

Department of Architecture and the  
Built Environment



# **THE DESIGN QUALITIES AND SPATIAL ORGANISATION FOR HIGHER EDUCATION INFORMAL LEARNING SPACES**

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# **ABSTRACT**

The impact of student populations, the technical revolution and social change have influenced innovations of future campus planning. Along with the evolution of pedagogical theory, the impact reflects the spatial configuration of the learning environment and the consequent student experiences therein. More specifically, the higher education informal learning spaces are increasingly being considered as essential to spatial expansion, meant to enrich the student experiences. How to design successful higher education's informal learning space raises a broad spectrum of perspectives on different realms. This thesis reviews the considerations for designing informal learning spaces from four perspectives: The Architectural Perspective; the Pedagogical Perspective; the Building Management Perspective and the Spatial Configurational Perspective. The literature review reflects a dearth of empirical research on the impact of the design quality of the spatial organisation of the informal learning space on student experiences. Hence, the aim of this study is to critically assess the design quality of the spatial organisation of informal learning spaces that shape higher education students' spatial perceptions and activities within them.

The study provides evidence relating to where, when, what, why and how students behave in informal learning spaces, while identifying the impact of student satisfaction with the design quality of the spatial organisation of informal learning spaces, with regard to the frequencies of student activities. It also explores the spatial design strategy for these contexts to better support the development of higher education's ideal informal learning space.

The case study method is employed to achieve the research aim. A mixed methods design, including the questionnaire, observation, interviews and focus groups, has been employed, at the Diamond at the University of Sheffield and the Newton at Nottingham Trent University. These were meant to study student activities, to obtain student preferences toward the design quality of the informal learning spaces, and to discuss the impact of the design quality upon student experiences.

Consequently, the proposed framework of evaluating the informal learning spaces, including seven design quality aspects, the Physical Comfort, the Flexibility, the Socialising, the Openness, the Functionality, the Spatial Hierarchy and the Other Support, are discussed from a student perspective to identify and design better strategies for higher education informal learning spaces. The summaries could become a guideline for the architects and campus planners with the aim of creating better higher education informal learning spaces.

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## **1. CHAPTER 1: INTRODUCTION.**

Informal learning processes are becoming increasingly crucial in the learning experience based on pedagogical theory and more and more learning process is taking place outside of classroom than ever before (Brown & Lippincott, 2003). In order to prompt the learning process, a variety of informal learning spaces in universities are being considered as essential spatial elements to enrich the students' learning experiences in the higher education learning environment. Consequently, it can be seen all around the higher education learning environment that the number of the informal learning spaces have increased, and the design qualities of the informal learning spaces have been well considered in practice. However, there is rarely an empirical research focusing on if the design qualities of the informal learning spaces enhance the informal learning process. As an interdisciplinary research realm, the design of the learning space is situated at the confluence of a number of disciplines including pedagogy, architecture, estates planning, policy and management (Boddington & Boys, 2011). That is, the evaluation and implementation of the informal learning spaces are concerned from different perspectives.

Considering the perspectives from the other disciplines, this thesis attempts to discuss the design quality of the spatial organisation of universities' informal learning spaces from the perspective of their users – the students. This research aims to critically assess the design qualities of the spatial organisation of informal learning spaces in shaping the students' spatial perceptions and different activities in higher education. In order to achieve this research aim, the research objectives aim to determine student socialising and informal learning

activities in relation to where, when, what, why and how they behave in the informal learning spaces, in order to examine the impact of the student satisfactions with the design quality of the spatial organisation of the informal learning spaces upon the frequencies of student activities. The study also intends to identify the spatial design strategy meant to better support ideal informal learning spaces in higher education.

This chapter firstly discusses the research background and identifies the research problems. Secondly, the definitions of informal learning spaces and the design quality of spatial organisation are identified to narrow down the research scope. Thirdly, the research aim and objectives are clarified. Fourthly, the research methodology and data collection methods are discussed briefly. After that, the structure of the thesis is presented at the end of this chapter.

## **1.1. RESEARCH BACKGROUND AND DEFINITION OF THE PROBLEM.**

The design of learning spaces is always updated based on the developments in the pedagogical theory. Historically, it is clear that the configuration of space profoundly impacts human activity generally (Hillier, 2007). Learning space evaluation, contending with the reality that there are explicit links between space and theories of learning, has been poorly explored in relation with the theories of learning, themselves, rarely emphasising the importance of space (Jamieson, 2003; Neary et al., 2010). Furthermore, even though the deliberate design of third places has subsequently been pursued in early educational practice (e.g., Cook, 2005; Nair & Gehling, 2010), there is little research

focusing on the design of the informal learning space within a higher education landscape. With an increasing amount of funding invested in building the informal learning spaces in the university campuses, the efficiency and efficacy of the informal learning spaces upon the informal learning processes deserves to be known. Instead of considering from the research realm of architecture, education and estates management, separately, this research aims to discuss the design of the informal learning space from a student perspective.

## **1.2. THE DEFINITION AND THE MODELS OF THE INFORMAL LEARNING SPACE.**

In 2006, DEGW began to use the term ‘Learning Landscape’ to describe the range of spaces where learning takes place. It includes formal and informal spaces involving specialised and general spaces. Such spaces include the library, café areas as well as the formal learning spaces (Neary et al., 2010). However, Temple and Fillippakou (2007) defined the Learning Landscape as spaces around the campus and within buildings, which can help to create a sense of belonging, as well as facilitate peer-group discussions, thus facilitating informal learning. Dugdale and Long (2007) more radically summarise that the Learning Landscape as a complete range of physical and virtual spaces where learning takes place, involving the open spaces available. That is to say, some academics identify the Learning Landscape as the informal learning space, being the space external to formal learning spaces. That is to say, even though the space between is one part of the complete range of the learning environment, the pivotal point of planning Learning Landscapes in higher education is to

create informal learning spaces where informal learning happens. Hence, informal learning spaces are seen as key to the development for any informal pedagogic interaction in a campus. The blurred and mixed-term usage of the term – Learning Landscape in this thesis stresses the holistic learning environment in the campus. That is to say, the Learning Landscape can be categorised into the formal learning space and the informal learning space.

Based on the explanations from Johnson and Lomas (2005) and Brown and Lippincott (2003), formal learning spaces include classrooms and laboratories, lecture halls, auditoriums, computer labs and studios, while any space outside the formal learning spaces that can be used for learning, including faculty offices, hallways, plazas, courtyards, dormitories, and food service areas are informal learning spaces. Formal learning spaces have been well researched because academics believe that the design of formal learning spaces impact student learning outcomes and practices (Brooks, 2011; Hunley & Schaller, 2009). However, the design of informal learning spaces in higher education environments have also received attention due to innovative architectural design and innovative pedagogical theory. More specifically, Johnson and Lomas (2005) maintained that learning is social, which requires feedbacks and interactions among students. Consequently, with an increasingly emphasis on teamwork and group projects in pedagogy, students can be observed interacting in small groups outside the classroom as they accomplish work related to their courses in relaxing environments. That is to say, the current teaching and learning methodologies require a more relaxing learning environment. Hence, an informal learning space should enable students to get to know each other and engage in dialogue, work on group projects and interact in a variety of ways.

Informal learning processes should be understood before exploring the design of the informal learning spaces. Learning is the process whereby knowledge is acquired, and informal learning is often treated as a residual category for describing any kind of learning which does not take place within, or follow from, a formally organised learning programme or event (Eraut, 2000). In other words, informal learning can be defined as the result of learning from the non-learning time. Richardson (2004: 25) defines informal learning as that *'which happens outside the formal education system or structured training and does not lead to a qualification'*. Conlon (2004) believes that informal learning tends to be the outcome of incidental learning through everyday experience. In terms of the informal learning spaces, as Harrop and Turpin (2013: 59) define it, the informal learning spaces are *'non-discipline specific spaces frequented by both staff and students for self-directed learning activities and can be within and outside library spaces'*. As far as informal learning space is concerned, it is the space used the formal setting, used during the lecture time including corridors, cafeteria, and spaces for student circulation, etc. These spaces are seen as the type of learning environment that fills the void between the quiet library spaces and the lecture spaces, as they provide the type of space for students, who can drop in and use it to discuss ideas, practice presentations, carry out group work activities, etc. (Kumar & Bhatt, 2015). Unlike any formal learning space, students can talk freely and do whatever they want to do. For example, students are often permitted to eat and drink within these spaces. Furthermore, settings in the informal learning spaces often help to create a more relaxed environment than that of a formal learning space.

According to McDaniel (2014), the informal learning spaces have been divided into four models. The four types and characteristics are shown in Table 1-1 below.

Table 1-1: The four types of the informal learning spaces.  
Source from: *Every Space is a Learning Space – Encouraging Informal Learning and Collaboration in Higher Education Environments* (McDaniel, 2014)

Type of the informal learning spaces	Characteristics
<b>Information Commons</b>	<i>Provide a diverse environment, offering a combination of spaces that support individual activity and research as well as social learning activities (Attis &amp; Koproske, 2013). IT-rich environment (Lippincott, 2006)</i>
<b>Learning Commons</b>	<i>The often centralised learning commons is conceived around the notion that 'the learning process' is 'enhanced when it occurs in a dynamic social context'. Offering a wide range of academic opportunities, this model of informal learning space addresses a number of services, including skills training, multimedia development, and student IT support, media labs, individual spaces for presentations, training, and distance learning, academic support services, career resources, and collaborative study areas (Jamieson, 2009). The learning commons can often be integrated into an existing space or exist as an independent informal social and learning place (Villa, 2013)</i>
<b>The Classroom – Beyond Four Walls</b>	<i>Many of the strategies for designing informal learning environments are being incorporated in formal learning areas In addition to good sight lines, acoustics, and indoor environmental quality, classrooms now feature design strategies, such as easily moveable furniture and perimeter-clad white boards, to successfully support group work and collaboration for more active learning approaches.</i>
<b>Leveraging Circulation Areas to Encourage Collaboration</b>	<i>'Front porches,' or spaces immediately outside formal spaces, provide opportunities for conversations that continue classroom discussions immediately following class time (O'Neill, 2013). 'Learning streets' activate circulation spaces and encourage impromptu encounters among students and between students and faculty. These spaces are most efficiency when planned as part of the overall program that includes formal learning environments and support areas to determine of square-footage allocation for a new facility or renovation.</i>

More specifically, the first section can be defined as the modern library. Traditionally, the campus library has served as the higher education institution's 'knowledge centre' (McDaniel, 2014: 4). Due to the development of IT technology and the revolution of the pedagogical theory, the library has been redefined. The modern library, provides students with a diverse and IT-rich

environment (Lippincott, 2006), offering a combination of spaces that support individual activity and research as well as social learning activities (Attis & Koproske, 2013).

The second model of informal learning spaces, Learning Commons, offers a wide range of academic opportunities and services, including skills training, multimedia development, and student IT support (Jamieson, 2009). The learning commons were often integrated into an existing space or exist as an independent informal social and learning place (Villa, 2013).

The third model is more directly connected to rethinking the formal learning space – classroom. Except for the basic design quality of the formal learning spaces, such as good sight lines, acoustics, and indoor environmental quality, the classroom has increased informal design strategies, such as easily moveable furniture and perimeter-clad white boards, etc., to successfully support group work and collaboration for more active learning approaches.

The fourth model of the informal learning space represents the learning street, which involves leverage circulation areas to encourage collaboration. O'Neill (2013) states that the learning street is available immediately outside formal spaces and provides opportunities for conversations that continue classroom discussion immediately following class time.

The four models of the informal learning spaces cover almost all the types of the informal learning spaces. In this thesis, the informal learning spaces refer to the exclusively informal learning spaces rather than the formal learning space where students could also participate in informal learning activities.

### **1.3. THE VALUE AND THE CHARACTERISTICS OF THE DESIGN QUALITY AND SPATIAL ORGANISATION.**

The design qualities and spatial organisations regarding learning spaces of higher education have been recognised as being of a very high standard. It is not only because considerable funds are being invested in the learning environment in higher education, but also for the impact on student recruitment. However, the budget is not focusing on the informal learning spaces. It is important to assess the design quality of the spatial organisation of informal learning spaces. The design qualities of the spatial organisation of informal learning spaces plays a significant role in students' preferences towards various spaces. In this thesis, seven design qualities of the spatial organisation of the informal learning spaces are identified based on the literature review (see Chapter 3), expert interviews and a pilot study (see chapter 4 section 6). The areas of focus are, the Physical Comfort, the Flexibility, the Ambience, the Functionality, the Situation, the Spatial Hierarchy, and the Other Support facilities. As Abdul-Samad & Macmillan (2004) suggested, the design qualities of spatial organisation should fully consider users demands and expectations. Consequently, this thesis aims to critically assess the design quality of the spatial organisation of informal learning spaces and how this shapes the students' spatial perceptions and different activities in higher education spatial contexts. In return, the research enhances the value of the design quality of the spatial organisation of higher education's informal learning spaces.



## **1.4. THE RESEARCH AIM AND OBJECTIVE OF THE STUDY.**

Despite the number of informal learning spaces in the higher education have been created over the last number of years, the value of the design of the informal learning spaces appears to be a distinct absence. Discuss the design of the informal learning spaces to better support student socialising and informal learning activities is imperative.

The aim of this thesis is to critically assess the design quality of the spatial organisation of informal learning spaces in shaping the students' spatial perceptions and different activities in higher education. It seeks to provide an evidence base in relation to understanding student activities and their selection and use of informal learning spaces in the higher education setting. It also seeks to identify the impact of student satisfactions with the design quality of informal learning spaces upon the frequencies of student activities within such environments. Their exploration of the spatial design strategy is studied in order to better develop an ideal informal learning space in higher education so as to generate solid evidence to inform future design.

Therefore, this thesis will focus on articulating the following key research objectives:

1. To determine the levels of student socialising and informal learning activities in relation to where, when, what and why they behave in the informal learning spaces;

2. To examine the impact of student satisfactions with the design quality of the spatial organisation of the informal learning spaces upon the frequencies of student activities;
3. To identify the spatial design strategy that better supports an ideal informal learning space in higher education.

## **1.5. STRUCTURE OF THE THESIS.**

The structure of the thesis (see Figure 1-1) starts from a systematic review on design quality and spatial organisation of the informal learning spaces in higher education. The literature review includes five parts: 1) Definition and Characteristics of the University; 2) Development of the University Campus from the Historical Perspective; 3) Learning Landscape Evaluation Framework; 4) Identify Socialising and informal learning activities in the informal learning spaces; and 5) Evaluation of the learning spaces and its design quality. With the research question: How does the value of the design quality and spatial organisation of the informal learning spaces shape student experiences in the higher education, the three research objectives were stated, which can also be seen in chapter 1 section 1.4. In order to achieve the research objectives, a mixed methods design, including both quantitative and qualitative methods, is employed. A pilot study at Telford Exhibition Hall in the University of Nottingham is done to examine the feasibility of the methodology prior to the two case studies, the Diamond at the University of Sheffield and the Newton at Nottingham Trent University. Consequently, the seven design qualities of the informal learning spaces are illustrated to articulate the impacts on student experiences the informal learning spaces.

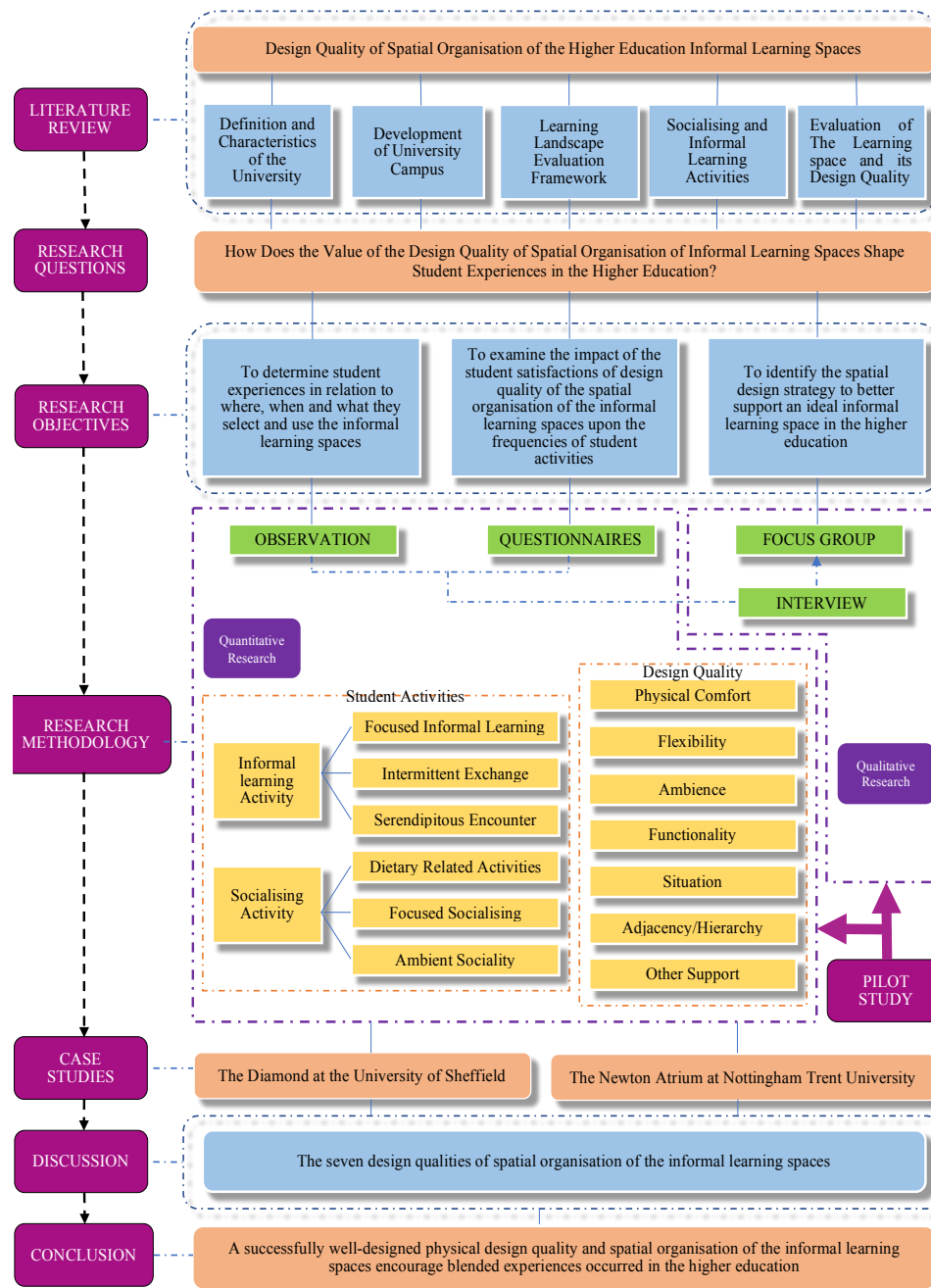


Figure 1-1: The structure of the thesis.

## **2. CHAPTER 2: THE LEARNING LANDSCAPE IN HIGHER EDUCATION.**

### **2.1. INTRODUCTION.**

The spatial design of the higher education learning environment has rapidly developed in recent years. The higher education context aims to provide academic programs with high standards. It also crucially realises that the learning environment itself is also a part and parcel of the learning experiences. The learning landscape in higher education reinforces the high ideals of scholarship and institutional values to create a unique and defining sense of place (Coulson et al., 2015). Therefore, the learning landscape should be designed for fulfilling the requirements of higher education. This chapter firstly identifies the definition and the characteristics of the university from a historical perspective. Secondly, the development of the university campus design in a historical perspective is reviewed to indicate the significance of informal learning spaces. After that, the section interprets the current thinking on the relationship between space and learning in higher education. Consequently, the trends and challenges of the university of the 21<sup>st</sup> century are summarised and the importance of the design qualities of the learning spaces is emphasised.

## **2.2. THE DEFINITION OF A UNIVERSITY AND ITS CHARACTERISTICS FROM A HISTORICAL DEVELOPMENT PERSPECTIVE.**

In order to discuss how to design the informal learning spaces in higher education, it is necessary to get an explicit understanding of what a university is and what the relationship between the university and the city is. Even though the main functions of the university are for the production, reproduction and dissemination of intellectual capital (Wernick, 2006), the definition of the university has inevitably dynamically changed according to time. In this section, the university's definition and characteristics are chronologically reviewed from historically developmental perspectives.

