifically reliable. However, so as to broaden the understand the effects of open space design on learning and reach more concrete and detailed results; further scientific study with the participation of larger respondent groups and various open space sample areas should be carried out. Furthermore, this thesis handled the research question just for the public open spaces, but there are also semi-public spaces like entrances of faculty buildings and private open spaces like courtyards in single faculties where students learn something. Moreover, further case studies can be conducted for different sample universities according to their typologies.

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APPENDIX A

- **Bu anket, kampüs içerisindeki "açık alanların" tasarımlarının öğrenme deneyimleri üzerindeki etkilerini araştırmak üzere hazırlanmıştır.**
- **Anket iki bölümden oluşmaktadır ve cevaplandırmanız yaklaşık 15 dakikanızı alacaktır.**
- **Anketten elde edilen veriler Şehir ve Bölge Planlama bölümü Araştırma Görevlisi Ender Peker tarafından yüksek lisans tezinde değerlendirilecektir.**

Katılımcının	
Cinsiyeti:	
Bölümü:	

1.BÖLÜM

1) Bu mekanı kullanarak nasıl bir öğrenme deneyimi yaşıyorsunuz?

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2) Bunun için neler yapıyorsunuz?

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3) Bu alan sizin daha fazla öğrenmenize imkan veren ne gibi mekansal özelliklere sahip?

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3.1) Başka aklınıza gelen özellikler ya da nedenler var mı? (Mekansal olmayan özellikler de olabilir)

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4) Siz bu alanı tasarlasaydınız, öğrenmeyi tetikleyecek ne gibi özellikler olmasınız istetirdiniz?

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2.BÖLÜM

4-16 numaralı soruları öğrenme deneyimlerinizi etkileme düzeyine göre yanıtlayınız.

1. Hiç
2. Az
3. Kısmen Az
4. Çekimser
5. Kısmen Çok
6. Çok
7. Kesinlikle Çok

4) Bu alan akademik öğrenmenizi ne kadar etkiliyor?

1 2 3 4 5 6 7

5) Alanın mekansal düzeninin öğrenme deneyimlerimi üzerinde etkisi var mı?

1 2 3 4 5 6 7

6) Bu mekandaki objelerin yerini istediğiniz gibi değiştirebiliyor musunuz? (Banklar, oturma elemanları vb.)

1 2 3 4 5 6 7

7) Bu alan sizi rahat hissettirecek konfora sahip mi?

1 2 3 4 5 6 7

8) Bu alanda kendinizi güvende hissediyor musunuz? (Trafik vb.)

1 2 3 4 5 6 7

9) Bu alanı oluşturan öğelerin renkleri (binalar, objeler vb.) ruh halinizi etkiliyor mu?

1 2 3 4 5 6 7

10) Alanın büyüklüğü öğrenmenizi ne kadar etkiliyor?

1 2 3 4 5 6 7

11) Bu alana kolay ulaşabiliyor musunuz?

1 2 3 4 5 6 7

12) Bu alan, arkadaşlarınızla etkileşim içinde olmanıza olanak sağlıyor mu?

1 2 3 4 5 6 7

13) Bu alan, arkadaşlarınızla birlikte çalışmanıza olanak sağlıyor mu?

1 2 3 4 5 6 7

14) Bu alan, sosyalleşmenize olanak sağlıyor mu?

1 2 3 4 5 6 7

15) Bu alan, çoklu deneyimlere elverişli mi? (yemek, dinlenmek, çalışmak vb.)

1 2 3 4 5 6 7

16) Bu alan, size kampusun bir parçası üzerinde olduğunuzu hissettiriyor mu?

1 2 3 4 5 6 7

APPENDIX B

Table B.1 List of Respondents

No of Respondent	Gender	Academic Background
1	F	Prep. School
2	F	Prep. School
3	F	Prep. School
4	F	Civil Engineering
5	M	Mechanical Engineering
6	F	History
7	F	Sociology
8	M	Prep. School
9	F	Prep. School
10	M	Mining Engineering
11	M	Computer Engineering
12	F	Architecture
13	M	Mining Engineering
14	M	Mining Engineering
15	F	Mathematics
16	M	Prep. School
17	M	Petroleum and Natural Gas Engineering
18	M	Petroleum and Natural Gas Engineering
19	F	Biology
20	M	Prep. School
21	F	Business Administration
22	M	Biology
23	F	Physics
24	F	Biology
25	F	Biology
26	F	Sociology
27	F	Political Science and Public Administration
28	F	Political Science and Public Administration
29	M	Physics
30	M	Physics
31	M	Physics
32	F	Environmental Engineering