Firstly, in a class society, the university also serves as a class institution (Wernick, 2006). The university, as a privileged gateway to prestigious occupations and posts, provides a place to cultivate and serve acculturated social elites. In classical Greece and Rome, it was exclusively aristocratic (Wernick, 2006). Similarly, social hierarchies accompanied the history of the university in eastern civilisations. In India and China, the university served the Brahmins, Mandarins and their sponsors. Finally, the strong classic emotion extended to gender. Women were not enrolled or involved within the universities until the mid-19<sup>th</sup> century. Even in highly developed societies, the gender integration has lagged behind regarding the entry of women into the work force (Wernick,

2006). Then, the centre of knowledge followed the economic development. The Yuasa phenomenon was defined by the Japanese researcher Yuasa. The definition shows that if the scientific results of a country account for 25% of the scientific results of the world, then that country is in a scientifically blossoming period. Historically, the scientific blossoming period has transferred between the following countries: Italy (1540-1610), the United Kingdom (1660-1730), France (1770-1830), Germany (1810-1920) and the United States (1920-now) (Liu & Zhou, 2007). Knowledge progress results in economic development. In slave society or feudal society, ancient Greece, Roman and China were the centre of knowledge. Later, the twelfth-century Renaissance, the Industrial Revolution and a series of social reforms and movements, like the City Beautiful Movement etc., occurred and in these events, the contents and the definitions of universities evolved gradually.

Denman (2005: 23) claims that history has played a pivotal role in the evolution of the university and the development of universities have made a great contribution to *'the civilisation'*. Historically, advanced forms of higher education and the history of the university are intimately intertwined (Turner, 1987). Higher education developed in several regions of the ancient world, including India, Sri Lanka, China, Japan, and Southeast Asia. A full historical map of the university as a developing constellation of institutions would need to be considered. However, the forms of university that prevail today are still regarded as a 'Western' institution. Indeed, western values have been disseminated everywhere by all kinds of models, colonial transplants, emulation by modernizing regimes, and so on. As a result, the ancient institution styles of India, China and Japan have been largely abandoned or displaced. In addition,

‘The West’ has a very wide sense of the meaning of ‘university’. The ‘Eastern’ elements, like Indian mathematics and Brahmanic philosophies, emerged from the earliest Athenian schools (Wernick, 2006).

The reshaping and revolution of modern universities have contributed to the rise of nation-states, industry and capitalism. Print replaced manuscript, and vernaculars replaced Latin. Any improvement of society has had an impact on the form or content of the university, forming the basis of a new public sphere. But for several centuries, universities have retained their main functions: serving the higher clergy, doctors and lawyers, and as finishing schools for the rich. The university was sponsored by the royalty or private patronage in these centuries. With their help, the climax of institution-building developed and new universities were established. Encouraged by funding providers, the places for academics to debate, could even extend to outside universities. Hence, salon societies and coffeehouses were provided to support this phenomenon.

The three principles of designing the university of Berlin (Boulton & Lucas, 2011), 1) unity of research and teaching, 2) freedom of teaching and 3) academic self-governance, specifically explained by Newman, who (1992: 94) emphasised that:

*‘A University is a place for the communication and circulation of thought, by means of personal intercourse. It is a place where inquiry is pushed forward, discoveries verified and perfected, and ...error exposed, by the collision of mind with mind, and knowledge with knowledge...’*

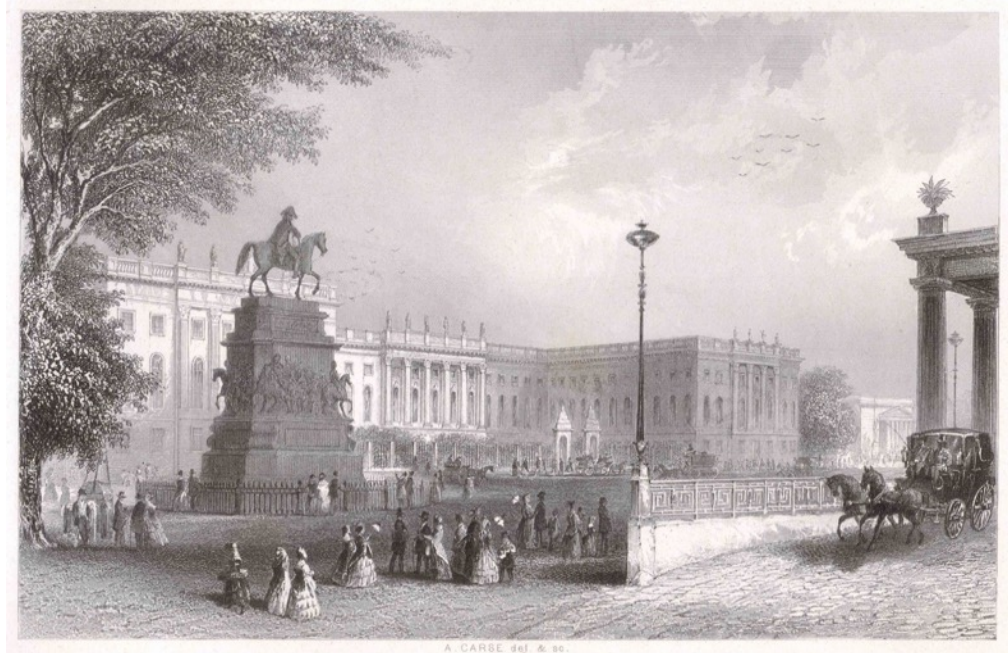


Figure 2-1: The University of Berlin in 1850.

Source from: <https://www.german-way.com/history-and-culture/education/universities-in-germany/>

The spirit of the university is emphasised in his description. More specifically, communication is really important. This contributes to the circulation of the thought. To this point, the definition of the university has never changed. But in terms of the contents of the universities, the definition of the university was again revamped in the 19<sup>th</sup> century. A series of revolutions in modern society, such as biological politics, capitalist industrialisation, and so on, contributed to the reform of the old university and the establishment of new universities such as the University of Berlin, which is a prototype of the multi-faculty research university (see Figure 2-1). A number of professional institutions as well as private and public colleges were founded in this period. The function and geometrical morphology of the universities varied at this time. Freer connections between research and teaching, more academic communications between researchers and students, and fewer limitations by governments and nobilities, are defined as the key characters of the modern university.



The university is a place for interaction and even mutual education but not simply the impacting of knowledge. Consequently, four huge changes have redefined the impression of the university in people's mind: Firstly, the desire for knowledge and expertise results in the diversification of institutions, hidden and conservative traditional universities cannot provide a place for sharing and discussing; Secondly, the subjects are balanced - the importance of sciences is emphasised, and the mystery of religion has gradually faded; Thirdly, provision and standards have been renewed. Compared with the previous pedagogical system, written exams, competitive admission and degree systems all provide a more useful way characterised by a work-oriented complexion than the previous. Lastly, the academic tradition has been re-invented in an instrumentalist direction. The four changes have led to the development of the design of the learning spaces. Based on this work-oriented situation, governments all over the world have attempted to create places where people can be directly educated in practice. The distinct case for creating the learning space, in practice, is the red brick university. It was also recognised as the Civic University and emerged in England in the 19<sup>th</sup> century for practitioners who lived in the city and near the factories.

Following the changes of the 19<sup>th</sup> century University, the 20<sup>th</sup> century university is an outgrowth of these tendencies (Wernick, 2006). It is recognised that the contemporary universities have been modernised for a second time. In the course of transformation, people saw the massive expansion of universities, especially in the latter half of the 20<sup>th</sup> century. Higher education participation rates increased dramatically from 5% to 50% in American society (Wernick,

2006). Consequently, the number of the participations resulted in the dramatic extensions of the physical learning spaces in the universities.

In this period, the definition of the university is redefined as the '*multiversity*' (Kerr, 2001: 6) with multiple programs, subjects, schools and departments, and even more industrial parks. The university has become corporate, professionally oriented to application, and modernised. The multiversity also means that the university has transformed from serving the elite to serving the masses. The baby boom, after World War II, facilitated this expansion (Russell, 1982). To the government, an expansion of the university provided much more educated and skilled labour, which was conducive to social stability. The emergence of the distance learning and open universities also spurred people to redefine the contemporary university. Modern telecommunications technologies, from TV, the phone to the computer and the internet, provided a broad and wide-based understanding of the context to educate.

Within the university, two noteworthy trends emerged. Firstly, with the impact of instrumentalism and vocationally-oriented programs, relative subjects and professional schools developed dramatically. Secondly, collaboration and the communication within the university were more interdisciplinary, such as biochemistry, informatics, and so on. With the spatial managerial revolution, the physical design of the university was repackaged (Turner, 1987). Consequently, the two trends build the theoretical foundation of the functional evolution of the learning space in the 20<sup>th</sup> century university with two points: 1) designing learning spaces in the university as a working environment; 2) encouraging communication and collaboration between subjects. The two

design strategies of the learning spaces for the 20<sup>th</sup> century universities are also applicable in the 21<sup>st</sup> century.

Furthermore, it can be seen that globalisation is another prominent trend for the 21<sup>st</sup> century university. Arnove (2005) advocates that competition has happened between universities, bidding, not only for students at the level of community and city, but also at a global one. The globalised trends of higher education could not be completely avoided (Altbach, 2004: 4). Coleman and Underhill (1998) also suggest that the definition of the university in the 21<sup>st</sup> century should be considered as increasingly relating to globalisation. Scott (1998) claims that the processes of globalisation happened in both virtual and land-based educational systems and, of course, it's place and space. The sense of this place creates more opportunities for sharing, interacting and integrating interdisciplinary knowledge. The university is seen as a '*community of scholars*' competing around the world (Wernick, 2006: 563). The scholars can be from different places with different backgrounds. The inclusive nature of the university provided diversity.

Furthermore, a dynamic process of engagement in the pursuit and explanation of knowledge and the fulfilment of the needs of the contemporary world requires a place of trans-disciplinary exchange and putting knowledge into practice. Therefore, the development of the university requires the design of the physical university to be more flexible and adaptable in the 21<sup>st</sup> century to fulfil the rapid changes of the function of the university.

Throughout the historical review of the development of the university, it is hard to give a definition of the university in the 21<sup>st</sup> century. However, based on the

historical review of the development of the university, this section emphasises the characteristics of the 21<sup>st</sup> century university. This enhances the will of the higher education and complies with the social development of the 21<sup>st</sup> century. More specifically, the function of the 21<sup>st</sup> century university engages more students in practice, requiring the development of the university to hold more vocationally-oriented programs and working events. In response to this, student-led learning styles, such as seminars and reviews, are more significant in the learning space. Moreover, the learning space is designed more like a working place, where students can practice and exercise in the workplace before they really get into the job market. The second characteristic of the 21<sup>st</sup> century university are more interdisciplinary. Students are encouraged to communicate and collaborate in the learning settings for collaborative group learning. Furthermore, the globalisation of the university, recruits more students from different cultural contexts. This demands a more inclusive design of the university. The commercialised nature of higher education attempts to satisfy every student coming from the different cultural contexts to share knowledge. In order to achieve this, the design of the 21<sup>st</sup> century's physical university is more flexible and adaptable for maximising the usage of the learning environment of the university, meant for all the students.

In this section, the university's definition and characteristics have been discussed from a historical development perspective. The development of the university has dynamically changed in close relation to the evolution of the pedagogical theory, culture, economics and society. These changes have impacted the spatial design of the university. The next section interprets the evolution of the university campus plan from a historical perspective.

## **2.3. THE DEVELOPMENT OF UNIVERSITY CAMPUS FROM A HISTORICAL PERSPECTIVE.**

The university, as a special educational institution with a long and common history, is rooted in various courses of society, cultures and economic environments. Coulson et al. (2015) presents the history of the university from the medieval to the present day. In doing so, he uncovers the pivotal components of campus design. Aside from the functional necessity, the buildings and landscapes form these physical facilities. Through these buildings and environments, people do not simply learn knowledge. The learning experience in the physical campus is also crucial. From the medieval universities, the proliferation and physical form was much shaped by the growth of the city. In the colonial colleges of the fledgling United States, these were envisaged as expressions of the utopian social ideals of the American imagination. To the modernist visions of post-war institutions, products of the push to democratise higher education and the layout of the university campus changed dramatically according to the evolution of the society (Turner, 1987).

This section examines the evolution of the spaces as well as urban design in universities, from their origins to Medieval Europe to America as well ascending to Asia. In doing so, it categorises universities into six chronological ‘generations’, based on their space planning characteristics and urban design. The history of China was never interrupted for a long time until the Second Opium War. Before that, the institutions of China owned a self-contained

educational system. The university we discuss here is based on the modern style university. As Coulson et al. (2015) explains, even though non-western institutions of higher learning like Nalanda in India and Nanjing University in China are important centres of learning, they are not autonomous corporations for scholars and are never known to issue degrees to their graduates in those years and therefore do not meet the technical definition of ‘university’. Hence, the historical origin of China’s ‘university’ is not within the scope of this discussion.

### ***2.3.1 The First Phase: The Historical Origin of the Education Concept Prototype***

#### ***2.3.1.1 Ancient Institutions (From 287 BCE to 4<sup>th</sup> Century).***

Higher education in the Western World started in 387 BCE when an ancient Greek philosopher, Plato, set up ‘The Academy’. He created a systemic methodology to comprehend and perceive the world. The way he used to debate two opposite views was through discussion and conversation. Critical thinking could be interchanged in social places. This was the reason why the term ‘Symposium’ originated from the Greek ‘Dinner Party’ (Dictionary, 1989). Plato believed that people can comprehend and perceive the world through these mechanisms of discussion and debate. Hence, he recruited young people who had inspiration and abstract thinking and taught them human intelligence. The places for teaching included housing and even under the olive trees (see Figure 2-2).



Figure 2-2: Plato at his Academy.

Source from: the Swedish journal *Svenska Familj-Journalen* (1862-1887) by an unknown Xylographer (1879)

[https://www.justcolor.net/travels/ancient-greece/?image=ancient-greece\\_coloring-plato-academy\\_1](https://www.justcolor.net/travels/ancient-greece/?image=ancient-greece_coloring-plato-academy_1)

Aristotle is one of the most famous students of Plato. He became the teacher of Alexander the Great and created the disciple system, which is a prototype of the school, the department or division. In order to improve education and encourage exploration, he established the 'Lyceum' academy in 335 BCE. The Lyceum was located just outside the eastern wall of Athens. The site was a multi-purpose location with indoor and outdoor spaces that were used for gymnastic, military and also educational purposes. The Lyceum continued to use the pattern of the gymnastic and the pathways of gardens had canopies. Instead of formal curricula in fixed spaces like classrooms, he provided frequent lectures while strolling around the campus and for this reason, his institution and members were called peripatetic (Capizzi, 1990). The first philosophy department appears in Lyceum. Today, people cannot find the site of Plato's Academy, but recently they found the ruins of the Lyceum (Capizzi, 1990).

In summary, in this period, the idea of education was based on seminars at dynamic times and places. Schools accentuated the link between knowledge and society, through debate and discussion. The planning characteristics of ancient institutions, like ‘the Academy’ and ‘Lyceum’ are informal spaces: under the olive trees, pathways in the garden, or even at home.

*2.3.1.2 The Early Medieval Institutions (From the 5<sup>th</sup> century to the 10<sup>th</sup> century).*

With the demise of the Roman Empire in the 5<sup>th</sup> century, classical civilisation in the Western world turned to Christianity. This became the basis for the curricula of the time. The safeguard and explanation of theology was explored. Education in institutions changed from recognising and exploring the world by debating and starting from humanity, to embracing theology. The faculty of theology emerged in higher educational institutions. After that, the faculty of law, which was used to serve the aristocracy, was set up.

The university in this period possessed no specific location. The place where masters gave lectures to students was always in the street, the church, teachers’ living rooms or rented houses (Ruegg, 2004). All these potential university facilities were located on two sides of the street. Hence, the streets played two roles in the city: one was as an open space for the city while the other was the axis of the ‘civic’ university which links all kinds of university facilities where the social communication happened.



**2.3.2 The Second Phase: Introverted Institutions - Enclosed Quadrangles, Monastic Architecture (From the 11<sup>th</sup> century to the 15<sup>th</sup> century) and the College.**

The university, in the medieval period, evolved from the scholastic guild or the corporation of students and masters (Coulson et al., 2015). With revived economy, the development of commercial trade, the emergence of autonomic counties and towns and the need for scientific knowledge and the scholastic guild were established in pursuit of freedom, independence and autonomy, as well as protecting the benefits of their own hierarchy.

The establishment and development of the '*Universitas Scholarium*' was a new type of institutions and organisations (Guski, 2015: 2). Sectarianism and the awareness of self-protection were the two main characteristics. People possessed no buildings and they had to live and learn in their own places to cultivate students with expertise (Coulson et al., 2015). Meanwhile, people who were skilled at their own crafts would also like to enhance the understanding of Christian creeds in the guilds. This facilitated the integration of different faculties. Commonly, people believed that the University of Bologna (see Figure 2-3), which was allegedly founded in 1088, inaugurated a new era. The Universities of Bologna, Paris and Oxford are called the triumvirate of European university prototypes (Coulson et al., 2015). They expanded from a single subject in the 11<sup>th</sup> century to become multi-disciplinary in the 13<sup>th</sup> century with law, medicine and theology... However, all the subjects were monitored and controlled by the power of religions and royalty. Hence, the community of masters and students moved throughout Europe when their scholarly privileges

were called into question. They never applied compunction, and this had no relevance to loyalty because members were recruited from all over the world (Coulson et al., 2015).



Figure 2-3: Plazzo dell' Archiginnasio, the seat of the University of Bologna from 1563 to 1803.

*Source from: University planning and architecture: The search for perfection (Coulson et al., 2015: 1)*

As the Middle Ages progressed, student migration movements in Europe happened frequently until the last major migrations to the University of Sienna in 1322, the university's first edifice was established to bind the university to the city through a chapel exclusively for the city's scholars. In the course of time, increased student populations, policies for university migrations, the development of the city centre and unprecedented awakening of the human spirit led to an expansion of property. Marvellous architecture exclusively owned by universities became a visible sign that the universities had evolved from a scholarly community into a specific institution.

The university forms of this period are mainly monastic in style. The enclosed and centralised campus is introverted in form. A distinctive academic quarter comprises lecture theatres, chapels, libraries and magnificent portico within a quadrangle, which were obviously located in the city centre. Even though the institutions rarely interact with society due to restricted policies (resulting in institutions being known as Ivory Towers), the central urban locations indicate the relationship between the city and the university as close (Chen, 2004).



Figure 2-4: The perspective of University of Oxford.

*Source from: The website of University of Oxford (<http://www.ox.ac.uk/visitors>)*

The four-sided courtyard format firstly emerged in England (Coulson et al., 2015). The format consists of several courtyards which are surrounded by a series of blocks. Courtyards are the main places for communication. Compared with ‘street institutions’ in the first half of Medieval Europe, the communication spaces changed from urban open spaces to enclosed quadrangles. To some extent, the trend of open spaces in universities became weakened. In the course of time, this isolated courtyard finally became a public social space like a square. Undoubtedly, the most iconic expressions of these spaces are the quadrangles in the universities of Oxford (1167) and Cambridge (1209).

Shown as Figure 2-4 and Figure 2-5, we can clearly see how a series of quadrangles constitute of the community of the university. College buildings

were erected and took shape in a piecemeal fashion irregularly around courtyards (Coulson et al., 2015), with social communal spaces including chapels, dining halls, etc.

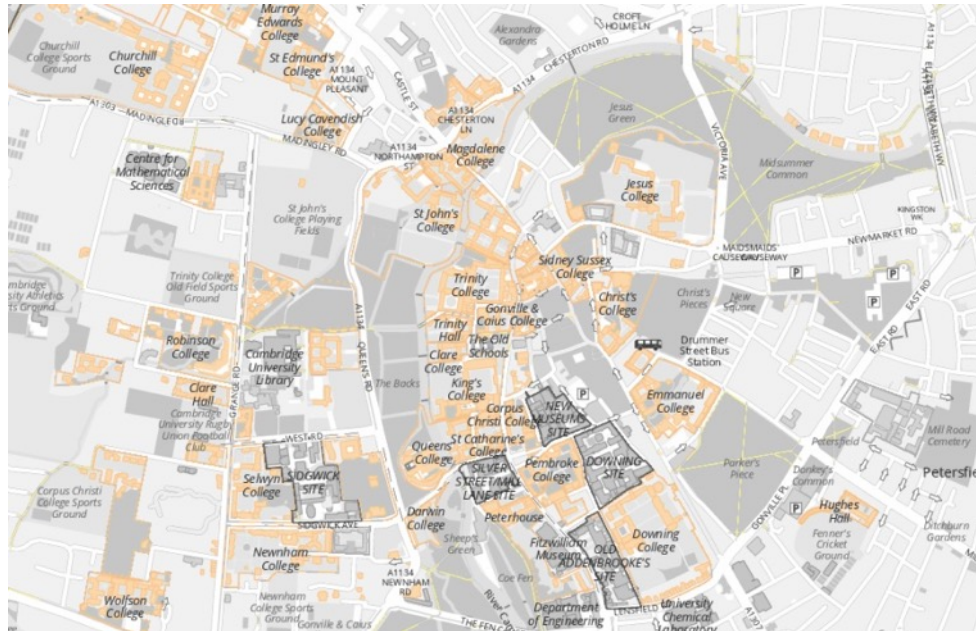


Figure 2-5: Site Plan of the University of Cambridge.

Source from: *The Website of the University of Cambridge*  
<http://map.cam.ac.uk/#52.206393,0.106632,15>

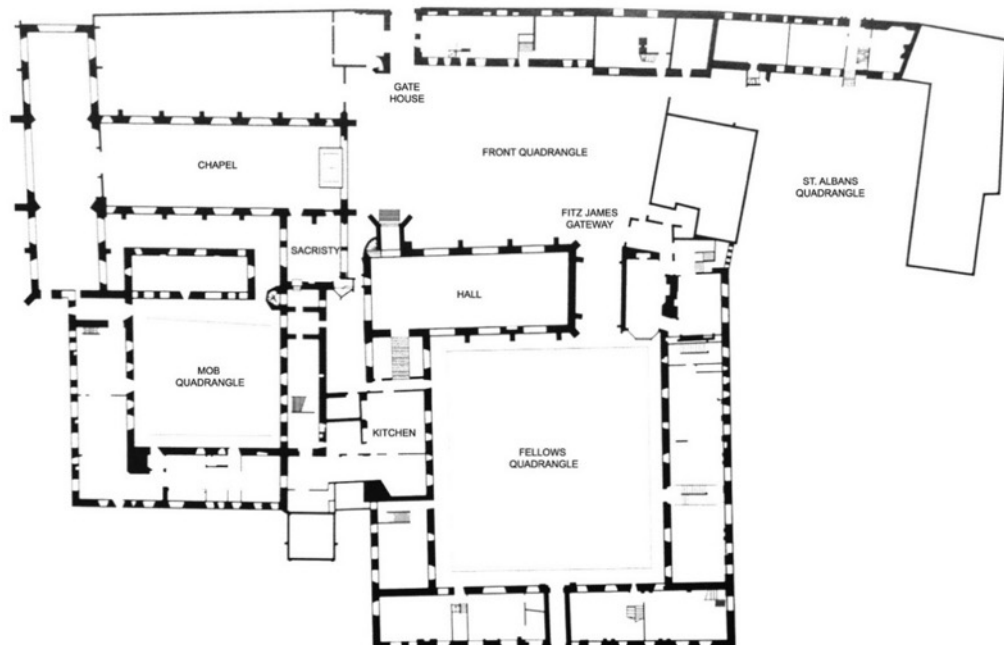


Figure 2-6: Plan of Merton College.

Source from: *University planning and architecture: The search for perfection.* (Coulson et al., 2015: 5)



As Figure 2-6 shows, Merton College (1264) is one of earliest and fully self-governing colleges in the University of Oxford. The construction of the Mob Quad is allegedly believed to be the oldest quadrangle in the University (Coulson et al., 2015). The courtyard pattern is extremely influential and impacted many famous universities later, such as the College of New Jersey, Yale College, Harvard College, and so on. Harvard College (1637), the oldest college in America, planned the living and studying space around the hall.



Figure 2-7: Medieval Universities in Europe.

Source from: *The myth of nations: the medieval origins of Europe* (Geary, 2003)

In summary, the university developed in such a turbulent period from openness towards society to introversion for safety. Even though the spaces moved from the public streets to the enclosed quadrangle, the relationships among the university, the church and the city became increasingly close. In other words, the university and city were integrated together into social spaces - the enclosed

quadrangle, where 'knowledge, belief and life were intertwined together and the supervision of scholars kept independent power on their own' (Wang, 2009: 5).

The enduring language of collegiate architecture, enclosed quadrangles, holds masters' and student's activities. This enclosed courtyard format is widely accepted and simulated throughout European university towns (see Figure 2-7) and even the modern university of China. The enclosed quadrangle pattern, like the University of Cambridge and Oxford, was well-accepted until John Caius and Bishop Matthew Wren created new principles in the 16<sup>th</sup> century, which will be explained in the following section.

### ***2.3.3 The Third Phase: Comprehensive University/Palace Style (From 16<sup>th</sup> Century to 19<sup>th</sup> Century) from Institution to University.***

The campus planning strategy did not change until Bishop Matthew Wren's new design came out. Bishop Matthew Wren is the precursor of the star architects of the modern age. As the vice-chancellor of the University of Cambridge, he is critically acclaimed for traditional patterns of colleges which were well-accepted by the managers of the University of Cambridge and Oxford. He devoted himself to creating openness, vistas with focal points, and hierarchical arrangements that characterised the Baroque style instead of the medieval enclosed quadrangle (Coulson et al., 2015). Impacted by Wren's idea, John Caius re-founded Gonville and Caius College (see Figure 2-8) in 1557. The college's building consists of a chapel, a hall, a library as well as accommodation buildings, reflected its functions as a place for communal life of study and prayer. The pattern of the college is called the Sanitary or three-sided style, with a wall on the fourth side. At the same time, distinct

directionality, central emphasis and two design methods, used in urban design, were introduced into a way of planning campuses as standard academic architectural vocabulary. The strategy of focal points and strong axes provides a systematic method of organising building groups in the campus. This is considered as the Renaissance of University Planning (Ma, 2009).



Figure 2-8: Gonville and Caius College.  
Source from: <http://www.cai.cam.ac.uk/history>

The method of planning the universities is closely related to the development of cities and the changes in educational purposes. Historically, both the industrial revolution and technology were explored in the 17<sup>th</sup> and 18<sup>th</sup> century. The relationship between knowledge and the surrounding society was linked again and emphasised more. New knowledge was explored, and the results would be developed to serve and improve the society where they came from. This was a period of enlightenment and inventions, which were created by philosophers and scientists like Marx, Watt and Newton, who studied and lived in the universities. In other words, the university provided the place which was the centre of enlightenment and inventions. The University of Halle, founded in

1694 by German Frederick III, reformed traditional education in medieval institutions. The system of the university totally changed, and the university first established the principle of autonomy, which is the foundation of the modern university (Boyd & King, 1967). The new university not only emphasised the education of religious belief, but also paid attention to imparting practical knowledge and skills. The University of Halle, together with the University of Gottingen (1737) and the University of Erlangen-Nuremberg (1743), they promoted a new era in Germany and even the Western education world (Coulson et al., 2015).

Obviously, the education concept of European universities in the 17<sup>th</sup> and 18<sup>th</sup> century presented a dualistic perspective - traditional and modern (Chen, 2004). One side had colleges like Oxford and Cambridge which were committed to fostering students who would serve the church and government. The other side, the new university asserted that students should be taught, through practice, knowledge and living skills as well as extraordinary opinions and creativity through independent and free study and research. The university planning pattern of the former was based on organising building groups around enclosed quadrangles, symmetrically, to emphasise solemnity and the position of the religious power. In order to meet the requirements of freedom, the latter created a series of libraries and classrooms for science subjects like physics and chemistry.

In the 19<sup>th</sup> century, the development of the industrial society and the background of technological progress, made the position of the university change from a place cultivating minority groups to a '*knowledge palace*' where knowledge



played a predominant role (Chen, 2004). Combined with multiple disciplines, comprehensive and modern university presented a new campus view from scale to pattern. The Humboldt University of Berlin (1810) was a good example (see Figure 2-9), simulated by universities all around the world. The morphology of the palace highlights the essence of containment. The Antechamber, as an architectural element was introduced into the accommodation. City elements like streets and squares were integrated into the academic community, which made the palace space even more like a kind of miniature city. The Palace style, with multi spaces and multi disciplines, resulted in a prototype of the university campus (Zhang, 2009).



Figure 2-9: Urban styles of Humboldt University of Berlin.

Source from: <http://footage.framepool.com/de/shot/211953160-wilhelm-von-humboldt-campus-mitte-humboldt-universitaet-unter-den-linden>

**2.3.4 The Fourth Phase: The American University Style and the Red-Brick University (From 18<sup>th</sup> Century to the First Half of the 20<sup>th</sup> Century) from Campus to Civic University.**

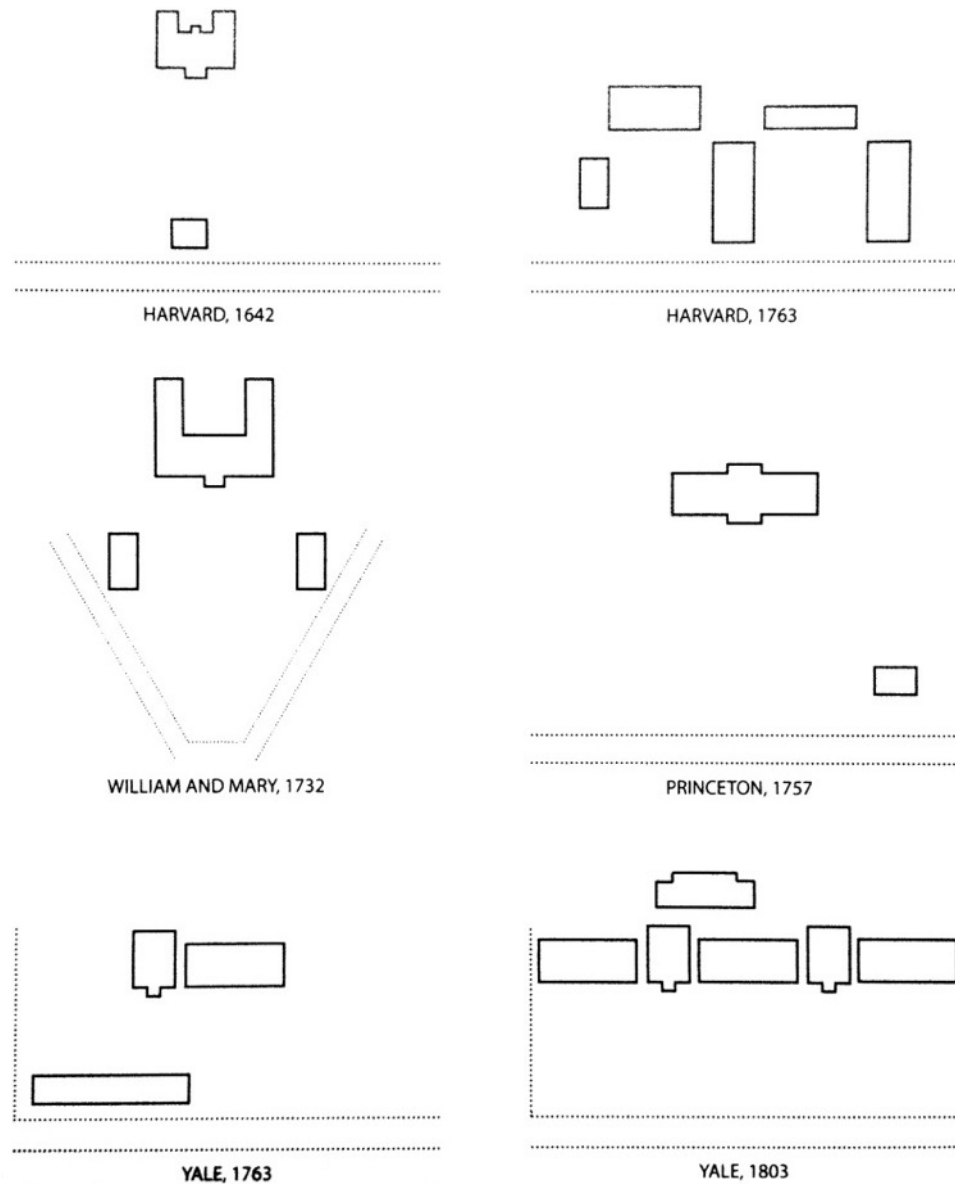


Figure 2-10: Layouts of the American Colleges.  
Source from: *Campus: An American planning tradition* (Turner, 1987: 19)

When higher education spread into New England, early American colleges followed the English tradition that the university should encompass living, society and academia. However, they largely rejected traditional enclosed quadrangle patterns. Instead, American institutions opted for and often adopted spatial patterns themselves, locating buildings in an open landscape (see Figure

2-10). The spirit of democracy and freedom were integrated into university planning since American Independence Day. Overall, university planning trended toward a spaciousness place where being open and green and being approachable and accessible to the community. One of the typical universities was the University of Virginia (see Figure 2-11), founded by the country's president Thomas Jefferson in 1819. The layout organised the lawn as a central point, the library as a focal point, with arranged masters' living houses and classrooms around ten courtyards separately. The open three-sided courtyard without brick walls was enclosed by colonnades. A symmetrical layout emphasised an open central square and library (Coulson et al., 2015).

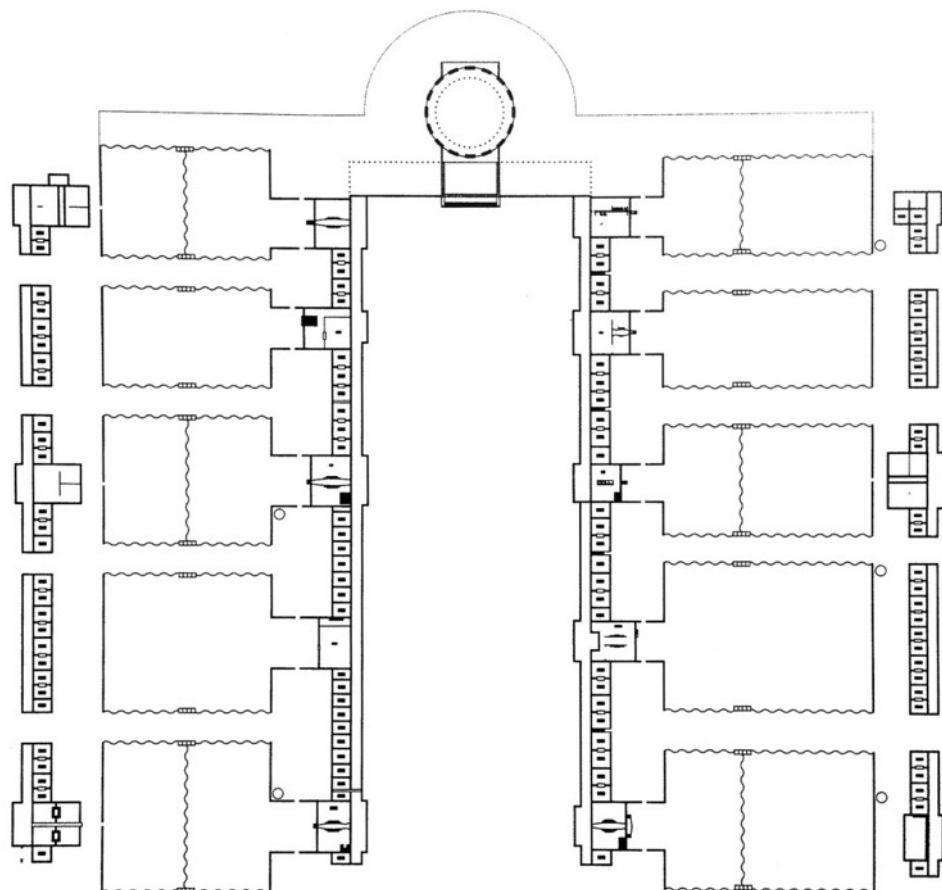


Figure 2-11: Schematic Plan of the University of Virginia.  
*Source from: based on Jefferson's 1822 plan*

Though the layout was known all over the world, increasingly, universities opted for a natural layout, coming from the ideas of Frederick Law Olmsted (the Father of American landscape architecture). This, was asymmetrical, more sustainable and in harmony with the surroundings, and in favour of flexible development and expansion. Natural universities were recognised for their beauty and uplifting potency and the relationship between the landscape and the university fulfilled much more flexible space usage around the institutions. The campus of Berkeley (1866), the University of California planned by Frederick Law Olmsted, where the layout was irregular and picturesque, was an example (Coulson et al., 2015). Convinced by the impact of the physical setting upon behaviour, he championed the location and design of the campus as a key ingredient of the civilising mission of higher education. Though the plan had never been executed, the influence stretched across the country, far into the next century.

However, the movement of City Beautiful, originating from the World's Columbian Exposition in Chicago, had a resounding impact upon campus design. Many universities began to consider themselves as cities. Bywords, such as 'City of Learning' and 'Collegiated City' came into common usage, and, indeed, came to shape the built form of the institutions (Chapman, 2006; Turner, 1987).

In terms of 'City of Learning', six Redbrick Universities in England sought to open up education towards their local students, often financed by wealthy industrialists. For this reason, the redbrick universities were located in the hubs of the industrial revolution, Birmingham, Bristol, Leeds, Liverpool, Manchester

and Sheffield. The campus was totally merged into the urban fabric and the space in the campus and cities were integrated. People learnt and lived in the 'Civic University'. The university campus had no boundaries with its city. They shared the same public park and nearby hospitals.

Architects played a prominent role in developing the campuses. They focused on a series of social movements and professional research spaces like Landscape areas like the Beaux-Arts Movement, etc. All these had an impact on the architects' and clients' minds. In this period, the universities in different areas developed towards a more spacious concept while being open to the public, from nature to city. The boundary between the city and the university was gradually blurred. Though Collegiate Gothic styles had no influence on campus planning, the refined detailing and the iconic skyline of the spires and towers held the imagination of the next forty years.

### ***2.3.5 The Fifth Phase: The Modern University (The Second Half of the 20<sup>th</sup> Century) Characteristics of the Modern University.***

In the opening decades of the twentieth century, educational philosophy propelled the development of the ideal campus. The coexistence of the Collegiate City and Collegiate Gothic was contributed to revealing the growing introspection of university planning. The university embraced a series of characteristics of the Modern University.

#### ***2.3.5.1 Combined with Industry.***

With the development of universities increasingly becoming comprehensive and multi-disciplinary, Science or Industrial Parks became a new style,

combining university and enterprise together. A successful typical Science Park is the Silicon Valley which was affiliate to the University of Stanford in 1950s. The Science Park has a strong link between the university and the city. The academic achievements were applied to industrial development, which promoted the achievements in scientific research turning into commodities. The space of the Science Park was much like an office space with less teaching and learning activities yet having more communications and discussions on how to transform research into a commodity. This tightly combined the university with industry with Science Parks presented with a strong vitality and productivity (Chen, 2004).

#### *2.3.5.2 Spatial Continuity and Sustainable Development.*

Joseph Hudnut, who introduced modern architecture into the School of Design at Harvard, asserted that the process of planning became more pivotal than the final form – the master plan (Turner, 1987). A similar opinion was stated by the head of Harvard's planning office who stated that, what the university should have was a guided, organic growth rather than a master plan.