Table B.1 List of Respondents

33	F	Environmental Engineering
34	F	City and Regional Planning
35	M	Mathematics
36	M	Psychology
37	M	Industrial Engineering
38	M	Sociology
39	M	Sociology
40	M	Physics
41	F	Business Administration
42	M	Business Administration
43	F	Elementary Education
44	F	Elementary Education
45	F	Mathematics
46	F	Biology
47	F	International Relations
48	F	Mathematics
49	F	Mathematics
50	F	Food Engineering
51	M	Civil Engineering
52	M	Electric & Electronic Engineering
53	M	Electric & Electronic Engineering
54	F	Genetics
55	M	Architecture
56	M	Philosophy
57	M	Chemistry
58	M	Architecture
59	M	Sociology
60	M	Genetics

APPENDIX C

C.1 Regression Test for All Independent Variables (Indoor + Outdoor)

Table C.1.1 Descriptive Statistics

		Mean	Std. Deviation	N
DV	Learning	4.50	1.269	60
IV1	Layout	5.33	1.434	60
IV2	Flexibility	3.27	2.449	60
IV3	Comfort	6.55	.622	60
IV4	Safety	6.20	.971	60
IV5	Color	5.35	1.571	60
IV6	Size	4.88	1.303	60
IV7	Accessibility	6.18	1.157	60
IV8	Interaction	6.62	.555	60
IV9	Collaboration	6.15	1.287	60
IV10	Social Engagement	6.20	1.070	60
IV11	Multiple Experiences	6.13	1.016	60
IV12	Sense of Campus	6.50	.911	60

Table C.1.2 Correlations

		DV	IV1	IV2	IV3	IV4	IV5	IV6	IV7	IV8	IV9	IV10	IV11	IV12
Pearson Correlation	DV	1.000	.708	-.082	.075	-.055	.013	.272	-.087	.205	.234	.075	.276	.029
	IV1	.708	1.000	.037	.437	.000	.053	.466	-.078	.206	.303	.121	.248	.130
	IV2	-.082	.037	1.000	.214	.191	-.201	.106	.120	.114	.299	-.008	.217	-.008
	IV3	.075	.437	.214	1.000	.152	.094	.373	.140	.375	.382	.494	.096	.105
	IV4	-.055	.000	.191	.152	1.000	-.224	.032	.148	.302	.206	.075	-.131	.172

Table C.1.2 (Continued)

		DV	IV1	IV2	IV3	IV4	IV5	IV6	IV7	IV8	IV9	IV10	IV11	IV12
Pearson Correlation	DV	1.000	.708	-.082	.075	-.055	.013	.272	-.087	.205	.234	.075	.276	.029
	IV1	.708	1.000	.037	.437	.000	.053	.466	-.078	.206	.303	.121	.248	.130
	IV2	-.082	.037	1.000	.214	.191	-.201	.106	.120	.114	.299	-.008	.217	-.008
	IV3	.075	.437	.214	1.000	.152	.094	.373	.140	.375	.382	.494	.096	.105
	IV4	-.055	.000	.191	.152	1.000	-.224	.032	.148	.302	.206	.075	-.131	.172
	IV5	.013	.053	-.201	.094	-.224	1.000	.161	.123	.156	-.035	.270	-.083	.231
	IV6	.272	.466	.106	.373	.032	.161	1.000	.273	.078	.102	.163	.089	.464
	IV7	-.087	-.078	.120	.140	.148	.123	.273	1.000	.164	-.042	.367	-.050	.410
	IV8	.205	.206	.114	.375	.302	.156	.078	.164	1.000	.580	.645	.092	.151
	IV9	.234	.303	.299	.382	.206	-.035	.102	-.042	.580	1.000	.409	.244	.022
	IV10	.075	.121	-.008	.494	.075	.270	.163	.367	.645	.409	1.000	.146	.243
	IV11	.276	.248	.217	.096	-.131	-.083	.089	-.050	.092	.244	.146	1.000	.000
	IV12	.029	.130	-.008	.105	.172	.231	.464	.410	.151	.022	.243	.000	1.000
Sig. (1-tailed)	DV	.	.000	.267	.284	.338	.461	.018	.255	.059	.036	.285	.016	.412
	IV1	.000	.	.389	.000	.500	.345	.000	.276	.057	.009	.178	.028	.162
	IV2	.267	.389	.	.051	.072	.062	.211	.180	.193	.010	.477	.048	.477
	IV3	.284	.000	.051	.	.124	.236	.002	.143	.002	.001	.000	.232	.213
	IV4	.338	.500	.072	.124	.	.042	.404	.130	.010	.057	.284	.160	.094
	IV5	.461	.345	.062	.236	.042	.	.110	.175	.116	.396	.018	.265	.038
	IV6	.018	.000	.211	.002	.404	.110	.	.017	.278	.220	.107	.250	.000
	IV7	.255	.276	.180	.143	.130	.175	.017	.	.105	.376	.002	.352	.001
	IV8	.059	.057	.193	.002	.010	.116	.278	.105	.	.000	.000	.242	.125
	IV9	.036	.009	.010	.001	.057	.396	.220	.376	.000	.	.001	.030	.435
	IV10	.285	.178	.477	.000	.284	.018	.107	.002	.000	.001	.	.132	.031
	IV11	.016	.028	.048	.232	.160	.265	.250	.352	.242	.030	.132	.	.500
	IV12	.412	.162	.477	.213	.094	.038	.000	.001	.125	.435	.031	.500	.