‘Let's imagine the university, as the city planners imagine the city, as a growing organism whose form lies partly in the past, partly in the future. Our university will never be completed.... If we make a master plan then, it must be in such general terms as will admit of new interpretations and unexpected development. We can take nothing for granted. Those facilities which have endured the longest may be the first to disappear.’ -- Hudnut, 1947: 37

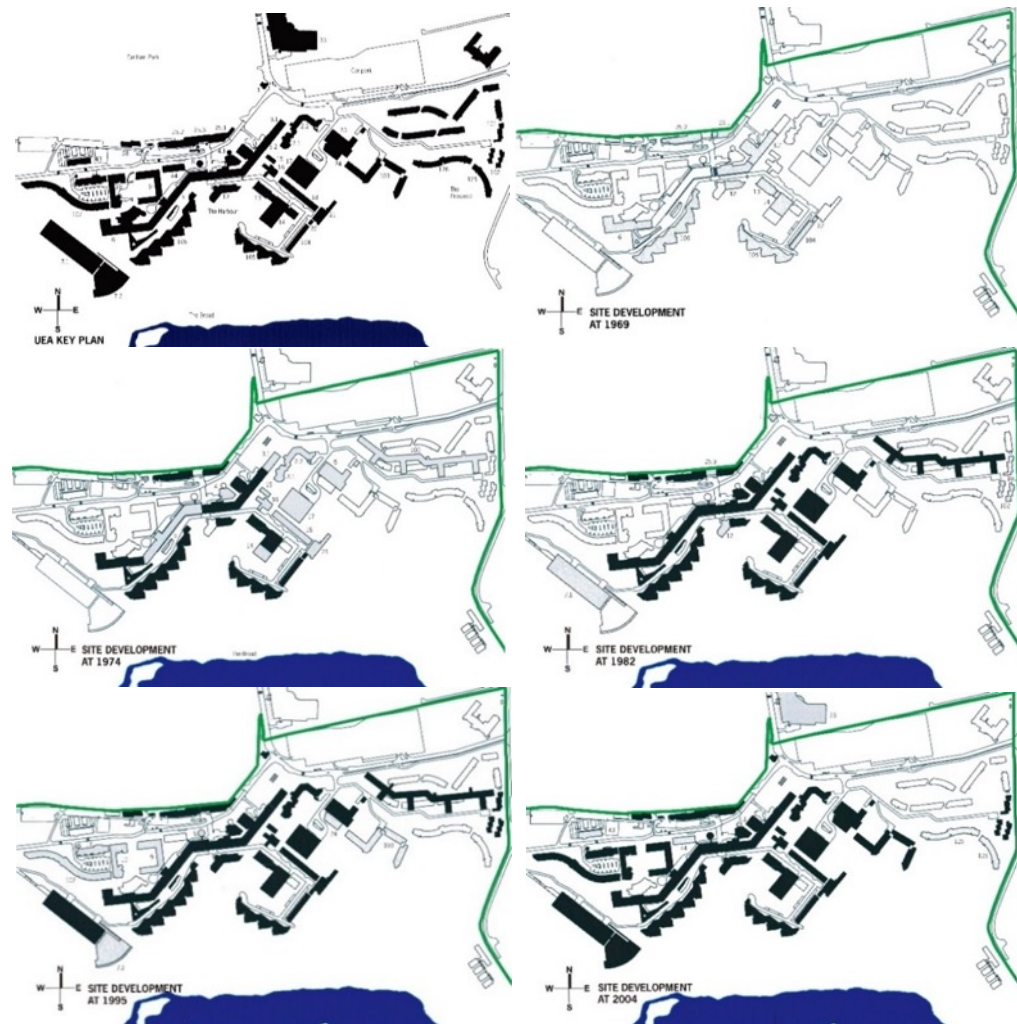


Figure 2-12: Master Plan of the University of East Anglia.

Source from: [http://www.uea.ac.uk/polopoly\\_fs/1.50472!conservation%20strategy.pdf](http://www.uea.ac.uk/polopoly_fs/1.50472!conservation%20strategy.pdf)

A dynamic and flexible concept emphasised organic growth as well as a standardised and modular scheme to accommodate changing requirements. Meanwhile, the concept would take future sustainability into consideration.

The schemes of the university emerged based on modern architectural theory around the 1960s. The planning system paid more focus to traffic organisation, new energy exploration and utilisation and the integration and rationality of specific functional spaces. The planned schemes emphasised the process of design and planning to find out the final results without taking expansion into consideration. The technical University Munich DE is one such case. The planned scheme did not predict the expansion in the 1960s and 1970s. The

stringent need for land for expansion cannot be satisfied due to unplanned fields around the campus which mostly had been occupied by small-scale housing. On the other hand, the campus planning of the University of East Anglia (see Figure 2-12) in Norwich, UK, was a good example. It is a compact campus, revised several times, in over thirty years, which realised the continuity of the planning concept. This formed a vivid and organic growth of the campus space.

#### *2.3.5.3 Open and Functional-Centralised.*

In order to solve the conflicting priorities between campus expansion and limited land, a good way is to create function-centralised, high-density and even high-rise buildings for educational use to increase efficiency. Hence, the universities pay more attention to multi-disciplinary communication, applications and explorations. Enclosed college formats and scattered layouts would not meet the requirements and impede people's communication in different subjects. Open campuses with function-centralised complex teaching buildings became a prominent style to organise the space in universities. The complex or functional-centralised teaching building became the icon of the university and played a pivotal role to provide a public social space. Highly integrated infrastructures were also convenient to manage and were ideal for energy conservation.

#### *2.3.5.4 Sustainability and Dynamic Pedestrian and Vehicular Systems.*

Rapid urbanisation led to the overuse of the greater level of natural resources whilst companies, organisations and governments realised that eco-friendly and



sustainable societies are necessary and that cities played a pivotal role in sustainability (Rees & Wackernagel, 1996; Bulkeley et al., 2011). Girardet (1999) advocates that environmental sustainability has become a hot issue in urban development. University as an institution or academic community, support sustainable urban development in two forms (Goddard & Vallance, 2013: 91):

‘... from one hand, as a university estate, university located in the city with green in the campus, which directly link to sustainable urban development; from the other hand, ‘skill workers’ from the institutions are involved into the governance and organisations to reinforce the application of technologies, strengthen the link between academic and practice, propose sustainable strategies and policies’.

The first form has a direct influence on the physical facilities of a university. The concept of the urban laboratory is presented to indicate the position of the campus in sustainable urban development (Evans, 2011; Karvonen & Heur, 2014). One could take the Jubilee Campus at the University of Nottingham as an example. Increasingly collaborative and interdisciplinary experimentation in sustainability did and has been done in the campus. Sustainability engagement has activated the economic development of cities and involved more practices and attention in return. This has also increased the competitiveness and influence of the 21<sup>st</sup> century universities.

### **2.3.6 The Sixth Phase: The 21<sup>st</sup> Century University.**

Learning spaces are seen as the most important contemporary infrastructure for learning in the 21<sup>st</sup> century (Uduku, 2015). When facing the issues of a student-population booming, the development of the university has to expand. Unlike previous centuries that focused on creating more learning spaces, the 21<sup>st</sup> century requires increased flexibility in the learning spaces (Uduku, 2015). This fulfils the students' different requirements and makes the learning spaces '*capable of continuously reconfiguring themselves*' (Pearlman, 2010: 124). Informal learning spaces are built in the higher education learning environment to facilitate the 21<sup>st</sup> century learning.

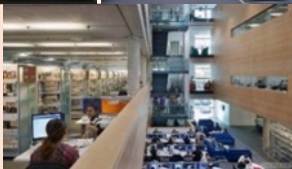
Table 2-1: Examples of cited UK innovated learning landscapes  
*Source from: Reshaping learning—an introduction (Boddington & Boys, 2011)*












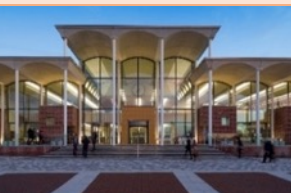
	Joint Info System Committee (JISC) 2006	Watson et al., 2007	Birmingham Uni LDU, 2005	Scottish Funding Council, 2006	Harrison. A. & Cairns, A. 2008	Neary et al, 2010
Learning Gateway, St Martin's College, Uni. of Cumbria	x	x				2
Telford FE College, Edinburgh	x			x	x	3
The Saltire Centre, Glasgow Caledonian University	x	x	x	x		4
Civic Quarter Library, Leeds Met University	x		x			2
South East Essex FE College	x		x			2
InterActive Classroom, Uni. of Strathclyde	x		x			2
The Learning Grid, Uni. of Warwick	x		x			x 3
CETL in Creativity, Uni. of Sussex	x					1
The Hive, Queen Mary, Uni. of London						x 1
White Space, Uni. of Abertay						0

A lots of informal learning spaces in higher education are cited by researchers to innovate and recreate the informal learning spaces in UK (see Table 2-1), which can be seen in the review of learning space (Boddington & Boys, 2011). It can be seen that the good examples are always cited as distinct examples. More empirical research on different cases are needed to examine the existing theoretical framework of designing informal learning spaces in higher education. This is partly why I explore more samples of informal learning spaces in Table 2-2.

The Table 2-2 presents the cases of the 21<sup>st</sup> century higher education informal learning spaces, including the name, location, year of building and the designer of the learning spaces, distinct images of the selected cases, and the model of the informal learning spaces. It is not easy to tell how much contribution to the innovation of the 21<sup>st</sup> century higher education informal learning spaces they have made. Nonetheless, through an architectural review and field trip (throughout UK campus and one field trip in New York) by the author (PhD researcher), it could be clearly seen that the distinct characteristics of higher education's informal learning spaces is inclusive in its informal learning spaces. These cases, including informal learning spaces, meet the definition of the 21<sup>st</sup> century learning space as they are flexible and reconfigurable, permit students and faculty to personalise their experiences, facilitate individual and collaborative learning, allow the use of technology, and, most importantly, can be reimagined to meet current and future needs (Narum, 2013).

Table 2-2: Cases of the 21<sup>st</sup> century higher education informal learning spaces.

Name, Location, Built Year, and Designer	Distinct images of the 21 <sup>st</sup> century informal learning spaces		Models
<i>The New School</i> New York, US 2014, SOM <a href="http://www.som.com/projects/university_center_the_new_school">http://www.som.com/projects/university_center_the_new_school</a>			Leverage circulation areas
<i>John Jay College of Criminal Justice</i> New York, US 2012, SOM <a href="http://www.som.com/projects/john_jay_college_of_criminal_justice">http://www.som.com/projects/john_jay_college_of_criminal_justice</a>			Leverage circulation areas
<i>Columbia University Medical Building</i> New York, US, 2016, Diller Scofidio + Renfro & Gensler <a href="http://www.dsrm.com/projects/columbia-medical-center">http://www.dsrm.com/projects/columbia-medical-center</a>			Leverage circulation areas
<i>The Arts Tower</i> Sheffield, UK 1966 refurbished in 2011, HLM Architects <a href="http://www.hlmarchitects.com/projects/education/the-arts-tower-sheffield.html">http://www.hlmarchitects.com/projects/education/the-arts-tower-sheffield.html</a>			Learning commons
<i>Information Commons Sheffield</i> UK 2007, RMJM			Information Commons
<i>The Diamond</i> Sheffield, UK, 2015, Twelve Architects <a href="http://www.twelvearchitects.com/portfolio/item/the-university-of-sheffield/">http://www.twelvearchitects.com/portfolio/item/the-university-of-sheffield/</a>			Leverage circulation areas
<i>The Adsetts Learning Centre</i> Sheffield Hallam University, UK 2011, AMA Alexi Marmot Associates			Learning commons
<i>Stoddart building</i> Sheffield Hallam, UK, AMA Alexi Marmot Associates <a href="http://aleximarmot.com/sheffieldbusinessschool/">http://aleximarmot.com/sheffieldbusinessschool/</a>			Leverage circulation areas

<p>Hult International Business School London UK, 2015 Sergison Bates Architects <a href="http://sergisonbates.com/en/projects/university-aldgate">http://sergisonbates.com/en/projects/university-aldgate</a></p>	 	<p>Leverage circulation areas</p>
<p>Maths Building, UoN, 2015 William Saunders Partnership <a href="http://www.curtins.com/case-study/university-of-nottingham-math-building-nottingham/">http://www.curtins.com/case-study/university-of-nottingham-math-building-nottingham/</a></p>	 	<p>Leverage circulation areas</p>
<p>Newton and Arkwright buildings Nottingham, UK 1950 refurbished in 2009, Hopkins Architects <a href="http://www.hopkins.co.uk/projects/16/113/">http://www.hopkins.co.uk/projects/16/113/</a></p>	 	<p>Leverage circulation areas</p>
<p>Amenities building Nottingham UK 2008, Make Architects <a href="http://www.makearchitects.com/projects/jubilee-campus/">http://www.makearchitects.com/projects/jubilee-campus/</a></p>	 	<p>Learning commons</p>
<p>Highfield House Nottingham UK 2012, Lathams, Derby <a href="http://www.lathamarchitects.co.uk/projects/projects_architecture/project/523">http://www.lathamarchitects.co.uk/projects/projects_architecture/project/523</a></p>	 	<p>Learning commons</p>
<p>Heart of Campus, Nottingham Trent University Nottingham UK 2015, Evans Vettori architects</p>	 	<p>Leverage circulation areas</p>

The design qualities of the spatial organisation of learning environment receive huge attention. More specifically, the Joint Information Systems Committee (JISC, 2006) has described the design quality of the spatial organisation of the 21<sup>st</sup> century higher education informal learning spaces, as flexible (able to accommodate both current and evolving pedagogies), future proofed (can be re-allocated and reconfigured), bold (look beyond tried and tested technologies and pedagogies), creative (energize and inspire learners and teachers), and

supportive (develop the potential of all learners). Additionally, they are, enterprising (capable of supporting different purposes), able to motivate learners, able to promote learning as an activity, able to support collaborative as well as formal practice, and able to provide a personalised and inclusive environment (Adedokun et al., 2017). Furthermore, Council (2006) also stresses the design quality of the spatial organisation of the 21<sup>st</sup> century learning spaces, including specifications, scale, air/heat/light including the look and feel, sustainability, utilisation and space management. In addition, the 21<sup>st</sup> century higher education's informal learning spaces offer students a series of support systems, including an IT-rich environment, sufficient plugs and sockets, and other supports. This integration of learning technologies and other support systems helps to enhance student experiences in the higher education's informal learning spaces.

However, more empirical research on exploring the success of the 21<sup>st</sup> century higher education's informal learning spaces is needed. In order to investigate the design quality of spatial organisation for higher education's informal learning spaces, this thesis has selected two case studies, the Diamond at the University of Sheffield and Newton at Nottingham Trent University (see Chapter 4 section 5). The two case studies both include informal learning spaces, with a model of leverage circulation area. A detailed description of the cases is shown in section 5 of the methodology chapter.

### **2.3.7 Summary.**

Historically, the university provides physical learning spaces to support the students' requirements. From Plato's Academy to the 21<sup>st</sup> century learning



spaces, the progress of places for higher education present a number of interesting characteristics in the different social, cultural and pedagogical contexts. The relationship between universities and societies is intertwined and consistently propelled. Six generations mentioned in this section cannot be strictly separated by time periods because of cultural diversity and different social contexts. Nevertheless, it can be seen from Table 2-3 that the higher education learning spaces are organised between scattered, single-functional, and enclosed to centralised, sophisticated, multi-functional and civic spaces.

Table 2-3: Six generations on how to organise buildings and spaces in the university.

Generations	Years	University Planning Format	Cases
<b>The Historical Origin of Education Concept</b>	387BCE - 5 <sup>th</sup> Century	<b>Location:</b> Olive Groves and path in the garden (informal spaces) <b>Content:</b> mathematics as well as the philosophical topics <b>Spatial Arrangement:</b> Involving Living and education spaces	<i>The Plato Academy The Lyceum Academy</i>
<b>From Guild to College</b>	5 <sup>th</sup> Century - 11 <sup>th</sup> Century	<b>Location:</b> No specific place to be located. Street, church, teachers' living room or rented houses <b>Content:</b> Theology, Law <b>Spatial Arrangement:</b> non specific	
	11 <sup>th</sup> Century - 15 <sup>th</sup> Century	<b>Location:</b> City centre <b>Content:</b> law, medicine and theology <b>Spatial Arrangement:</b> Monastic enclosed quadrangle, the four-sided courtyard format	<i>Colleges in Oxford and Cambridge</i>
<b>From College to University Campus</b>	15 <sup>th</sup> Century - 18 <sup>th</sup> Century	<b>Location:</b> non specific <b>Content:</b> Increased spaces on labs and classrooms on Chemistry and Physics; practice knowledge and living skills as well as extraordinary opinions and creativity by independent and free study and research. <b>Spatial Arrangement:</b> three-sided style, with a wall in the fourth side; Comprehensive university, combined with many institutions and colleges; City elements like streets and squares are integrated into the academic community, which make the "Palace" space even more like a kind of miniature city	<i>University of Halle</i>
<b>From Campus to Civic University</b>	18 <sup>th</sup> Century - First half of 20 <sup>th</sup> Century	<b>Location:</b> Located in the natural environment <b>Content:</b> Teaching and scientific research <b>Spatial Arrangement:</b> An open green grounded, spacious, unsymmetrical layout, approachable and accessible to the community	<i>The University of Virginia</i>
<b>Modern University</b>	The second half of the 20 <sup>th</sup> century	<b>Location:</b> Civic University and campus style <b>Content:</b> Combined with Expertise, <b>Spatial Arrangement:</b> unsymmetrical, more sustainable and harmony toward the surrounding in favour of flexible development and expansion, Function-Centralized, Dynamic Pedestrian and Vehicular System	<i>the University of East Anglia</i>
<b>The 21<sup>st</sup> Century University</b>	From 2000s to present	<b>Location:</b> Every campus, Metropolitan <b>Content:</b> Informal learning <b>Spatial Arrangement:</b> A change from initially focusing on formal learning to as well as the informal learning process	<i>Columbia University Medical Building</i>

As a whole, the layout transforms from monastic enclosed quadrangles with symmetrical axes towards a spacious, unsymmetrical pattern focusing on the

relationships between the campus and its surrounding environments. The educational buildings' layouts tend to be organised from scattered layouts to blended and centralised patterns. The functions of educational buildings in the campus from single subject with living to a 'miniature city', promote students, not only in their learning but also with socialising spaces and activities to enhance a sense of community and encourage engagement.

In conclusion, the historical literature review of the development of the university indicates that the spatial design of the university follows the pedagogical requirement and differing forms of social changes. Therefore, it is necessary to clarify the current pedagogical theory and social changes. The next section interprets the current thinking on the relationship between learning and space.

## **2.4. THE CURRENT THINKING ON THE RELATIONSHIP BETWEEN SPACE AND LEARNING.**

### ***2.4.1 The Background to the Spatial Design of the Learning Landscape in Higher Education – the Theory of Public Space.***

The development of the 21<sup>st</sup> century higher education is experiencing rapid change. Consequently, four distinct characteristics of higher education are listed by Barnett (2014): i) the marketization of higher education; ii) the emergence of students as consumers; iii) the potential of new digital technologies; and, iv) the apparent potential for widening higher education at reduced unit costs.



The marketization of higher education and the emergence of students as consumers has made campus managers start to pursue design qualities of the university campus to attract potential students. Meanwhile, the development of technologies shapes student learning styles and the learning processes can happen outside of the classroom. Consequently, in-between spaces, such as corridors and atria, are particularly designed to intensify the efficiency and efficacy of the learning process. The design of the in-between learning spaces can be adopted from the public space design approach in urban theory and planning.

As Gehl mentioned in his book *'Life Between Buildings'* (2011), people enjoy watching other people, looking out for people they know, and some of them enjoy being watched. People appreciate the way space feels safer when there are other people around. This social experience is also stressed by Jacobs (2016). High quality public space in the urban context, the 'space between buildings', is extremely important for encouraging these positive social experiences, and this is increasingly recognised in the design of towns and cities. Higher education campuses need to also consider their public spaces to support student learning experiences in the university. Gehl and Gemzoe (2000: 27) has more recently summarised the three main features of good public space in a city by prioritising thoroughfare, meeting place and marketplace:

*Public space in a city encourages people to move through it by foot or on bike, so it needs to have destinations at either end as well as along the route. In a learning setting, the thoroughfare means that the space is used to access a number of different semi-private rooms or facilities.*

*Meeting place means that there are furnishings that encourage people to stop and chat with each other. In urban settings, this means benches and tables to sit at, pillars to gather around and lean things against, and trees to provide shade. In the learning environment, this might mean small, round tables to gather at, 'edge' seats in windowsills or booths, and floor cushions. The marketplace can refer to shops and stalls, but also to any place at which a transaction of ideas or performance might occur. In higher education, this might be any place where the communications occur, such as libraries, and cafes.*

The checks of 'thoroughfare, meeting place and marketplace' (Nair & Gehling, 2010) are useful indicators of a space's effectiveness at supporting a wide range of formal and informal learning activities for students.

#### ***2.4.2 Applying Urban Theory to the Design of the Learning Space.***

As defined earlier, the university is a mini city (Kerr, 2001). That is to say, the university is a city for supporting student lives. The design of the learning space, groups students together and delivers knowledge to them. The university is more like a factory while the city can also be seen as one big money-making factory (Nair & Gehling, 2010). Another reason is that much in the same way as modernist city planners, there are attempts to create places for people sharing ideas and communicating with each other. Encouraging students' learning outside of the classroom, the design of the 21<sup>st</sup> century university can be seen as the urban place to support people's activities. To this point, the informal learning spaces, such as corridors and atria, are now being designed to enhance student learning experiences.

It is important to understand why urban theory can be applied to the campus design. The application helps to understand student activities in the informal learning spaces and enhances the design of the informal learning spaces to oppose the traditional spatial configuration of the university.