Table C.1.2 (Continued)

N	DV	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV1	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV2	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV3	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV4	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV5	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV6	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV7	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV8	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV9	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV10	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV11	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV12	60	60	60	60	60	60	60	60	60	60	60	60	60

Table C.1.3 Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	IV1	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	IV3	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: DV

Table C.1.4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.708[a]	.501	.492	.904	.501	58.256	1	58	.000
2	.754[b]	.569	.554	.848	.068	8.952	1	57	.004

a. Predictors: (Constant), IV1

b. Predictors: (Constant), IV1, IV3

Table C. 1.5 ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	47.604	1	47.604	58.256	.000[a]
	Residual	47.396	58	.817		
	Total	95.000	59			
2	Regression	54.038	2	27.019	37.597	.000[b]
	Residual	40.962	57	.719		
	Total	95.000	59			

a. Predictors: (Constant), IV1

b. Predictors: (Constant), IV1, IV3

c. Dependent Variable: DV

Table 1.6 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.159	.453		2.559	.013		
	IV1	.626	.082	.708	7.633	.000	1.000	1.000
2	(Constant)	4.427	1.172		3.778	.000		
	IV1	.738	.086	.834	8.628	.000	.809	1.236
	IV3	-.590	.197	-.289	-2.992	.004	.809	1.236

a. Dependent Variable: DV

Table C.1.7 Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	IV2	-.108[a]	-1.169	.247	-.153	.999	1.001	.999
	IV3	-.289[a]	-2.992	.004	-.368	.809	1.236	.809
	IV4	-.055[a]	-.590	.557	-.078	1.000	1.000	1.000
	IV5	-.025[a]	-.263	.794	-.035	.997	1.003	.997
	IV6	-.074[a]	-.703	.485	-.093	.783	1.277	.783
	IV7	-.031[a]	-.334	.739	-.044	.994	1.006	.994
	IV8	.061[a]	.645	.522	.085	.958	1.044	.958
	IV9	.021[a]	.213	.832	.028	.908	1.101	.908
	IV10	-.011[a]	-.120	.905	-.016	.985	1.015	.985
	IV11	.107[a]	1.120	.268	.147	.938	1.066	.938
	IV12	-.064[a]	-.676	.502	-.089	.983	1.017	.983

Table C.1.7 (Continued)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
2	IV2	-.054[b]	-.597	.553	-.080	.950	1.052	.770
	IV4	-.012[b]	-.130	.897	-.017	.972	1.029	.786
	IV5	-.004[b]	-.044	.965	-.006	.991	1.009	.804
	IV6	-.012[b]	-.117	.907	-.016	.748	1.338	.703
	IV7	.020[b]	.225	.823	.030	.956	1.046	.779
	IV8	.165[b]	1.790	.079	.233	.857	1.167	.724
	IV9	.110[b]	1.154	.253	.152	.831	1.203	.741
	IV10	.156[b]	1.569	.122	.205	.745	1.342	.612
	IV11	.103[b]	1.154	.253	.152	.938	1.066	.766
	IV12	-.050[b]	-.561	.577	-.075	.980	1.020	.802

a. Predictors in the Model: (Constant), IV1

b. Predictors in the Model: (Constant), IV1, IV3

c. Dependent Variable: DV

Table.1.8 Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	IV1	IV3
1	1	1.966	1.000	.02	.02	
	2	.034	7.632	.98	.98	
2	1	2.956	1.000	.00	.01	.00
	2	.040	8.633	.05	.90	.02
	3	.004	27.085	.95	.10	.98

C.2. Regression Test for Independent Variables (Indoor)

Table C.2.1 Descriptive Statistics

		Mean	Std. Deviation	N
DV	Learning	4.50	1.269	60
IV1	Layout	5.33	1.434	60
IV2	Flexibility	3.27	2.449	60
IV3	Comfort	6.55	.622	60
IV4	Safety	6.20	.971	60
IV5	Color	5.35	1.571	60
IV6	Size	4.88	1.303	60
IV7	Accessibility	6.18	1.157	60