#### **2.4.3 The Higher Education Learning Spaces.**

Previous section interprets the definition of the university in chronological order and the development of the higher education learning environment from a historical perspective, which states that the learning environment in higher education can change based on pedagogical theory, social and cultural issues. The changes of the higher education learning environments are not only on the function of the shelter and the control of activities by those involved, but also about opportunities for the verbal and nonverbal communication of ideas (Rapoport, 1982). These communications indicate the shift in learning styles. The shift, from the teacher - centred model, learning towards student – centred model, has been supported by a growing body of research and theory, pointing to the benefits of learning which include changes in learning styles. The learning styles of different students are dynamic and varied. According to a well-known proverb: *'there are a thousand Hamlets in a thousand people's eyes.'* Students learn through a variety of learning styles like the visual, aural, verbal, social, and the solitary etc. These learning styles, which when used properly, directly enhance student learning experiences in the higher education learning environment. Students should, especially, be given the freedom to develop their own learning styles in solving problems (Felder & Silverman, 1988). Students can also determine their learning models, including individual and group study.

Furthermore, the increasingly student populations from different nations has also prompted a new, more tailored, spatial design approach to learning. All these require a more inclusive and diverse higher education learning environment to fulfil different needs. More specifically, the learning space should be designed towards all the people, make more contributions to communication and interaction and become much more flexible, comprehensive and open. In many institutions, spatial types are increasingly being designed primarily around patterns of human interaction rather than the specific needs of particular departments, disciplines or technologies. Through that, students can obtain more mixed learning experiences.

Based on the environment behaviour theory, the built environment in human lives plays a pivotal role in human cognitive activities, like perception, cognition and actions. That is to say, the built environment clearly serves many multifunctional purposes. This helps architects fulfil many needs when spaces are appropriately configured. As needs change, we strive to change the built environment in order for it to function well (Lang, 1994: 29). This logic is also suitable for higher education learning environments. Based on a series of the organisations and conferences, academics and researchers, who are interested in learning and its space, have made significant contributions to the field.

More specifically, Moos (1976) summarised the environmental impacts on human behaviour and then specifically focused on the education settings. Meanwhile, the learning space is not simply limited for single action - learning. It is an action integrated with all the student activities happening in one community. Learning requires a kind of community where the space integrates

living, working and playing together (see Figure 2-13). Consequently, the ‘learning landscape’ concept has been used to develop spatial models for universities which recognise that learning is not just confined to formal teaching spaces and that the quality of the student experiences is impacted by all aspects of their physical learning environments.

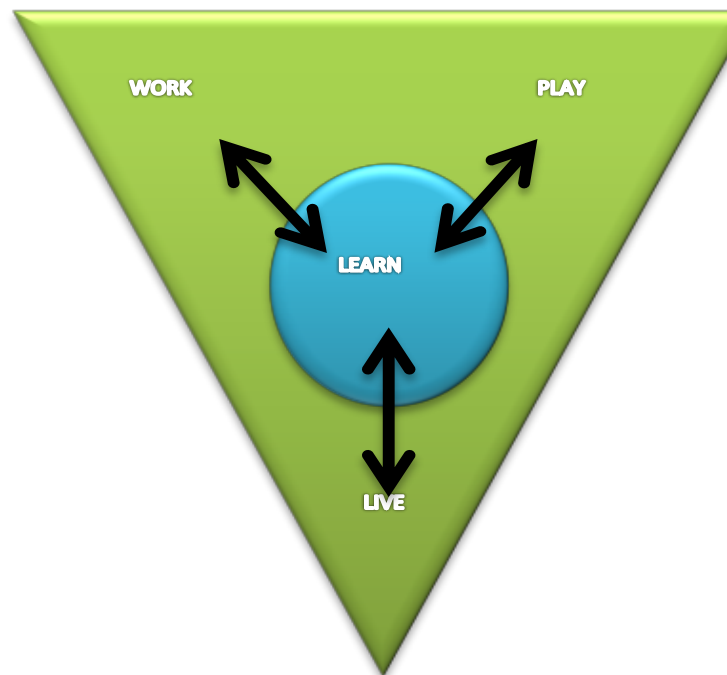


Figure 2-13: Integrated Communities Linked Through Learning.  
*Source from: Design for the Changing Educational Landscape: Space, Place and the Future of Learning (Harrison & Hutton, 2013)*

The concept of the learning landscape has emerged as a way of thinking holistically about the spatial organisation of the universities (also see section 2 of the chapter 1). While there is no agreement or simple definition as to the precise meaning of the term - learning landscape (Thody, 2008), the use of this metaphor encourages multidimensional thinking about the construction of universities which has been missing from the debate regarding the future of higher education (Neary & Thody, 2009). The concept of the learning landscape has been used to describe the changes that are being made to learning environments.

The revolution of educational facilities happens from the mere upgrading of traditional teaching accommodation to the provision of student focused spaces, which are often designated as social learning, or even just social spaces. Eventually, the campus is likely to comprise a mix of formal classroom types, with traditional-style spaces and new styles such as done by Neary et al. (see Figure 2-14) and, most importantly, new-generation blended spaces for more collaborative, active learning approaches.

The Mapping Profile

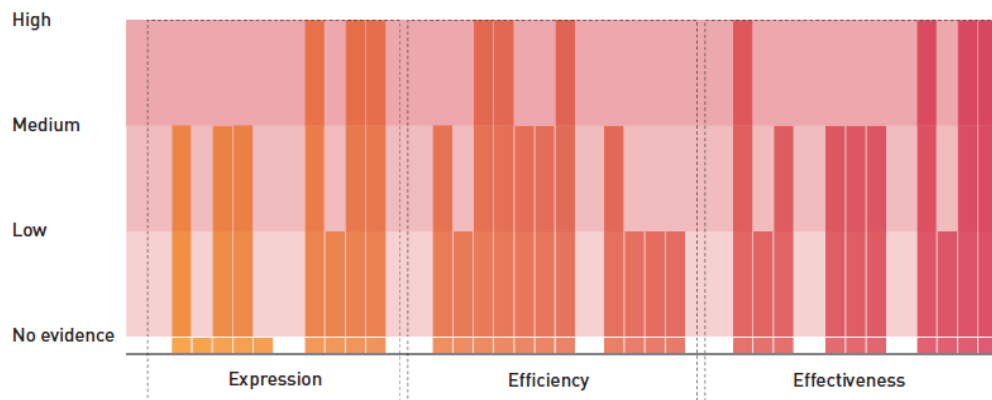


Figure 2-14: Qualitative analysis of the Mapping Profile.

Source from: <http://learninglandscapes.blogs.lincoln.ac.uk/files/2010/04/FinalReport.pdf>

This global information environment, in which learners are immersed, requires new perspectives and fresh approaches for campus planning. Led by DEGW and the University of Lincoln (Neary et al., 2010), A Learning Landscape approach has been developed to respond to this challenge.

The approach has been developed initially through an analytical framework of the campus for higher education institutions and is a first-time feature (see Figure 2-14). It classifies 'Learning Points', which includes 'social learning spaces', 'social learning supported by students', 'experimental teaching spaces', 'research and teaching spaces', 'technology/media' and 'postgraduate

provision’, in twelve UK campus files (Neary et al., 2010). Through the site visits and semi-structured interviews, a number of compelling themes on the design and development of teaching and learning spaces have been derived from the research. The themes include the relationship between teaching and research, the importance of support and service models, leadership, the virtual and the built environment, a.o. After the analysis and discussion of the campus profiles, a set of development tools for Learning Landscapes in Higher Education has been developed. The final report argues that the concept of value has become increasingly important for the design and development of effective and efficient buildings, as well as spaces that express the ideals and the identity of the client and customer. In other words, the tool is essentially a matrix that investigates the spatial criteria that are encompassed in three fundamental qualities of good design: ‘Efficiency’, ‘Effectiveness’ and ‘Expression’ (see Figure 2-14). Based on the analysis and the development of the tools, Learning Landscapes Principles have been proposed (see Table 2-4).

Table 2-4: The Learning Landscapes Principles.

Source from: <http://learninglandscapes.blogs.lincoln.ac.uk/files/2010/04/FinalReport.pdf>

- 
- ♦ *Drive research into effective teaching and learning*
  - ♦ *Provide support models for staff and students on how to use innovative spaces, with provision for mentoring*
  - ♦ *Include students, as clients and collaborators, ensuring their voices are heard*
  - ♦ *Evaluate spaces in ways that are academically credible, based on measures of success that reflect the kinds of activities that are taking place*
  - ♦ *Understand the importance of time as an issue for space planning: not just spaces, but space-time*
  - ♦ *Connect the learning and teaching spaces with the campus as a whole, in ways that articulate the vision and mission of the university*
  - ♦ *Recognise and reward leadership that supports the development of learning and teaching spaces*
  - ♦ *Create formal and informal management structures that support strategic experimentation*
  - ♦ *Clarify roles, grounded in supportive relationships between and across professional groups*
  - ♦ *Intellectualise the issues: generate debate on the nature of academic values and the role and purpose of higher education: the idea of the university*
-

The research on Learning Landscapes has given us an overview and framework on how to evaluate learning environments from an estates management perspective. However, the research has focused on the whole view of the campus from the perspective of managers and does not provide specific strategies on learning environment design. even through the intellectual framework for these tools can also be found in other researcher sources like, Lynch's (1960) '*The Image of the City*', Jacobs' (2016) '*Death and Life of Great American Cities*', and Krier's (2006) '*Town Spaces: Contemporary Interpretations in Traditional Urbanism*', there is no explicitly explanation what is a good expression as a physical design quality of the learning space, how to design an informal learning space in higher education to ensure its efficiency and effectiveness. Hence, these questions helped to generate an analytical framework (see Table 3-15) in evaluating the informal learning spaces.

The Learning Landscape is the total context for students' learning experiences and the diverse landscape of learning settings available today – from the specialised to the multipurpose, from formal to the informal, and from the physical to the virtual. Temple and Fillippakou (2007) state that the 'Learning Landscape' is the space around the campus and within buildings, which can help to create a sense of belonging, as well as facilitating peer-group discussion and thus informal learning. The goal of the Learning Landscape approach is to acknowledge this richness and maximise encounters among people, places, and ideas, just as a vibrant urban environment does (Neary, 2008). To apply a learner-centred approach, campuses need to be conceived as 'networks' of places for learning, discovery, and discourse between students, faculties, staff,



and the wider community. They are not only for formal but also for informal learning spaces in the campuses and all need to be created with more effectively as well as efficiently.

Originally used in relation to schools and colleges, the term has recently been applied to higher education to describe what is regarded as '*a design in educational transformation*' (Harrison & Hutton, 2013: 271), and a silent revolution in the design of teaching and learning spaces in higher education (Chiddick, 2006). As the definition section of the first chapter mentioned, the learning landscape in higher education includes both formal and informal learning spaces. While, the learning environment of the 21<sup>st</sup> century higher education focuses on both the efficiency and efficacy of the formal learning space and the informal learning space, the missing focus on the design of the informal learning spaces and the space between, should be designed meticulously (see Figure 2-15). Temple and Fillippakou (2007) reviewed that there was a broad acceptance in the literature which emphasised that the design of the informal learning space, around the campus and within buildings, can help to create a sense of belonging, as well as facilitating peer-group discussion and thus informal learning processes.

More specifically, JISC (2006) believed that the well-designed informal learning spaces were likely to increase student motivation and may even have an impact on their ability to learn, especially from their informal learning activities. Meanwhile, the high-quality space for informal learning can also enhance socialising for its target groups. For these reasons, the informal learning spaces have been given a high priority in new designs recently and a

collection of educational learning spaces have already been rewarded for their innovation. In other words, the informal learning spaces are increasingly important in the higher education learning environment.

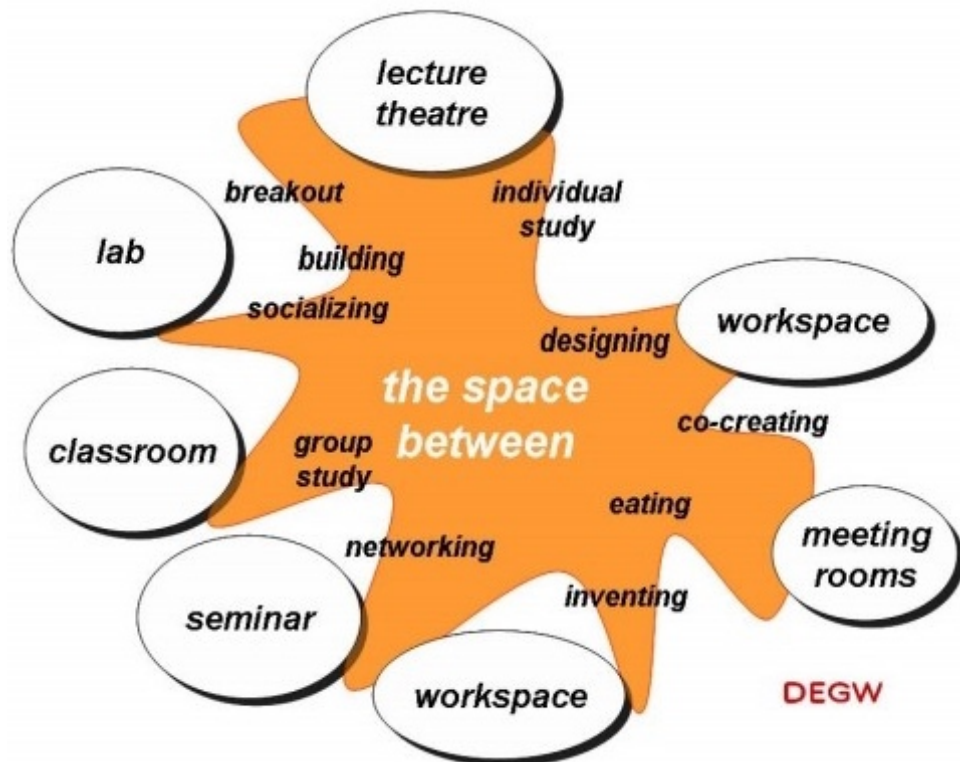


Figure 2-15: The informal learning space - the space between.  
Source from: *Working beyond walls: The government workplace as an agent of change* (DEGW, 2008)

A learning spectrum (see Figure 2-16) has been created by Radcliffe et al. (2008) to explore the relationships between various spaces, people and learning modalities. This model begins to look at an institution as a whole and at space as a highly connected network of places for learning rather than it being made up of a series of learning silos. The model proposes that every square metre has the potential to support the learning process and so every coffee shop; every corridor and every courtyard is incorporated into the design. John Seely Brown has emphasised that learning is a remarkably social process. In truth, it occurs not as a response to teaching, but rather as a result of a social framework that fosters learning (JISC, 2006). From this point of view, the informal learning

spaces have played a significant role and is increasingly being recognised for its educational value and contribution to creating a sense of community (Harrison & Hutton, 2013).

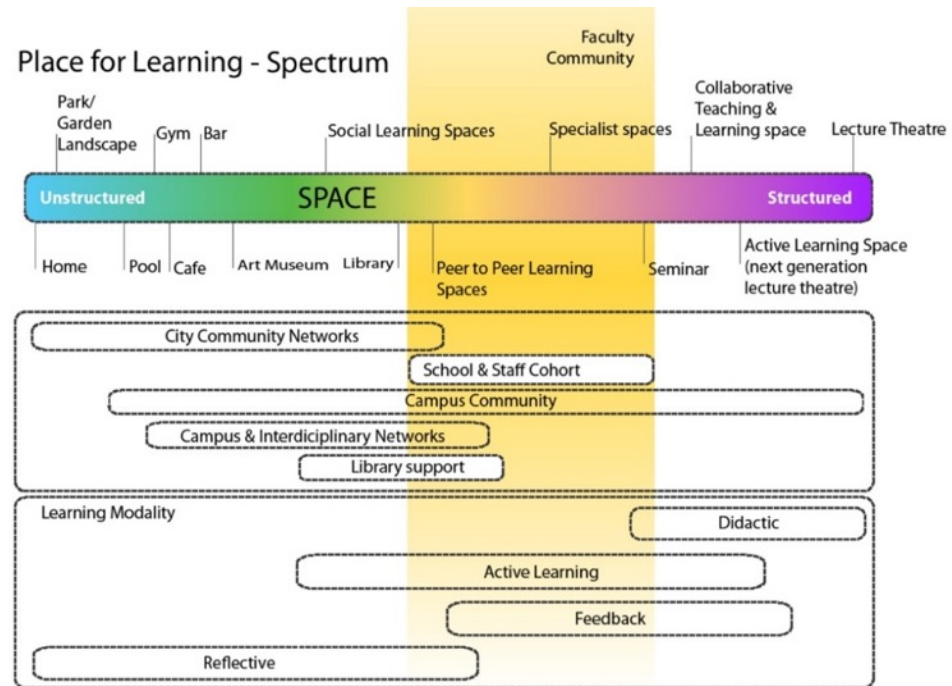


Figure 2-16: Place for Learning Spectrum.

*Source from: Designing next generation places of learning: Collaboration at the pedagogy-space-technology nexus (Radcliffe et al., 2008)*

Furthermore, the learning environment clearly serves many purposes. It is multifunctional, for it helps us fulfil many needs when it is appropriately configured. This can only be used in the informal learning spaces. It is not a wise choice to promote socialising activities in the lecture space or classroom. Instead, some spaces in the learning settings, such as corridors, atria, circulation spaces and café areas etc., where have not been fully used for learning. They can be adjusted to prompt informal learning activities.

In summary, three ideas on the design of the 21<sup>st</sup> century learning spaces have been presented in this section. More specifically, the 21<sup>st</sup> century higher education learning spaces are more inclusive and blended, where there is an

acceptance of more differentiated student activities, such as communications and collaborations. Secondly, every square metre of the learning spaces has the potential to support the learning process and so every coffee shop, corridor and courtyard is strategically incorporated into the design (Radcliffe et al., 2008). From this point of view, the informal learning space has played a significant role and is increasingly being recognised for its educational value and contribution to the creation of a sense of community (Harrison & Hutton, 2013). Thirdly, the discussion of holistic learning environments indicates that the informal learning spaces should be improved for increasing both socialising and informal learning activities rather than reshaping existing formal learning spaces to promote socialising in it.

## **2.5. SUMMARY.**

Throughout the historical review of the development of the university, it is difficult to give a definition of the university in the 21<sup>st</sup> century. However, based on the historical review of the development of the university, this chapter has emphasised the characteristics of the 21<sup>st</sup> century university and the current thinking on the physical campus of the university. This enhances the will of the higher education to comply with academic and the social developments of the 21<sup>st</sup> century.

In short, the characteristics of the 21<sup>st</sup> century university can be concluded as seen in Table 2-5 and these characteristics reflect back to the learning landscape of higher education. More specifically, the function of the 21<sup>st</sup> century university is to engage more students in practice. This requires that the

development of the university can hold more vocationally-oriented programs and working events. In response to this, the design of the learning landscape in higher education should be designed to hold student-led learning more like a working place, where students can practice and exercise in the workplace before they really get into the job market.

Table 2-5: The characteristics of the 21<sup>st</sup> century university.

- 
1. *The impact of Instrumentalism and vocationally-oriented program, relative subjects and professional schools develop dramatically.*
  2. *The collaboration and the communication within the university are more interdisciplinary.*
  3. *The higher education globalisation provided a scholar community where people from different cultural context share, interact and integrate interdisciplinary knowledge.*
  4. *The design of the physical university should be more adaptable and sustainable.*
  5. *Being everything to everybody.*
  6. *Innovative technology are reimagined to meet current and future needs*
- 

While the architectural design of higher education has only recently been connected to pedagogical issues, the literature on higher education pedagogy still tends to ignore the issue of space design (Temple, 2007). Writing on teaching and learning in universities should reveal an awareness of issues of context and setting, but it largely ignores any direct engagement with issues of space or spatiality. (Jamieson, 2003; Temple, 2007) This is apparent from a brief review of some of the most important studies on effective student learning practices in higher education.

When designing a learning space, the designers should understand how students' learning behaviours occur and how the learning environment responds to their behaviour. The learning space principles of higher education learning spaces for the 21<sup>st</sup> century (see Table 2-6) are mentioned by Temple and Fillippakou (2007). They guide the design of the higher education learning environment.

As Table 2-6 shows, there are five categories in terms of the principles: learning activities; connections inside and outside the classroom; display and capture; flexibility; and comfort, safety, and functionality.

Table 2-6: The learning space design principles of the learning space for the 21<sup>st</sup> century.

Source from: [https://www.heacademy.ac.uk/system/files/learning\\_spaces\\_v3.pdf](https://www.heacademy.ac.uk/system/files/learning_spaces_v3.pdf)

Category	Principles
<b>Learning activities</b>	<ol style="list-style-type: none"><li>1. Support multiple modes of learning (discussion, experiential, reflection)</li><li>2. Support authentic, project-based activities</li><li>3. Space aligns with curricular change</li><li>4. Take advantage of the rooms providing secondary learning</li></ol>
<b>Connections inside and outside the classroom</b>	<ol style="list-style-type: none"><li>1. Facilitate face-to-face and online discussion within and beyond the classroom</li><li>2. Enable interactivity between different science groups and activities</li><li>3. Maximise the ability of faculty to get into the social space of every student</li><li>4. Enable interaction with teammates, external experts, and others</li><li>5. Integrate librarians, along with faculty, staff and students</li><li>6. Make the activity of the group visible to the outside world</li></ol>
<b>Display and capture</b>	<ol style="list-style-type: none"><li>1. Ability for faculty and students to display multiple types of resources simultaneously</li><li>2. Ability to capture both the formal and informal work and interactions</li></ol>
<b>Flexibility</b>	<ol style="list-style-type: none"><li>1. Space should be easily reconfigurable in a short period of time for group and individual work; without losing power, networking, and so forth</li><li>2. Support nomadic learning activities</li><li>3. Have facilities open 24 x 7; maximise use over time</li></ol>
<b>Comfort, safety, and functionality</b>	<ol style="list-style-type: none"><li>1. Accommodate the learner's notion of comfort</li><li>2. Provide students with adequate functional work space</li><li>3. Must be fully accessible</li><li>4. Include space for storage</li><li>5. Meet safety and security needs</li><li>6. The space should be explicitly designed for sustainability</li></ol>

Temple and Fillippakou (2007: 71) concluded in their research on learning spaces for the 21<sup>st</sup> century, stating that: '*the university, space and learning are intimately connected*'. They have found that though it is one of the most important components and difficult to link to the learning and understanding of the spatial arrangement of the university, this requires additional research. The informal learning spaces play an important role in interpreting the meaning of the university. This is reviewed in the next chapter.

### **3. CHAPTER 3: THE DESIGN QUALITY OF HIGHER EDUCATION INFORMAL LEARNING SPACES.**

*‘We spend a lot of time trying to change people. The thing to do is to change the environment and people will change themselves.’ - Les Watson, Pro Vice-Chancellor, Glasgow Caledonian University (Livingstone, 2008: 25)*

How do we make well-designed learning environments? The previous chapter has indicated the developments of the learning environment in the 21<sup>st</sup> century. In this chapter, the transformation from prompting formal learning to informal learning is explained first. After that, socialising and informal learning activities are defined and classified. Thirdly, the learning space and its physical design quality is reviewed from four different perspectives: The Pedagogical Perspective; the Architectural Perspective; the Building Management Perspective; and the Spatial Configurational Perspective. Lastly, the design qualities of the learning spaces and evaluation models are reviewed in terms of analysing the informal learning spaces. Consequently, the seven design qualities of the informal learning spaces are listed.

### **3.1. INTRODUCTION: PEDAGOGICAL SPACE TRANSFORMATION FROM PROMOTING FORMAL LEARNING TO INFORMAL LEARNING.**

This section introduces the process of transformation and how the educational spaces have developed from focusing on formal learning to realising the importance of informal learning. Even though university life continues to be recognised as a series of learning activities for formal academic programs in classroom settings, that largely reflect and maintain longstanding educational practice (Jamieson, 2009), research into teaching and learning in higher education is slowly changing the way universities design and conduct formal educational programs. Many researches in higher education now recognise that knowledge is not delivered to the student, but rather constructed by the individual, and that learning is a social process requiring active engagement with others in meaningful experiences (Biggs, 1991; Jaques, 1991; Ramsden, 1992; Prosser & Trigwell, 1999). Consequently, increasingly new-generation classrooms are created to accommodate the formal learning activities associated with the shift toward a more student-centred pedagogy.

Designed by Neary in 2006, the Reinvention Centre at Westwood (see Figure 3-1) is an often-cited example (Lambert, 2011; Neary, 2008; Joy et al., 2014). The room was designed and refurbished by the Reinvention Centre in 2006 in order to provide an open, creative space for a range of teaching and learning



activities. It provides 120 m<sup>2</sup> of floor space with flexible, moveable furniture. This makes it easy for users themselves to transform the shape and purpose of the room, and the open design and layout facilitate active learning and interaction between students and teachers. Physical conditions such as lighting are elaborately considered and technical settings such as wireless Wi-Fi are fully supported. Unfortunately, this innovation classroom has not been widely used to replace the traditional formal learning spaces. Instead, the idea of flexibility and technical support has inspired the spatial organisation of higher education's informal learning spaces. This is mainly the reason for the characteristics of the informal learning activities in the next sections.



Figure 3-1: The Reinvention Centre at Westwood.

*Source from:*

[http://www2.warwick.ac.uk/fac/cross\\_fac/iatl/resources/spaces/reinvention/about/](http://www2.warwick.ac.uk/fac/cross_fac/iatl/resources/spaces/reinvention/about/)

## **3.2. THE EMERGENCE OF THE THIRD PLACE AND THE FUNCTIONAL ZONES OF THE INFORMAL LEARNING SPACES.**

The increased use of the term ‘third place’ derives from the research of urban sociologist Ray Oldenburg and his 1989 book ‘The Great Good Place’ (Oldenburg, 1989). He writes about the importance of public gathering places and why these places are essential to community and public life. Literally, the ‘third place’ in the educational environment can be traced back to the space in-between created by Herman Hertzberger. Inspired by Montessori method (Montessori, 2013), a method of education for young children that stresses the development of a child's own initiative and natural abilities, especially through practical play, Herzberger created a series of educational facilities, offering flexible ‘in between’ spaces that encourage student social activities. This is the first time that architects introduce the space in-between into learning environments. Starting from Apollo School (see Figure 3-2), the images of children playing and learning on broad wooden steps as a creative space inspired many architects of designing learning spaces. Another excellent learning environmental design is in Montessori College Oost.

The large hall is created as a meeting area focusing on communication for 1,200 pupils from more than 50 different countries. The college is the first extended Montessori school Hertzberger has built. The special features of the building are probably incidental elements such as spaces outside the classrooms that can be used for spontaneous communication, stairs that serve as seating or writing

areas, and the steps and benches one finds in every corner. The large atrium is dissected by numerous ‘staircase bridges’. Circulation and visual links were part of the architectural program, for ‘a school should be like a small city’ (Hertzberger, 2016: 18).



Figure 3-2: Apollo School

Source from: <https://www.dezeen.com/2011/12/06/key-projects-by-herman-hertzberger/>



Figure 3-3: Montessori College Oost

Source from: <https://inspiration.detail.de/montessori-college-oost-in-amsterdam-103696.html?lang=en>

The emergence of the third place achieved the aim of pedagogical theory and ambitions of the campus planners. As Florida (2000) defined, the third place is the place far beyond home and work, where we could find less formal information. The common features of the third place are the opportunity for users to walk through or spectacular things to see, and purposeful engagement

(Mikunda, 2004). It has already been clearly seen in the cases of the 21<sup>st</sup> century higher education informal learning spaces (see Table 2-2). The most representative third spaces in the university campus were come down to four functional zones: The Entrance Space, Café Area, Corridor Space and The Open Space (Atrium). The functional zones and their settings are articulated in the following sections.

### ***3.2.1 The Entrance Space.***

The Entrance Space is normally an anteroom or small foyer leading into a larger space, such as a lobby, entrance hall, passage, etc., for the purpose of waiting, reducing heat loss, providing space for outwear, etc. (Harrison, 2006). The Entrance Space may seem like common sense; yet many campus buildings fail to address this need (Marcus & Francis, 1997: 177). The Entrance Space of a university building can similarly offer an important physical and psychological transition from the campus as a whole to a department or college or a significant social/study/meeting/eating place.

In modern architecture, the Entrance Space typically refers to a small room or area next to the outer door and connecting it with the interior of the building. In the educational context, the entrance space provides several functions such as Security Check Point, Information Desk, etc. At the Diamond, the size of Entrance Space was designed large enough to ensure meeting the regulations for evacuation and to provide enough spaces for students to rush in and out of the building. There are three Entrance Spaces. Only two of them, which were close to the reception, were mainly used by students. The reception is manned 24/7 and only for security during the night. Large LED screens are installed on

the wall to give a vivid introduction of the design of the Diamond. An Open day welcome point is temporarily located in front of the screen (see Figure 3-4). The arrangement of the Entrance Space at the Newton also provides an extended space. However, more cosy furniture is arranged there to stimulate meeting, waiting and learning behaviours.



Figure 3-4: Entrance Space at the Diamond (Left) and at the Newton (Right)  
Source from: [https://www.youtube.com/watch?v=RnS\\_R-gKHKM](https://www.youtube.com/watch?v=RnS_R-gKHKM) (Left) and photo by author (Right)

### **3.2.2 Café Area.**

It is well known that the learning space is merging with aspects of general amenity space, including common room areas and cafeterias. (Harrison & Hutton, 2013: 49). Although beverages are not crucial in developing a third place, the enjoyment of conversation over a cup of coffee adds to the experience (Harris, 2007: 145). Due to the ability of attracting a large and diverse range of users, the Café Area appear to be an integral part of their development as a new third place.

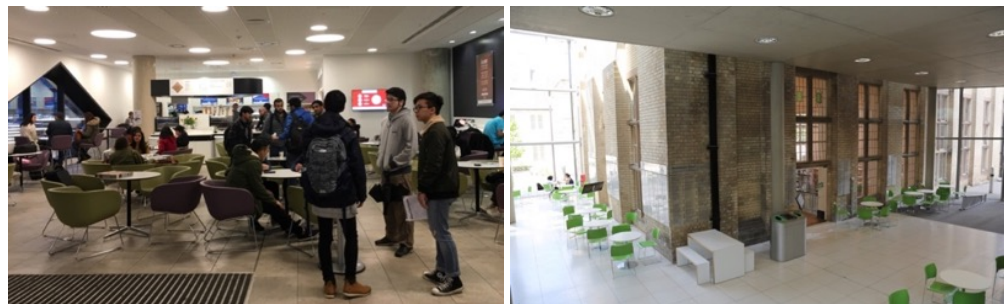


Figure 3-5: The Café Area at the Diamond, the University of Sheffield (Left) and at the Newton, Nottingham Trent University (Right)  
Source from: Photo by author.

Located in the hub of the Diamond building, the Diamond Kitchen (Figure 3-5) offers an array of international flavours with a grab & go offer complimented by a sleek and stylish design. The kitchen runs from 8 am – 5 pm 7 days a week. 72 removable and different types of chairs and tables were provided in this Café area to allow users to arrange the layout based on their preferences. The Café area is open to everyone.

### ***3.2.3 The Corridor Space.***

Corridor space is defined as a long passage in a building from which doors lead into rooms. Increasingly corridor spaces in the university provide extra space for socialising and informal learning. The enlarged corridor with comfortable chairs and tables enables an extra place for communication or just to relax after a period of formal learning. CABE (2006) reviewed the schools that had been built in the previous five years. The results showed that, in the better schools, circulation spaces were consistently generous, easy to navigate and clearly defined into primary and secondary zones with breakout, and teaching bases and supervision were well considered. The assessors noted that multipurpose use of spaces, such as the canteen combined with the ‘street’ were extremely successful if they were designed well. The reshaping of the Corridor Space can be seen as a standard typology of the informal learning space in the 21<sup>st</sup> century higher education. The cases, the Diamond at the University of Sheffield and the Newton at Nottingham Trent University, both provide a variety of Corridor Spaces as a learning street (see Figure 3-6). At the Diamond, you cannot even tell the differences between circulation space and formal learning spaces.





Figure 3-6: Corridor Space at the Diamond (Left) and at the Newton (Right)  
*Source from: Photo by author.*

### **3.2.4 The Open Space.**

The Open Space in this study emphasises the atrium area, where as a transitional space to enable users to experience a contiguous organic spatial relationship between the variety of spaces. It is always designed as a multi-layer atrium. Users in these conditions also enjoy a greater and freer sense of access and view as they are generally able to move more easily through one space to another, whether through open stairs, ramps, bridges or corridors (Yeang, 2002).

At the Diamond, the Open Space is organised by four Moonscape areas and extra flexible tables and chairs (see Figure 3-7). Next to the Pilot Plant Analytics, Light Structures Lab and Clean Room, the Open Space provides evacuation and extra learning spaces for students. Within wide open spaces and beneath the multi-level atrium, the area provides a place different from the learning space. Different from the Open Space at the Diamond, the Central Court is mainly used as a hub for the passageway. Meanwhile, lots of events are organised in this area, such as Graduation Exhibition, Open Day Events, etc. (see Figure 3-8).

The third place in the campus enhances the student experiences in the higher education learning environment. Even though the boundary of the four

functional zones between inside, outside and between learning space has blurred, they are often increasing the emphasis on informal learning spaces, reimagining corridors and other circulation spaces or finding ways to layer learning activities on to spaces used for other activities such as socialising (Harrison & Hutton, 2013).



Figure 3-7: The Open Space at the Diamond.

*Source from: Photo by author.*



Figure 3-8: The Open Space at the Newton.

*Source from: Photo by author.*

### **3.3. SOCIALISING AND INFORMAL LEARNING ACTIVITIES.**

*Learning is a remarkably social process. In truth, it occurs not as a response to teaching, but rather as a result of a social framework that fosters learning. – Brown, 2001:65*



Table 3-1: Key learning styles in higher education.

Source from: *How people learn: Brain, mind, experience, and school: Expanded edition* (NRC, 2000)

Learning types	Description
<b>Learning through reflection</b>	<i>Studies into cognitive science have demonstrated that individuals who have the opportunity to reflect on information, to evaluate their own learning process and to identify for themselves new directions for study, are more effective. Learning through reflection is by necessity a solo activity.</i>
<b>Learning by ‘doing’</b>	<i>Originating with seminal works by Piaget in the 1950s there is now much evidence that actively engaging in and working through practical tasks can assist learning. This might include computer-based simulations or physical simulation of real-life environments. Learning of this type can include both group and solo activities.</i>
<b>Learning through conversation</b>	<i>Central to the theory of social constructivism, learning from active discussion with teachers and other students, is an incredibly effective way of improving learning outcomes. Learning through conversation is by necessity a group activity.</i>

It is imperative that designers, planners and managers of informal learning spaces know what people do in learning environments because learning experiences range from structured, formal, teacher-led experiences to moments of less structured, peer-to-peer, informal or self-directed learning (Wilson, 2009). This section identifies the socialising and informal learning activities. National Research Council (2000) emphasises that there are three learning types (see Table 3-1). Even though the learning styles are generally for all the types of the learning process, it still can be considered as an idea to identify student socialising and informal learning activities in higher education informal learning spaces.

Jamieson (2009: 19) defines the informal learning as a ‘*course-related activity undertaken individually and collaboratively on campus that occurs outside the classroom.*’ Informal learning activity is independent of teacher or faculty-led instruction and can generally be understood as any supplemental learning activity that occurs outside of the formal instructional setting, including, but not limited to, course reading, assignments, and individual and group projects.

Informal learning, which occurs outside the formal instructor-facilitated setting, is now recognised as an important part of the overall learning environment (Hunley & Schaller, 2009). Through an understanding of the importance of less structured spaces for students to explore learning and engage in peer-to-peer activities, further emphasis is being directed at strategies to incorporate these informal learning spaces on campus environments. Furthermore, Conlon (2004: 286) stated that,

*‘... as individuals mature, they increase their capacity to learn, think and create, and they recognise they can learn moment by moment, which can turn into wisdom not just information or knowledge. Much of this learning is informal and comes from more experienced workers through listening and peer interactions. Many participants stressed informal and tacit learning over the more formal learning as having greater impact on their studies.’*

Due to the social nature of these informal learning activities, this type of learning typically occurs in situations such as the library, student cafeterias, cafes, and other socially-oriented spaces. To address the increasing demand for more informal learning spaces, campuses create social hubs, internal student streets and other designated spaces that promote both social and learning-related activity outside the classroom (O’Neill, 2013: 11). Keppell et al. (2012) defined the informal learning spaces as spaces that have been explicitly designed to encourage students to engage in both independent learning and peer learning that is often unscripted.

The design of the informal learning spaces can be learnt from the planning of urban space. In order to examine the impact of urban spaces upon users, researchers normally designated specific behaviours they want to observe (Jung, 2009; Mehta, 2013; Lee & Lee, 2013). More specifically, through the behaviour observation on the street, Mehta (2013) summarise social behaviours in the urban open spaces. Through analyses of different degrees of behavioural states, social behaviours are divided into three kinds of social activities like Passive Sociability (alone together), Fleeting Sociability and Enduring Sociability (see Table 3-2).

Table 3-2: Human behaviour and states.  
Source from: *The street: a quintessential social public space* (Mehta, 2013)

Behaviours States	Behaviour
<i>Passive sociability (Alone together)</i>	<i>Eating, sitting, standing, etc....</i>
<i>Fleeting sociability</i>	<i>Waving, greeting</i>
<i>Enduring sociability</i>	<i>Conversations, discussions</i>

These categories are the same as what Jung (2009) did when he analysed users' behaviours in urban central streets. Mandatory activities, selective activities and social activities are presented and defined based on different intentions (see Table 3-3). Lee and Lee (2013) developed more specific activities according to Jung's categories and types of behaviours (see Table 3-4). All these attempts focus on different degrees of behaviour in urban open spaces according to status (dynamic or static), time (enduring or fleeting) and types (willing or passive). Similarly, to assess the impact of the design qualities of higher education informal learning spaces on student experiences, it is necessary to identify and classify the students' behaviours that happened in those spaces.

Table 3-3: Types of human behaviour in an outdoor space.  
Source from: *A Study on Analysis of User Behaviour in Urban Central Street: On the Dongsung Street in Daegu (Jung, 2009)*

	Definition	Examples of Activity	Impact of the outside environment
<b>Mandatory activities</b>	<i>Activities that must be performed</i>	<i>Going to work or school, waiting for someone or a bus, sitting down due to tiredness</i>	<i>Not significantly impacted by the outside environment</i>
<b>Selective activities</b>	<i>Activities that people undertake at will and as time and space allow</i>	<i>Wandering the streets, sitting down for a moment to enjoy the scenery, standing and watching the streets</i>	<i>Sensitive to the outside environment</i>
<b>Social activities</b>	<i>All activities that people undertake because they are in a public space</i>	<i>Playing, saying hello or engaging in conversation, participating in a group activity or parade</i>	<i>More active in a conducive environment than in a poor one</i>

Table 3-4: Categories of human behaviour in the street.  
Source from: *A Study on the Impact of Ubiquitous Street Furniture on Human Behaviour - Based on Media Poles Installed on Seoul's Gangnam Boulevard (Lee & Lee, 2013)*

	Walking behaviour	Visual perception behaviour	Resting behaviour
<b>Mandatory activities</b>	<i>Walking/running to get somewhere</i>	<i>Seeing out of necessity, etc.</i>	<i>Stopping walking/sitting to take a rest on the way to somewhere, etc.</i>
<b>Selective activities</b>	<i>Walking/wandering for something, etc.</i>	<i>Seeing out of interest, etc.</i>	<i>Stopping/sitting out of interest in something, etc.</i>
<b>Social activities</b>	<i>Walking/running to do something, etc.</i>	<i>Seeing to do something, etc.</i>	<i>Stopping/sitting to do something, etc.</i>

Commonly, social spaces in the campuses provide a recreational environment for students to communicate. With the evolution of learning theory, informal learning is increasingly becoming popular. Blended student experiences have prompted informal learning spaces to be transferred into the higher education learning landscape. With this background, the student experiences consist of socialising and informal learning activities. They are blurred and combined binary activities. Similar to what Jamieson (2009) asserts, learning, of course, involves socialising, and it is not easy to separate exclusively student social activity from that which is learning-related, particularly as both forms of peer-to-peer engagement often take place in the same campus settings. Marsick et al. (2000) highlight that when self-directed learners the traditional learning

organisation, they do not realise that they are undergoing the informal learning activities to achieve goals. Hence, the impact of the informal learning spaces upon socialising and informal learning activities cannot solely use subjective survey methodologies for investigation. It is necessary to use multiple methods to evaluate student experiences. Meanwhile, it is also the limitation of this research as well when discussing the impact of the informal learning spaces upon student experiences.