Table C.2.2 Correlations

		DV	IV1	IV2	IV3	IV4	IV5	IV6	IV7
Pearson Correlation	DV	1.000	.708	-.082	.075	-.055	.013	.272	-.087
	IV1	.708	1.000	.037	.437	.000	.053	.466	-.078
	IV2	-.082	.037	1.000	.214	.191	-.201	.106	.120
	IV3	.075	.437	.214	1.000	.152	.094	.373	.140
	IV4	-.055	.000	.191	.152	1.000	-.224	.032	.148
	IV5	.013	.053	-.201	.094	-.224	1.000	.161	.123
	IV6	.272	.466	.106	.373	.032	.161	1.000	.273
	IV7	-.087	-.078	.120	.140	.148	.123	.273	1.000
Sig. (1-tailed)	DV	.	.000	.267	.284	.338	.461	.018	.255
	IV1	.000	.	.389	.000	.500	.345	.000	.276
	IV2	.267	.389	.	.051	.072	.062	.211	.180
	IV3	.284	.000	.051	.	.124	.236	.002	.143

Table C.2.2 (Continued)

	IV4	.338	.500	.072	.124	.	.042	.404	.130
	IV5	.461	.345	.062	.236	.042	.	.110	.175
	IV6	.018	.000	.211	.002	.404	.110	.	.017
	IV7	.255	.276	.180	.143	.130	.175	.017	.
N	DV	60	60	60	60	60	60	60	60
	IV1	60	60	60	60	60	60	60	60
	IV2	60	60	60	60	60	60	60	60
	IV3	60	60	60	60	60	60	60	60
	IV4	60	60	60	60	60	60	60	60
	IV5	60	60	60	60	60	60	60	60
	IV6	60	60	60	60	60	60	60	60
	IV7	60	60	60	60	60	60	60	60

Table C.2.3 Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	IV1	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	IV3	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: DV

Table C.2.4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.708[a]	.501	.492	.904	.501	58.256	1	58	.000
2	.754[b]	.569	.554	.848	.068	8.952	1	57	.004

a. Predictors: (Constant), IV1

b. Predictors: (Constant), IV1, IV3

Table C.2.5 ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	47.604	1	47.604	58.256	.000[a]
	Residual	47.396	58	.817		
	Total	95.000	59			
2	Regression	54.038	2	27.019	37.597	.000[b]
	Residual	40.962	57	.719		
	Total	95.000	59			

a. Predictors: (Constant), IV1

b. Predictors: (Constant), IV1, IV3

c. Dependent Variable: DV

Table C.2.6 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.159	.453		2.559	.013		
	IV1	.626	.082	.708	7.633	.000	1.000	1.000
2	(Constant)	4.427	1.172		3.778	.000		
	IV1	.738	.086	.834	8.628	.000	.809	1.236
	IV3	-.590	.197	-.289	-2.992	.004	.809	1.236

a. Dependent Variable: DV

Table C.2.7 Excluded Variables[c]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	IV2	-.108[a]	-1.169	.247	-.153	.999	1.001	.999
	IV3	-.289[a]	-2.992	.004	-.368	.809	1.236	.809
	IV4	-.055[a]	-.590	.557	-.078	1.000	1.000	1.000
	IV5	-.025[a]	-.263	.794	-.035	.997	1.003	.997
	IV6	-.074[a]	-.703	.485	-.093	.783	1.277	.783
	IV7	-.031[a]	-.334	.739	-.044	.994	1.006	.994
2	IV2	-.054[b]	-.597	.553	-.080	.950	1.052	.770
	IV4	-.012[b]	-.130	.897	-.017	.972	1.029	.786
	IV5	-.004[b]	-.044	.965	-.006	.991	1.009	.804
	IV6	-.012[b]	-.117	.907	-.016	.748	1.338	.703
	IV7	.020[b]	.225	.823	.030	.956	1.046	.779

a. Predictors in the Model: (Constant), IV1

b. Predictors in the Model: (Constant), IV1, IV3

c. Dependent Variable: DV

Table C.2.8 Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	IV1	IV3
1	1	1.966	1.000	.02	.02	
	2	.034	7.632	.98	.98	
2	1	2.956	1.000	.00	.01	.00
	2	.040	8.633	.05	.90	.02
	3	.004	27.085	.95	.10	.98

a. Dependent Variable: DV

C.3 Regression Test for Independent Variables (Outdoor)

Table C.3.1 Descriptive Statistics

		Mean	Std. Deviation	N
DV	Learning	4.50	1.269	60
IV8	Interaction	6.62	.555	60
IV9	Collaboration	6.15	1.287	60
IV10	Social Engagement	6.20	1.070	60
IV11	Multiple Experiences	6.13	1.016	60
IV12	Sense of Campus	6.50	.911	60

Table C.3.2 Correlations

		DV	IV8	IV9	IV10	IV11	IV12
Pearson Correlation	DV	1.000	.205	.234	.075	.276	.029
	IV8	.205	1.000	.580	.645	.092	.151
	IV9	.234	.580	1.000	.409	.244	.022
	IV10	.075	.645	.409	1.000	.146	.243
	IV11	.276	.092	.244	.146	1.000	.000
	IV12	.029	.151	.022	.243	.000	1.000
Sig. (1-tailed)	DV	.	.059	.036	.285	.016	.412
	IV8	.059	.	.000	.000	.242	.125
	IV9	.036	.000	.	.001	.030	.435
	IV10	.285	.000	.001	.	.132	.031
	IV11	.016	.242	.030	.132	.	.500
	IV12	.412	.125	.435	.031	.500	.
N	DV	60	60	60	60	60	60
	IV8	60	60	60	60	60	60
	IV9	60	60	60	60	60	60
	IV10	60	60	60	60	60	60
	IV11	60	60	60	60	60	60
	IV12	60	60	60	60	60	60

Table C.3.3 Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	IV11	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: DV

Table C.3.4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.276[a]	.076	.060	1.230	.076	4.783	1	58	.033

a. Predictors: (Constant), IV11

Table C.3.5 ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.237	1	7.237	4.783	.033[a]
	Residual	87.763	58	1.513		
	Total	95.000	59			

a. Predictors: (Constant), IV11

b. Dependent Variable: DV

Table C.3.6 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.386	.979		2.436	.018		
	IV11	.345	.158	.276	2.187	.033	1.000	1.000

a. Dependent Variable: DV

Table C.3.7 Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	IV8	.181[a]	1.438	.156	.187	.992	1.009	.992
	IV9	.177[a]	1.369	.176	.178	.941	1.063	.941
	IV10	.035[a]	.274	.785	.036	.979	1.022	.979
	IV12	.029[a]	.230	.819	.030	1.000	1.000	1.000

a. Predictors in the Model: (Constant), IV11

b. Dependent Variable: DV

Table C.3.8 Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions	
				(Constant)	IV11
1	1	1.987	1.000	.01	.01
	2	.013	12.254	.99	.99

a. Dependent Variable: DV

C.4 Regression Test for Learning Experiences Generated by Respondents

Table C.4.1 Descriptive Statistics

		Mean	Std. Deviation	N
DV	Learning	4.50	1.242	60
IV1	Group discussion	.42	.497	60
IV2	Individual studying	.37	.486	60
IV3	Tutoring each other	.62	.490	60
IV4	Relaxing	.53	.503	60
IV5	Coincidental meetings	.57	.593	60
IV6	Chatting	.42	.497	60
IV7	Sharing current daily issues	.50	.504	60
IV8	Observing surrounding areas	.13	.343	60
IV9	Others	.07	.252	60

Table C.4.2 Correlations

		DV	IV1	IV2	IV3	IV4	IV5	IV6	IV7	IV8	IV9
Pearson Correlation	DV	1.000	.124	.000	.292	.271	-.161	-.178	-.054	.119	.000
	IV1	.124	1.000	.339	.180	-.023	-.182	.109	-.237	-.133	-.090
	IV2	.000	.339	1.000	.315	.157	-.322	.058	-.208	-.095	.213
	IV3	.292	.180	.315	1.000	.568	-.406	-.446	-.309	.108	-.064
	IV4	.271	-.023	.157	.568	1.000	-.349	-.497	-.267	.170	-.018
	IV5	-.161	-.182	-.322	-.406	-.349	1.000	.163	.170	-.128	-.144
	IV6	-.178	.109	.058	-.446	-.497	.163	1.000	.101	-.133	-.090
	IV7	-.054	-.237	-.208	-.309	-.267	.170	.101	1.000	-.098	.134
	IV8	.119	-.133	-.095	.108	.170	-.128	-.133	-.098	1.000	-.105
	IV9	.000	-.090	.213	-.064	-.018	-.144	-.090	.134	-.105	1.000

Table C.4.2 (Continued)

		DV	IV1	IV2	IV3	IV4	IV5	IV6	IV7	IV8	IV9
Sig. (1-tailed)	DV	.	.174	.500	.012	.018	.109	.086	.341	.182	.500
	IV1	.174	.	.004	.085	.432	.082	.204	.034	.156	.246
	IV2	.500	.004	.	.007	.115	.006	.329	.056	.235	.051
	IV3	.012	.085	.007	.	.000	.001	.000	.008	.207	.313
	IV4	.018	.432	.115	.000	.	.003	.000	.019	.097	.446
	IV5	.109	.082	.006	.001	.003	.	.107	.097	.165	.136
	IV6	.086	.204	.329	.000	.000	.107	.	.220	.156	.246
	IV7	.341	.034	.056	.008	.019	.097	.220	.	.228	.154
	IV8	.182	.156	.235	.207	.097	.165	.156	.228	.	.213
	IV9	.500	.246	.051	.313	.446	.136	.246	.154	.213	.
N	DV	60	60	60	60	60	60	60	60	60	60
	IV1	60	60	60	60	60	60	60	60	60	60
	IV2	60	60	60	60	60	60	60	60	60	60
	IV3	60	60	60	60	60	60	60	60	60	60
	IV4	60	60	60	60	60	60	60	60	60	60
	IV5	60	60	60	60	60	60	60	60	60	60
	IV6	60	60	60	60	60	60	60	60	60	60
	IV7	60	60	60	60	60	60	60	60	60	60
	IV8	60	60	60	60	60	60	60	60	60	60
	IV9	60	60	60	60	60	60	60	60	60	60