A number of researchers have described student engagement as fairly ‘*ambiguous*’ (Parsons & Taylor, 2011: 17). The ambiguous definitions result from the complexity and different perspectives and categories of student experience. Nevertheless, this does not signify that seeking and research on student experiences has been meaningless. Instead, more research is needed in this realm. Unlike the ambiguous definition of student engagement, almost all researchers suggest the common strategies used to improve student engagement. Many researchers classify student engagement in different levels (Fredricks et al., 2004; Harris, 2008: 65). All of these researchers consider learning from an educational perspective or even formal learning rather than considering how spaces impact upon socialising and informal learning activities. Some of the categories such as exploration are important to improve student engagement and how to apply what they learn into real life, but this is beyond the scope of this research. Even in the categories of ‘*Interaction*’, some papers focus on the content and position (like teacher or peer or inter-disciplinary people) of interaction, this can also not be linked with the spatial properties. However, what we can do is to identify the types of interaction according to different levels of the learning processes.

Eraut (2004) defined informal learning as learning that comes closer to the informal end than the formal end of a continuum (see Table 3-5). The characteristics of the informal end of the continuum of formality include implicit, unintended, opportunistic and unstructured learning and the absence of a teacher. The categories are distinguished by different degrees or levels of intention in different time dimensions. The author also implies a blurred boundary between socialising and informal learning activities in this paper. The research Eraut (2004) did focus on the essences of informal learning. It is more of an abstract aspect to discuss informal learning activities. In this thesis, the modalities or the performances of informal learning activities are discussed. Crook and Mitchell (2012) propose a more nuanced conception of the socialising in learning. From informal learning process to socialising, four types of social engagement and interactions are listed and layered based on the different degrees of the learning processes (see Whether socialising or engaging in informal learning activities, academics have attempted to classify them according to the different degrees of the learning processes. What Eraut (2004) focus on is the informal learning itself and the thinking over from intentions. However, what Crook and Mitchell (2012) classify is originally from the different types of information delivery. In this thesis, the framework on student activities reviews what Crook and Mitchell (2012) have done but with more specific activity options (see Table 3-7).

Table 3-6).

Table 3-5: A typology of Informal Learning.  
*Source from: Original framework from Eraut (2004)*

Time of focus	Implicit learning	Reactive learning	Deliberative learning
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<i>Past episode(s)</i>	<i>Implicit linkage of past memories with current experience</i>	<i>Brief near-spontaneous reflection on past episodes, events, incidents, experiences</i>	<i>Discussion and review of past actions, communications, events, experiences</i>
<i>Current experience</i>	<i>A selection from experience enters episodic memory</i>	<i>Noting facts, ideas, opinions, impressions; asking questions; observing effects of actions</i>	<i>Engagement in decision making, problem solving, planned informal learning</i>
<i>Further behaviour</i>	<i>Unconscious expectations</i>	<i>Recognition of possible future learning opportunities</i>	<i>Planning learning opportunities; rehearsing for future events</i>

Whether socialising or engaging in informal learning activities, academics have attempted to classify them according to the different degrees of the learning processes. What Eraut (2004) focus on is the informal learning itself and the thinking over from intentions. However, what Crook and Mitchell (2012) classify is originally from the different types of information delivery. In this thesis, the framework on student activities reviews what Crook and Mitchell (2012) have done but with more specific activity options (see Table 3-7).

Table 3-6: Four types of social engagement and interactions.  
Source from: *Ambience in social learning: Student engagement with new designs for learning spaces* (Crook & Mitchell, 2012)

<b>Behaviours</b>	<b>Characteristics</b>
<b>Focused Collaboration</b>	<i>Occasions of traditional, and relatively intense joint problem solving. There are likely to be planned and strongly outcome-oriented.</i>
<b>Intermittent Exchange</b>	<i>Whereby students convene for independent study that permits an occasional and improvised to-and-fro of questioning or commentary.</i>
<b>Serendipitous Encounter</b>	<i>That is, chance meetings with peers in which study-related issues (and perhaps other matters) are discussed briefly and on the fly.</i>
<b>Ambient sociality</b>	<i>Students identify the importance of simply 'being there' as participants in a studying community.</i>

Table 3-7: Degrees of student experiences of both socialising and informal learning activities.

<b>Different degrees of student experiences</b>	<b>Items</b>
<b>Focused Informal Learning</b>	<ul style="list-style-type: none"> <li>• Prepared coursework</li> <li>• Discussed ideas from reading books or lectures</li> <li>• Worked with others on coursework</li> <li>• Study alone</li> </ul>
<b>Intermittent exchange</b>	<ul style="list-style-type: none"> <li>• Talked about career plans</li> <li>• Study alone, but with occasional interaction with others</li> <li>• Worked with others on activities other than coursework</li> <li>• Received prompt feedback from faculty on your academic performance</li> <li>• Tutored or taught other students</li> </ul>

	<ul style="list-style-type: none"> <li>• <i>Had serious conversations with students of a different program or department than your own</i></li> </ul>
<b>Focused Socialising</b>	<ul style="list-style-type: none"> <li>• <i>Took a call</i></li> <li>• <i>Used of tablet, laptop or phone</i></li> <li>• <i>Casual Chatting</i></li> <li>• <i>Took a break from studies with friends</i></li> </ul>
<b>Dietary related activities</b>	<ul style="list-style-type: none"> <li>• <i>Had a meal</i></li> <li>• <i>Had a snack</i></li> </ul>
<b>Serendipitous encounter</b>	<ul style="list-style-type: none"> <li>• <i>When you meet a friend of someone you know, but neither of you planned to</i></li> </ul>
<b>Ambient sociality</b>	<ul style="list-style-type: none"> <li>• <i>Attended event such as Exhibitions, Open Day or Coursework Show</i></li> <li>• <i>Found a way to lecture room or gathering for going to another place together</i></li> <li>• <i>Used as a meeting point before or after lectures</i></li> <li>• <i>People watching</i></li> <li>• <i>Had a rest</i></li> </ul>

Different degrees of the learning process and socialising activities are recorded to examine how they occupy the informal learning spaces. The Focused Collaboration here represents the highest degree of the ‘learning process’ happening in the informal learning spaces and the Ambient Sociality represented in the lowest degree of the ‘learning process’, happening in the informal learning spaces. The higher the degree of the learning process, the more potential the activities have for promoting informal learning activities. The lower the degree of the learning process, the more students tend to engage in socialising activities.

Overall, through defining the different research scopes on student activities, this section narrows down the research extents. Consequently, the specific items of the six types of student socialising and informal learning activities were listed for better examining student usage of the informal learning spaces, which can be used as a framework to examine the student frequencies of the socialising and informal learning activities based on the questionnaire. It can also help to



identify the way of evaluating informal learning spaces on different degrees of the student activities.

The next section emphasises the evaluation of the design qualities of the informal learning spaces in higher education from four perspectives, the pedagogical perspective, the architectural perspective, the building management perspective, and the spatial configurational perspective.

### **3.4. THE LEARNING SPACE AND ITS PHYSICAL DESIGN QUALITY.**

In terms of interpreting the design quality of the learning space, the physical comfort should be satisfied as a basic requirement. This is important to retain students in a learning environment. With a comfortable physical environment, such as proper artificial and natural light, appropriate temperature, sufficient fresh air, comfortable chairs and acoustic level, etc., the space is recognised as a place supporting student activities. Safety and security is also important to ensure a safe and relax place for learning and socialising. Meanwhile, managers and educationist also request the efficiency and efficacy of the design. Beyond that, the sense of community and belonging can be generated and the creativity and spontaneity of learning activities and communicating are occurred. Well-designed social informal learning spaces should follow the hierarchy of needs (see Figure 3-9) which is similar as Maslow's hierarchy of needs in Psychology.



Figure 3-9: The hierarchy of students' needs in learning environments.  
*Source from: Maslow's hierarchy of needs (Maslow & Lewis, 1987)*

Radcliffe et al. (2008) created a Place for Learning Spectrum (see Figure 2-16) to explore the relationships between various spaces, people and learning modalities in the learning environment. This model begins to look at an institution as a whole and at space as a highly connected network of places for learning rather than it being made up of a series of learning silos. The model proposes that every square metre has the potential to support the learning process and so every coffee shop, every corridor, every courtyard is incorporated into the design. In truth, this occurs not as a response to teaching, but rather as a result of a social framework that fosters learning (JISC, 2006). Furthermore, the Learning Spectrum provides an overall perspective of the learning environment, which could be improved to suit the different learning modalities and learning styles.

Students are spending more and more time outside of classrooms. More and more mixed learning experiences happen in higher education's informal learning spaces. Better physically designed informal learning spaces can attract students allowing them to spend more time in it at an intensively rate of usage. Meanwhile, hospitality and quality designed learning environments improve

willing-participant behaviours. From this perspective, researchers believe that good physical design quality and psychologically determined spatial evaluation reflects the success of the informal learning spaces.

Any good and successful designs of the informal learning spaces are an outcome of well thought out and understood forms of student daily life to the various ways students are meant to use them. To know how the informal learning spaces are best used is to first understand the value of the space. Informal learning spaces are defined as a huge range of spaces that support the learning experiences beyond traditional classrooms and laboratories, many of which are informal and support diverse learning styles. This definition can help us understand the value of the informal learning spaces. There is no specific research focus on the informal learning spaces and its physical design quality. However, it can be measured by evaluating the learning environment from four perspectives: the pedagogical perspective, the architectural perspective, the building management perspective and the spatial configuration perspective.

#### ***3.4.1 The Pedagogical Perspective.***

The design quality of learning environments is always well considered for supporting teaching and learning activities. Hence, the transformation of learning environments has always been stimulated by the innovation of pedagogical theory and the development of teaching and learning process. From this perspective, academics focus on how learning environments influence student achievement, student performance, and the school climate. More specifically, Tanner (2000) has determined how school architectural design factors might influence student achievement scores in elementary schools.

Tanner (2000) notes the rationale that the school environment influences behaviour and attitude, while behaviour and attitude influence learning. Thus, the school environment must positively influence learning. Barker's (1968) suggested that in order to study the environmental-behaviour relations, both the environment and the behaviour must be measured independently. Tanner (2000) separates the research in two parts: measuring the environment through the assessment of design patterns and measuring learning behaviours (student achievement) by a standardised test. By reviewing the related literature, an instrument of measuring the degree to which a design pattern exists in a school was compressed and validated. Four descriptors (f=functionality of the pattern, a=adequacy of the pattern, s=safety associated with the pattern, and q=quality of the pattern), which are most likely to be associated with each pattern, were assigned to 39 relevant design patterns by the evaluator. Analysed by quantitative research methods, the research found out that seven design patterns had significantly positive correlations with student achievement (see Table 3-8).

Earthman (2002) reviewed all the related papers and summarised that the design qualities of the school facilities, including the physical characteristics (air conditioning, lighting, acoustic, etc.), overall building conditions and maintenance, and overcrowding conditions, have significant impacts upon student performance. The ethnographic and perception studies indicate the poor design qualities of school facilities have a negative impact on student performance.

Table 3-8: Seven design patterns had significant positive correlations with student achievement.

Design Patterns	Explanations
Context	<i>The school and grounds are compatible with the surroundings and sufficient to facilitate the curriculum and programs (q).</i>

<b>Outdoor rooms</b>	<i>Defined outdoor learning environments - enough like a classroom, but with the added beauties of nature (f).</i>
<b>Pathways</b>	<i>Clearly defined areas that allow freedom of movement among structures. These play a vital role in the way people interact with buildings. Pathways may also connect buildings to one another so that a person can walk under the cover of arcades (f).</i>
<b>Outdoor spaces</b>	<i>Places which are defined; may be surrounded by wings of buildings, trees, hedges, fences, fields, arcades or walkways (f).</i>
<b>Technology for students</b>	<i>Spaces with computers, compact disks, learning packages, Internet connections, television, and video: Computers are placed within the learning environment in a manner that complements teaching and learning. Computers appear as an integral part of the curriculum (a); computer laboratories are not arranged in a rigid, institutionalized, manner (a); the teacher can easily view all computer screens from one location (a).</i>
<b>Technology for teachers</b>	<i>Computers (including laptops), multimedia and Internet connections are easily accessible. Teachers have access to technology (outside the media centre) for use in research and planning lessons (a).</i>
<b>Overall impression</b>	<i>Judged on whether the learning environments are student friendly and teacher friendly and meet the educational program's needs (f) (a) (s) (q).</i>

Furthermore, as a factor in student achievement (Haynes et al., 1997), the school climate, which has an immediate impact on students' sense of safety and well-being and on student behaviour, was positively affected by school design and setting (Yielding, 1993). The quality of the school climate has an immediate impact on the students' sense of safety and well-being and on student behaviour. More specifically, the research purpose being, to observe, record, and describe the interface between educational facilities and learning climate in three north Alabama elementary schools, this study employed a naturalistic design where the interaction between facility users was observed and recorded. Using a mixed method design, both qualitative research and quantitative research methods were put into use. Through observation, document review and individual interview, the constructs of an instrument for the quantitative research method were generated. After that the questionnaires were disseminated to both teachers and students in three primary schools. Yielding (1993) analysed the perception of teachers on educational facilities by setting 26 questionnaire items, in which illumination, noise, colour, thermal environment, space, location, maintenance, aesthetics and safety were tested as constructs. Specific physical features (space,

equipment, maintenance, appearance, comfort, and general physical arrangement) had the ability to positively or negatively impact the learning climate (Yielding, 1993).

Radcliffe et al. (2008) develop a pedagogy-space-technology (PST) framework to explain, review and evaluate learning environments through case studies. They concluded that the traditional learning spaces in higher education institutions do not usually provide the type of spaces that can activate learning, collaborative work and group work, experimentation, and role playing. The feedback from the students and teachers regarding the learning environment can be used as a strong indication that the spaces meet the requirements of the new generation of students.

Oblinger et al. (2005) emphasise that the goal of assessing learning environments was to identify problems and implement needed changes and the key assessment approaches that include the observation of students and their views of the space through interviews or focus groups. For example, a consideration of student studying patterns and of room use over time or asking students to rate the overall impact of space on their learning. Important questions to ask included whether the facility contributed to: 1) improvements in teaching and student learning, pedagogy, and course structures; 2) greater interaction among students and faculty; 3) a cohesive campus community.

In summary, the design qualities of any learning environment impact upon student performance from a pedagogical perspective in four aspects: Efficacy & Efficiency, Student Achievement, Overall Impression, and Comfort. The research methods within the pedagogical perspective mainly use a document

review and naturalistic design approach as mixed research design method (both quantitative and qualitative research methods). The quantitative methods were used to find the correlation between design quality and student achievements with the use of quantitative methods to generate or apply secondary data directly.

### **3.4.2 *The Architectural Perspective.***

In this section, the research on learning environments is mainly based on the architectural perspective. A space is designed when there is a requirement. The classification and characteristics of the types of spaces are subjectively divided based on their different functions and locations. The design quality of a learning environment is the essence of the particularities of architectural design. 1) The traditional categories of space are becoming less meaningful as space becomes less specialised, boundaries blurred, and operating hours extended toward 24–7 access; 2) Space types are designed primarily around patterns of human interaction rather than specific needs of particular departments, disciplines or technologies; 3) New space models now focus on enhancing the quality of life as much as supporting the learning experience. All these spatial characteristics of the informal learning spaces (Dugdale & Long, 2007) require a new spatial design model. Consequently, the informal learning spaces are seen as places where leveraging circulation areas encourage collaboration (McDaniel, 2014). As ‘*glue*’ and ‘*event space*’, the circulation is redefined as a ‘*balanced*’ space and a more freely available space (Dugdale & Long, 2007: 9). The design of the informal learning spaces from the architectural perspective focuses on the ambience the space creates. For example, the social hubs are appearing as key features of campus life, along with internal student streets within buildings that

feature a mix of functions expected to promote both social and learning-related activity (Chism, 2006). Edinburgh's Telford College, which was originally established in the 1960s, is an example of one of the three largest further education colleges in Scotland that introduced 'the Hub' (see Figure 3-10) and 'the Learning Streets' to support social learning spaces. 'The Hub' is a large student union where students do various activities in one place, such as eating and social activities. 'The Learning Streets' functions to reorganise from separately narrow corridors into thoroughfares with communal spaces. The design of these two spaces blurs the distinction between formal learning and social activities – the Hub and the Learning Streets make learning visible and active, and an integral part of being at college.



Figure 3-10: The Hub of Edinburgh's Telford College.

*Source from: Designing spaces for effective learning: A guide to 21<sup>st</sup> century learning space design (JISC, 2006)*

Meanwhile, architects tend to create a place which can both fulfil their basic functional requirements and the spatial aesthetic. A unique informal learning space is always seen as the landmark of the university and helps to recruit more students and staff. The visualised images of the informal learning spaces generate spatial ambiances to enhance the quality of the learning environment.



From the architectural perspective, the inductive method and an empirical logic is used to interpret and conclude the impact of learning environments upon student experiences. The review of related literature and design articles helps to assess how the minds of architects interpret learning environments to better serve students. Instead of in-depth social science analysis, architects organise learning environments to highlight the good design quality of spaces that meet the latent physical and psychological requirements of students.

### ***3.4.3 The Building Management Perspective.***

From a building management perspective, stakeholders firstly focus on the safety and wellbeing of the informal learning spaces. Beyond that, the efficiency and efficacy of spatial utilisation is considered. In order to achieve that, the flexibility of the informal learning spaces is emphasised to support efficient space utilisation, team-based learning, transdisciplinary learning and that the place should be designed to improve simulation and innovation (McDonald, 2013). However, there are approaches mainly aimed at interpreting and summarising the aspects, plus some individual cases that are mentioned to support his idea. More solid empirical research is needed to prove these design qualities of learning environments.

There were also researchers who did research on the efficiency of the learning spaces using solid methods. More specifically, Neary et al. (2010) propose the learning landscape principles based on twelve case studies in the UK. Interviews allow a fluid conversation around the issues and topics chosen by the research team. They give an opportunity for the expressions of opinion and insight into an institution and its facilities. In total, the research team conducted over sixty interviews, with members of staff and student representatives from the chosen

twelve universities. Information was recorded and structured using a prototype mapping profile, which was developed by DEGW, with reference to urban design literature and theory. Photographs and university campus maps were used as base materials to develop the mapping profile further. For the research that focused on the learning and teaching spaces, the main issues were the relationship between innovation and the mission and vision of the institution, as well as matters to do with leadership, governance and management in relation to organisational structures for decision making. Other areas for investigation were project management and evaluation. With semi-structured interviews and documentary analysis, the report advocated the most effective processes for the design and development of teaching and learning spaces (see Table 3-9).

Table 3-9: Learning Landscape Principles.

Source from: *Learning Landscape in Higher Education* (Neary et al., 2010)

<b>The most effective processes for the design and development of learning spaces</b>	
1.	<i>Drive research into effective teaching and learning.</i>
2.	<i>Provide support models for staff and students on how to use innovative spaces, with provision for mentoring.</i>
3.	<i>Include students, as clients and collaborators, ensuring their voices are heard</i>
4.	<i>Evaluate spaces in ways that are academically credible, based on measures of success that reflect the kinds of activities that are taking place.</i>
5.	<i>Understand the importance of time as an issue for space planning: not just space, but space-time.</i>
6.	<i>Connect the learning and teaching space with the campus as a whole, in ways that articulate the vision and mission of the university.</i>
7.	<i>Recognise and reward leadership that supports the development of learning and teaching spaces</i>
8.	<i>Create formal and informal management structures that support strategic experimentation.</i>
9.	<i>Clarify roles, grounded in supportive relationships between and across professional groups</i>
10.	<i>Intellectualise the issues: generate debate on the nature of academic values and the role and purpose of higher education: the idea of the university.</i>

The learning space design in the 21<sup>st</sup> century was discussed (see Table 2-6). Even though the specific methods are not mentioned in this summary, we can clearly see what management stakeholders mainly focused on. More specifically, the functionality of the learning spaces in the 21<sup>st</sup> century should

fulfil the requirement for the students. With the function of supporting student socialising and informal learning activities, students could do both individual and group study and even secondary learning (see Table 3-5). Secondly, the learning process does not only occur in the classroom. The learning space in the 21<sup>st</sup> century aims to enhance the connection between the formal learning space and the informal learning space, where students are encouraged to engage in and communicate with each other. Furthermore, the flexibility of the learning environment is also emphasised from a building management perspective, which could maximise the efficiency of spatial utilisation.