Table C.4.3 Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	IV3	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: DV

Table C.4.4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.292[a]	.085	.070	1.198	.085	5.417	1	58	.023

a. Predictors: (Constant), IV3

Table C.4.5 ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.773	1	7.773	5.417	.023[a]
	Residual	83.227	58	1.435		
	Total	91.000	59			

a. Predictors: (Constant), IV3

b. Dependent Variable: DV

Table C.4.6 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	4.043	.250		16.188	.000			
	IV3	.740	.318	.292	2.327	.023	.292	.292	.292

a. Dependent Variable: DV

Table C.4.7 Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	IV1	.073[a]	.572	.570	.076	.968
	IV2	-.102[a]	-.771	.444	-.102	.901
	IV4	.155[a]	1.019	.313	.134	.677
	IV5	-.051[a]	-.367	.715	-.049	.835
	IV6	-.060[a]	-.424	.673	-.056	.801
	IV7	.040[a]	.299	.766	.040	.905
	IV8	.089[a]	.702	.486	.093	.988
	IV9	.019[a]	.148	.883	.020	.996

a. Predictors in the Model: (Constant), IV3

b. Dependent Variable: DV

C.5 Regression Test for Existing Physical Attributes Generated by Respondents

Table C.5.1 Descriptive Statistics

		Mean	Std. Deviation	N
DV	Learning	4.50	1.242	60
IV1	Ability for easy movement	.47	.566	60
IV2	Presence of nature	1.27	1.339	60
IV3	Lack of rigid boundaries	.32	.537	60
IV4	Segregation from traffic	.07	.252	60
IV5	Natural color	.37	.486	60
IV6	Natural lighting	.25	.437	60
IV7	Emotional appraisals	1.08	.907	60
IV8	Social diversity	.17	.457	60
IV9	Silence	.42	.561	60
IV10	Fresh air	.93	.800	60
IV11	Urban furniture	.083	.2787	60
IV12	Spaciousness	.20	.403	60
IV13	Auto-control	.32	.537	60

Table C.5.2 Correlations

		DV	IV1	IV2	IV3	IV4	IV5	IV6	IV7	IV8	IV9	IV10	IV11	IV12	IV13
Pearson Correlation	DV	1.000	.313	.133	-.038	-.054	-.028	.234	-.113	.298	-.061	.051	-.024	.237	.242
	IV1	.313	1.000	.124	.119	.016	.230	.000	-.143	.153	-.249	-.080	-.036	.326	.175
	IV2	.133	.124	1.000	.140	-.003	.212	-.290	-.088	.231	-.060	.270	.167	-.006	-.120
	IV3	-.038	.119	.140	1.000	.218	-.063	-.127	.397	-.012	.117	.090	.047	.172	.117
	IV4	-.054	.016	-.003	.218	1.000	-.065	.000	.124	-.098	.040	.022	-.081	.033	-.159

Table C.5.2 (Continued)

	IV5	-.028	.230	.212	-.063	-.065	1.000	-.040	-.224	.025	-.073	.020	-.104	.225	-.063
	IV6	.234	.000	-.290	-.127	.000	-.040	1.000	-.182	-.042	-.017	-.146	-.174	.289	.235
	IV7	-.113	-.143	-.088	.397	.124	-.224	-.182	1.000	.089	-.036	.171	-.095	.046	.258
	IV8	.298	.153	.231	-.012	-.098	.025	-.042	.089	1.000	-.209	-.201	-.111	.184	.058
	IV9	-.061	-.249	-.060	.117	.040	-.073	-.017	-.036	-.209	1.000	.063	.208	-.225	.061
	IV10	.051	-.080	.270	.090	.022	.020	-.146	.171	-.201	.063	1.000	.025	-.221	.129
	IV11	-.024	-.036	.167	.047	-.081	-.104	-.174	-.095	-.111	.208	.025	1.000	-.151	-.179
	IV12	.237	.326	-.006	.172	.033	.225	.289	.046	.184	-.225	-.221	-.151	1.000	.016
	IV13	.242	.175	-.120	.117	-.159	-.063	.235	.258	.058	.061	.129	-.179	.016	1.000
Sig. (1-tailed)	DV	.	.007	.156	.386	.340	.416	.036	.195	.010	.322	.349	.426	.034	.031
	IV1	.007	.	.173	.183	.452	.039	.500	.138	.122	.028	.272	.393	.005	.091
	IV2	.156	.173	.	.143	.490	.052	.012	.251	.038	.324	.018	.102	.481	.181
	IV3	.386	.183	.143	.	.047	.317	.168	.001	.465	.186	.248	.360	.094	.187
	IV4	.340	.452	.490	.047	.	.312	.500	.173	.228	.381	.432	.270	.400	.112
	IV5	.416	.039	.052	.317	.312	.	.381	.043	.424	.291	.439	.214	.042	.317
	IV6	.036	.500	.012	.168	.500	.381	.	.082	.374	.448	.133	.092	.013	.035
	IV7	.195	.138	.251	.001	.173	.043	.082	.	.251	.392	.095	.235	.363	.023
	IV8	.010	.122	.038	.465	.228	.424	.374	.251	.	.054	.062	.200	.080	.331
	IV9	.322	.028	.324	.186	.381	.291	.448	.392	.054	.	.316	.056	.042	.322
	IV10	.349	.272	.018	.248	.432	.439	.133	.095	.062	.316	.	.424	.045	.163
	IV11	.426	.393	.102	.360	.270	.214	.092	.235	.200	.056	.424	.	.125	.085
	IV12	.034	.005	.481	.094	.400	.042	.013	.363	.080	.042	.045	.125	.	.453
	IV13	.031	.091	.181	.187	.112	.317	.035	.023	.331	.322	.163	.085	.453	.
N	DV	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV1	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV2	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV3	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV4	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV5	60	60	60	60	60	60	60	60	60	60	60	60	60	60

Table C.5.2 (Continued)

	IV6	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV7	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV8	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV9	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV10	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV11	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV12	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	IV13	60	60	60	60	60	60	60	60	60	60	60	60	60	60

Table C.5.3 Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	IV1	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	IV8	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	IV6	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: DV

Table C.5.4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.313[a]	.098	.083	1.190	.098	6.308	1	58	.015
2	.403[b]	.162	.133	1.156	.064	4.378	1	57	.041
3	.472[c]	.223	.181	1.124	.060	4.343	1	56	.042

a. Predictors: (Constant), IV1

b. Predictors: (Constant), IV1, IV8

c. Predictors: (Constant), IV1, IV8, IV6

Table C.5.5 ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.926	1	8.926	6.308	.015[a]
	Residual	82.074	58	1.415		
	Total	91.000	59			
2	Regression	14.781	2	7.390	5.527	.006[b]
	Residual	76.219	57	1.337		
	Total	91.000	59			
3	Regression	20.266	3	6.755	5.348	.003[c]
	Residual	70.734	56	1.263		
	Total	91.000	59			

a. Predictors: (Constant), IV1

b. Predictors: (Constant), IV1, IV8

c. Predictors: (Constant), IV1, IV8, IV6

d. Dependent Variable: DV

Table C.5.6 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	4.180	.200		20.934	.000			
	IV1	.687	.273	.313	2.512	.015	.313	.313	.313
2	(Constant)	4.103	.197		20.782	.000			
	IV1	.601	.269	.274	2.234	.029	.313	.284	.271
	IV8	.697	.333	.257	2.092	.041	.298	.267	.254
3	(Constant)	3.926	.210		18.690	.000			
	IV1	.597	.261	.272	2.285	.026	.313	.292	.269
	IV8	.726	.324	.267	2.240	.029	.298	.287	.264
	IV6	.699	.335	.246	2.084	.042	.234	.268	.246

a. Dependent Variable: DV

Table C.5.7 Excluded Variables[d]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	IV2	.095[a]	.755	.453	.100	.985
	IV3	-.076[a]	-.606	.547	-.080	.986
	IV4	-.059[a]	-.472	.639	-.062	1.000
	IV5	-.106[a]	-.822	.414	-.108	.947
	IV6	.234[a]	1.923	.059	.247	1.000
	IV7	-.069[a]	-.548	.586	-.072	.980
	IV8	.257[a]	2.092	.041	.267	.977
	IV9	.018[a]	.141	.889	.019	.938
	IV10	.077[a]	.610	.545	.080	.994
	IV11	-.013[a]	-.106	.916	-.014	.999

Table C.5.7 (Continued)

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
	IV12	.151[a]	1.145	.257	.150	.893
	IV13	.193[a]	1.540	.129	.200	.969
2	IV2	.042[b]	.333	.740	.044	.939
	IV3	-.069[b]	-.560	.578	-.075	.985
	IV4	-.034[b]	-.275	.785	-.037	.989
	IV5	-.103[b]	-.825	.413	-.110	.947
	IV6	.246[b]	2.084	.042	.268	.998
	IV7	-.100[b]	-.806	.424	-.107	.967
	IV9	.067[b]	.525	.602	.070	.908
	IV10	.130[b]	1.052	.297	.139	.957
	IV11	.014[b]	.113	.910	.015	.987
	IV12	.115[b]	.882	.381	.117	.875
	IV13	.185[b]	1.518	.135	.199	.968
3	IV2	.126[c]	.992	.325	.133	.860
	IV3	-.038[c]	-.311	.757	-.042	.969
	IV4	-.033[c]	-.273	.786	-.037	.989
	IV5	-.093[c]	-.762	.449	-.102	.945
	IV7	-.056[c]	-.461	.647	-.062	.936
	IV9	.074[c]	.595	.554	.080	.907
	IV10	.174[c]	1.441	.155	.191	.933
	IV11	.060[c]	.497	.621	.067	.955
	IV12	.035[c]	.264	.793	.036	.788
	IV13	.132[c]	1.076	.287	.144	.912

a. Predictors in the Model: (Constant), IV1

b. Predictors in the Model: (Constant), IV1, IV8

c. Predictors in the Model: (Constant), IV1, IV8, IV6

d. Dependent Variable: DV

C.6 Regression Test for Expected Physical Attributes Generated by Respondents

Table C.6.1 Descriptive Statistics

		Mean	Std. Deviation	N
DV	Learning	4.50	1.242	60
IV1	Comfortable and flexible furniture	1.25	1.019	60
IV2	Shadowing	.93	.899	60
IV3	Lighting	.92	.869	60
IV4	Natural Elements	.05	.220	60
IV6	Segregation from traffic	.08	.279	60
IV7	Basic daily requirements	.13	.343	60
IV8	Others	.15	.360	60

Table C.6.2 Correlations

		DV	IV1	IV2	IV3	IV4	IV6	IV7	IV8
Pearson Correlation	DV	1.000	-.020	-.319	.118	.155	.073	.119	.095
	IV1	-.020	1.000	.074	.273	-.057	-.134	.388	.312
	IV2	-.319	.074	1.000	-.072	-.154	-.045	.029	-.387
	IV3	.118	.273	-.072	1.000	.022	.029	.095	.041
	IV4	.155	-.057	-.154	.022	1.000	-.069	.135	-.096
	IV6	.073	-.134	-.045	.029	-.069	1.000	.059	-.127
	IV7	.119	.388	.029	.095	.135	.059	1.000	.247
	IV8	.095	.312	-.387	.041	-.096	-.127	.247	1.000
Sig. (1-tailed)	DV	.	.439	.007	.185	.118	.289	.182	.236
	IV1	.439	.	.287	.018	.333	.153	.001	.008
	IV2	.007	.287	.	.292	.120	.366	.412	.001
	IV3	.185	.018	.292	.	.433	.413	.236	.379

Table C.6.2 (Continued)

		DV	IV1	IV2	IV3	IV4	IV6	IV7	IV8
	IV4	.118	.333	.120	.433	.	.300	.152	.232
	IV6	.289	.153	.366	.413	.300	.	.327	.167
	IV7	.182	.001	.412	.236	.152	.327	.	.028
	IV8	.236	.008	.001	.379	.232	.167	.028	.
N	DV	60	60	60	60	60	60	60	60
	IV1	60	60	60	60	60	60	60	60
	IV2	60	60	60	60	60	60	60	60
	IV3	60	60	60	60	60	60	60	60
	IV4	60	60	60	60	60	60	60	60
	IV6	60	60	60	60	60	60	60	60
	IV7	60	60	60	60	60	60	60	60
	IV8	60	60	60	60	60	60	60	60

Table C.6.3 Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	IV2	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: DV

Table C.6.4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.319[a]	.102	.086	1.187	.102	6.554	1	58	.013

a. Predictors: (Constant), IV2

Table C.6.5 ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.239	1	9.239	6.554	.013[a]
	Residual	81.761	58	1.410		
	Total	91.000	59			

a. Predictors: (Constant), IV2

b. Dependent Variable: DV

Table C.6.6 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	4.911	.222		22.134	.000			
	IV2	-.440	.172	-.319	-2.560	.013	-.319	-.319	-.319

a. Dependent Variable: DV

Table C.6.7 Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	IV1	.003[a]	.028	.978	.004	.995
	IV3	.095[a]	.760	.450	.100	.995
	IV4	.109[a]	.861	.393	.113	.976
	IV6	.059[a]	.472	.639	.062	.998
	IV7	.129[a]	1.036	.305	.136	.999
	IV8	-.034[a]	-.248	.805	-.033	.850

a. Predictors in the Model: (Constant), IV2

b. Dependent Variable: DV