Table 3-10: Learning Spaces Design in the 21<sup>st</sup> Century.  
Source from: *Designing spaces for effective learning: A guide to 21<sup>st</sup> century learning space design (JISC, 2006)*

Category	Principles
<b>Learning Activities</b>	<ol style="list-style-type: none"><li>1. Support multiple modes of learning (discussion, experiential, reflection)</li><li>2. Should support authentic, project-based activities</li><li>3. Space aligns with curricular change</li><li>4. Take advantage of the rooms providing secondary learning (for example, use the walls for artifacts)</li></ol>
<b>Connections Inside and Outside the Classroom</b>	<ol style="list-style-type: none"><li>1. Facilitate face-to-face and online discussion within and beyond the classroom</li><li>2. Enable interactivity between different science groups and activities</li><li>3. Maximise the ability of faculty to get into the social space of every student; avoid lecture hall feeling; 'there should be no back of the room' – no hiding places for students</li><li>4. Enable interaction with teammates, external experts, and others</li><li>5. Integrate librarians, along with faculty, staff and students</li><li>6. Make the activity of the group visible to the outside world</li></ol>
<b>Flexibility</b>	<ol style="list-style-type: none"><li>1. Space should be easily reconfigurable in a short period of time for group and individual work; without losing power, networking, and so forth</li><li>2. Support nomadic learning activities</li><li>3. Have facilities open 24 x 7; maximise use over time</li></ol>
<b>Comfort, Safety, and Other Support</b>	<ol style="list-style-type: none"><li>1. Accommodate the learner's notion of comfort</li><li>2. Provide students with adequate functional work space (for example, room for laptops and elbows)</li><li>3. Must be fully accessible</li><li>4. Include space for storage</li><li>5. Meet safety and security needs</li><li>6. The space should be explicitly designed for sustainability (for example, long-term costs for supporting the space)</li></ol>

As McDonald (2013: 1) claimed, the flexibility of the learning space enhances the student's utilisation of space in higher education:

*‘Just a few years ago we would strive to utilize a space during 60 percent of its usable hours; now we are asked to strive for 70 to 80 percent utilisation.’*

Moreover, comfort, safety and other support are also stressed in the design of the learning space in the 21<sup>st</sup> century. Based on the literature reviews (conducted over a four-month period), interviews (telephone interviews conducted with representatives of four national educational organisations), case studies (four case studies), and learning and a teaching trends survey (a short online survey of 121 individuals from 65 Scottish institutions, who encompass a broad range of roles and responsibilities, including Principals, Vice Chancellors, other senior managers, Estates Managers, Room time-tablers, People in teaching and learning development units, People in information and communications technology.), Scottish Funding Council (2006) are studied to give an overview of the trends, in learning and teaching, that play a major role in shaping the physical learning environment. The research was aimed to ensure that investment in estates and estate management is informed by research into effective learning and student-centred approaches. In order to confirm the effectiveness and addressing of the three key learning styles (learning through reflection, learning by doing and learning through conversation), the report classified learning spaces into seven spatial types: Group teaching/learning; Simulated environments; Immersive environments; Peer-to-peer and social learning; Clusters; Individual learning; and External spaces. All these spatial classifications are divided based on different student learning activities. Instead of the observation method, they used qualitative methods. Literature reviews, interviews with representatives of national educational organisations, four case

studies of new learning environments in colleges and universities, and an online survey on educational trends was sent to all further and higher educational institutions in Scotland. This was meant to assess how students study and why they exhibit certain behaviours. Later the suggestions for physical learning environment management were proposed.

Table 3-11: Possible checklist of questions on spatial characteristics.  
Source from: *A New Handbook for Creating Inspirational Learning Spaces* (Cairns et al., 2015)

Elements	Questions
<b>Ambience</b>	<ol style="list-style-type: none"> <li>1. How will all types of user be able to develop a familiarity with and feel 'ownership' of the space?</li> <li>2. Would you know which organisation you are in, if you were transported into your learning space without seeing the rest of the site?</li> </ol>
<b>Location &amp; Dimensions</b>	<ol style="list-style-type: none"> <li>1. Are each of your spaces at least 98m<sup>2</sup>?</li> <li>2. Does the location and layout of the space suit different ages and physical abilities of all users?</li> <li>3. Can you locate your learning staff office next to the learning space?</li> <li>4. Is your learning work visible to other visitors – e.g. are there windows in to the space or is the work produced there displayed for everyone to see?</li> <li>5. How will audiences find your space?</li> </ol>
<b>Storage</b>	<ol style="list-style-type: none"> <li>1. Can you incorporate more storage?</li> <li>2. If your audience includes children and young people with additional needs, have you allowed extra space for their equipment (e.g. air tanks, medications, wheelchairs, etc.)?</li> </ol>
<b>Lighting</b>	<ol style="list-style-type: none"> <li>1. Do you have a lighting plan for your space?</li> <li>2. Can you adjust the lighting for bright task-based work or lower-level creative activity?</li> <li>3. Can you blackout your space?</li> <li>4. Can you spot light activity?</li> <li>5. Can you spot light two speakers at once?</li> </ol>
<b>Acoustics</b>	<ol style="list-style-type: none"> <li>1. Do you have an acoustic plan for your space?</li> <li>2. Have you considered measures to dampen noise in the space?</li> <li>3. Can you sound-proof your space or ensure ambient noise does not rise above 35 decibels?</li> </ol>
<b>Heating &amp; Ventilation</b>	<ol style="list-style-type: none"> <li>1. Do you have windows that open?</li> <li>2. Have you planned for how you will cool down your space?</li> <li>3. Are your heating controls for the learning space separate from the rest of the building?</li> </ol>
<b>Flooring</b>	<ol style="list-style-type: none"> <li>1. Will your flooring be washable and easy to keep clean?</li> </ol>
<b>Wall space &amp; Display</b>	<ol style="list-style-type: none"> <li>1. Do you have one clear wall where you can display work or project on to?</li> <li>2. Have you planned how you will attach displays to the wall?</li> <li>3. Could 3D objects be available as handling collections?</li> <li>4. Could there be opportunities to display other 3D objects or items (vitrines, display cases, etc.)?</li> </ol>
<b>Plumbing</b>	<ol style="list-style-type: none"> <li>1. Does your wet area include at least one sink with double-bore drainage and a raked drainer?</li> </ol>
<b>Furniture</b>	<ol style="list-style-type: none"> <li>1. Are the fittings, furniture, equipment and materials used compatible with the range of users?</li> <li>2. Is any furniture light weight and stackable?</li> </ol>

<b>Technology &amp; Digital</b>	3.	Can you store away all of your furniture at once?
	1.	Do you have enough power points for all the electrical equipment you might use in the room to be in use at the same time, plus additional plugs for your visitors' equipment?
	2.	Do you have plug points on or next to workspaces and surfaces?
	3.	Do you have mobile reception/Wi-Fi in your space?
	4.	Do you have enough bandwidth for 30 devices to use the Internet at the same time?

Cairns et al. (2015) suggests that a series of spatial design features should be carefully considered. These are ambience, location & dimensions, flexibility, storage, lighting, acoustics, heating & ventilation, flooring, wall space & display, plumbing, furniture, and technology & digital implements. Invaluably, the research made a possible checklist of questions on these spatial characteristics (see

Table 3-11). Cairns et al. (2015) does not mention the specific methods around it. However, it indeed provides us with an overview of the framework on learning environment elements which probably impact upon student activities.

Through semi-structured interviews with academic and administrative staff in seven higher education institutions and a literature review to consider the implications of the other studies conducted, SMG (2006) presents the results of a survey of changes in institutions' current space usage and their likely future space needs.

Jamieson (2009) explores a broader understanding of the entire campus as a learning space based on the development of informal learning theory. He asserted that the future campus will be determined by the university's response to informal learning. In order to achieve that, the campus must be '*a variety of places where students can be inspired; where they can discover, reflect, form communities, and take greater responsibility for their own learning on many levels.*' (Jamieson, 2009: 24).

Denison University, a small liberal arts college in Ohio, established the learning spaces project to enhance the utility, appearance and comfort of all campus spaces related to learning. Consequently, a series of design guidelines were

proposed to support many styles of learning, to be versatile, comfortable and attractive, rich with information and reliable technology, maintained and accessible (Siddall, 2006).

Table 3-12: Design guidelines based on the study of Denison University.  
*Source from: The Denison Learning Space Project (Siddall, 2006)*

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1.	<i>Learning spaces should support a diversity of learning styles;</i>
2.	<i>Learning spaces must be versatile;</i>
3.	<i>Learning spaces must be comfortable and attractive;</i>
4.	<i>Learning spaces are information rich and technologically reliable;</i>
5.	<i>Learning spaces must be maintained continuously;</i>
6.	<i>Learning spaces should be ubiquitous in space and time;</i>
7.	<i>Learning spaces should be used effectively; and</i>
8.	<i>Sufficient resources must be allocated for learning spaces.</i>

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In summary, this section has introduced how educational institution managers plan and manage the new learning environments. It is clear that there is no single agreed approach to developing sets of design principles for new learning spaces, nor is there a universal set of principles. From this perspective, more qualitative methods are used to explore the possibility of the further development of the learning spaces. Flexibility is a key design quality in terms of the spatial management of the learning spaces (McDaniel, 2014; Keppell et al., 2012).

#### ***3.4.4 The Spatial Configurational Perspective.***

From a spatial configurational perspective, architects and those involved in planning practice consider how the spatial organisation and configuration impact student behaviours. Previous studies reveal that the spatial configuration of buildings integrates or segregates different areas, influencing the levels of individuals' mobility and access from one area to another (Hillier & Hanson, 1989). The spatial organisation of buildings is strongly correlated with space use and occupancy patterns, directing individuals' movement and activity patterns within the physical environments (Hillier et al., 1987; Hillier et al.,

1993; Penn et al., 1999; Haq & Zimring, 2003). In that respect, it is possible to state that the patterns of interaction among individuals and their actions in a building are derivative of the spatial configuration of which they are an integral part. Therefore, researchers (Hillier and Hanson, 1989; Dai et al., 2015; Coelho & Kruger, 2015; Sailer, 2015) have kept exploring how people use spaces and how spaces impact people's patterns of interactions through the use of the space syntax method.

Since Space Syntax Theory was explored by Hillier and Hanson (1989), it is thought to be possible to quantify and describe how easily navigable any space, both urban spaces and also architectural, is. This method has been widely used for the design of urban scale approaches and building scale approaches with projects such as museums, airports, hospitals and other settings. The complexity of educational settings has become a hot issue recently. It is useful for the physical design and spatial configuration of educational settings where wayfinding is a significant issue. Moreover, Space syntax has also been applied to predict the correlation between spatial layouts and the social effects of aspects like social and spatial organisation, the complexity of circulation, and adaptability in educational spaces.

More specifically, Dai et al. (2015) examine the impact of complex horizontal and vertical circulations upon the users' way-finding behaviours in single-cases like the Xiangshan Campus of China Academy of Art. A blended method involving an open-ended questionnaire, a cognitive mapping sketch, and a way-finding experiment were used to conduct seven vertical and horizontal spatial features. However, the research focused on the spatial configuration method and



how to improve the method. It did not emphasise on how spatial configurations impact users' social interaction and informal learning. Even though wayfinding is valuable for complex educational settings, there is only one little issue regarding how students use it and does not focus on student learning experiences. A more imperative issue of how spatial configurations of social spaces impact social interactions and informal learning is not mentioned in this paper.

Coelho and Kruger (2015) recognise the relevance of adaptable educational architecture towards evolving pedagogical, technical and social needs. Through proposing research questions 'how' and 'by what means' can a contemporary school building be considered on its degree of adaptability to formal learning spaces as content providing places and informal learning spaces as a place for peer communication, a recognised relevance towards educational experience and student achievement is explained. The use of a mathematical approach to determine the entropy of each space provides a quantitative measure of adaptability. The mechanism of the space syntax theory is beyond this research scope, but the ideas of Integration and Connectivity are successfully used to claim how and why a space is being used. This paper starts to consider the importance of informal learning spaces and attempts to explain the process through the Space Syntax method.

Existing research on school buildings and how their layout informs the spatial and social organisation of teaching and learning is scarce, having with an evidence based that has been called incomplete and underdeveloped in a 2005 report commissioned by the UK Design Council. Interactions between educational settings and student experiences are needed and researchers have

started embarking on relevant research (Kaynar, 2005; Vieira & Kruger, 2015). Rather than focusing on an empirical case and post-rationalising phenomena found in the field, Sailer (2015) use a very interesting case, the Hogwarts School of Witchcraft and Wizardry, the fictional secondary school in Harry Potter, portrays the main character and his friends in the novels by Joanne K Rowling and the associated movie series. The analysis of the Hogwarts narrative highlights the importance of social and public spaces for the accommodation of diverse learning processes. Only 10% of the learning activities in the movies occurred in classroom settings and the majority of peer learning took place in common rooms, dormitories and courtyards. It is also shown that peer learning tends to happen in more integrated spaces. This research bases its focus on virtual school settings. A similar method can be used to examine real and higher education settings.

In summary, from a spatial configurational perspective, researchers believe that spatial organisation has invisible pedagogical influences on students, especially for way-finding, navigation and, especially a latent impact upon encountering. Combined with other methods, such as observations, questionnaires and document reviews, the application of mixed methods design in the learning environment has been well explored.

### **3.4.5 Summary.**

A variety of research realms focus on how to make well-designed learning environments. The design quality of informal learning spaces discussed in this thesis is reviewed from four different perspectives, the Pedagogical Perspective, the Architectural Perspective, the Building Management Perspective, and the

Spatial Configurational Perspective. Based on different research realms, the considerations of the design qualities and the spatial organisation of learning environments correlates with learning outcomes, retention, recruitment, spatial usage and management, occupation and movement, comfort and satisfaction, etc. All these aspects and the associated research methods are literately reviewed in the above sections and can be seen in the Table 3-13. It can be seen that even though the focuses of the design quality and spatial organisation of the learning spaces from different perspectives are vary, it can still see that they mainly focus on how to design to better achieve users' intentions.

Table 3-13: The Design qualities and the spatial organisation of the learning spaces from different perspectives.

*Source from: Summerised by Author*

Perspectives	Design Qualities	Sources
<b>The Pedagogical Perspective</b>	<i>Efficacy &amp; Efficiency</i>	<i>Tanner, 2000; Yielding, 1993; Haynes et al., 1997; Oblinger et al., 2005</i>
	<i>Technology</i>	<i>Radcliffe et al., 2008</i>
	<i>Physical Characteristics</i>	<i>Earthman, 2002; Cairns et al., 2015</i>
<b>The Architectural Perspective</b>	<i>Visualisation</i>	<i>Chism, 2006; JISC, 2006; Florida, 2000; Mikunda, 2004</i>
	<i>Functionality</i>	<i>Dugdale &amp; Long, 2007; JISC, 2006</i>
	<i>Circulation</i>	<i>McDaniel, 2014; Chism, 2006; Cairns et al., 2015; CABE, 2006</i>
	<i>Overall Impression</i>	<i>Dugdale &amp; Long, 2007</i>
	<i>Ambience</i>	<i>Neary et al, 2010; Harrison &amp; Hutton, 2013</i>
<b>The Building Management Perspective</b>	<i>Flexibility</i>	<i>McDonald, 2013; Cairns et al., 2015; JISC, 2006; Jamienson, 2009; Siddall, 2006; McDaniel, 2014; Keppell, et al., 2012</i>
	<i>Circulation</i>	<i>JISC, 2006; Cairns et al., 2015; Jamienson, 2009</i>
	<i>Technology</i>	<i>Cairns et al., 2015; jamienson, 2009; Siddall, 2006</i>
	<i>Physical Characteristics</i>	<i>Cairns et al., 2015; Neary et al., 2010; Siddall, 2006;SFC, 2006</i>
	<i>Food &amp; Beverage</i>	<i>Bryant et al., 2009; Brown &amp; Lippincott, 2003; Jamieson, 2009</i>
<b>The Spatial Configurational Perspective</b>	<i>Circulation</i>	<i>Hillier &amp; Hanson, 1989; Dai et al., 2015; Coelho &amp; Kruger, 2015; Sailer, 2015; Kaynar, 2005; Andrea &amp; Mario, 2015</i>

The limitation of the table listed is that, most of time, researchers considered the design quality and the spatial organisation of the learning spaces from an inter-disciplinary perspective. Their ideas have already integrated as a well-

considered strategy or analytical framework. Therefore, there is a good way to emphasise the design from users (the students in this thesis) rather than the perspectives mentioned above.

Even so, the design qualities mentioned in the four perspectives can be used to evaluate the design of the learning spaces. Furthermore, more means to evaluate informal learning spaces are explained in the next section.

### **3.5. EVALUATING INFORMAL LEARNING SPACES.**

Learning, of course, involves social interaction, and it is not easy to exclusively separate student social activity from that which is formal learning-related, particularly as both forms of peer-to-peer engagement often take place in the same campus settings (Jamieson, 2009). That is to say, informal learning and socialising activities are a kind of combined student experience in the informal learning spaces. After knowing that, we can see how people design the spaces to support student socialising and informal learning activities within the higher education informal learning spaces context.

With the development of technology, increasingly mixed learning experiences have happened in the informal learning spaces. Learning is moving towards more collaborative (active learning with hands-on experience), integrated (multidisciplinary), blended (learning take place anywhere/anytime, mobile technology with social activity), immersive (with simulated or real-world experiences) and Hybrid (activities, combining online with fact-to-face,

augmented with mixed reality experiences) (Dugdale & Long, 2007). Combining socialising and Informal learning activities within the informal learning spaces is arguably about to become an effective way to improve learning experiences in the campuses (McDaniel, 2014; Riddle & Souter, 2012). Architects and pedagogical specialists are all encouraged to consider the importance of mixed learning experiences in the educational settings. Such learning experiences call for an evolution of the learning landscape. Through an understanding of the importance of less structured spaces for students to explore learning and engage in peer-to-peer activities, further emphasis is being directed at strategies that incorporate these informal learning spaces on campus environments (McDaniel, 2014). Due to the social nature of some of these informal learning activities, this type of learning has typically occurred in locations such as the libraries, student cafeterias, cafes, and other socially-oriented spaces. All these spaces have been called informal learning spaces or *Informal Learning Landscapes* (Harrison & Hutton, 2013: 48) as, increasingly, people have realised that the quality of student experience has been influenced by all aspects of the physical settings. Historically, the development of the university campus has been shaped by the emphasis on traditional instructional methods in the formal learning spaces. Conversely, the future campus will be determined, to a large extent, in the informal learning spaces by the universities' response to student experience.

Because they realise that the role of the informal learning spaces is increasingly becoming pivotal. Researchers have gradually attempted to interpret the function and the design of the informal learning spaces (Keppell et al., 2012; McDaniel, 2014; JISC, 2006). Meanwhile, Brown and Lippincott (2003)

indicate that informal learning spaces are any space outside the classroom that can be used for learning. These could include faculty offices, hallways, plazas, courtyards, dormitories, and food service areas. Just as practitioners and academics have challenged the role of the classroom as the primary container for learning (see Figure 3-1), so has there been an increased interest in where else learning can take place within the whole university. Formal learning spaces such as lecture halls, have metamorphosed into larger learning studios or suites for connected spaces. The boundary between inside, outside and between the formal learning spaces has become blurred, often increasing the emphasis on the informal learning spaces by either creating new atrium spaces, reimagining corridors and other circulation spaces or finding ways to layer learning activities on to spaces used for other activities such as dining or playing (Harrison & Hutton, 2013: 80). Dugdale and Long (2007) visually describe the complete range of physical and virtual spaces where learning takes place as the informal learning spaces – the space between (see Figure 2-15). More and more institutions have made endeavours to create highly adaptable and integrated informal landscapes instead of specialised learning spaces. To address the increasing demand for more informal learning spaces, campuses are creating social hubs, internal student streets, and other designated spaces that promote both social and learning-related activity outside the classroom (O'Neill, 2013).

The spaces of campus landscapes can be described as '*socially catalytic*' because they catalyse socialising and they are keys to fostering a sense of community and engagement (Waite, 2014: 73). How to design such a socially catalytic becomes a key issue to discuss the learning environment.

Gehl (2011) summarises the three main features of good public space by referring to, Marketplace, Thoroughfare and Meeting place. All the spaces between buildings (self-contained destinations) as found in a city, are considered. Nair and Gehling (2010) have attempted to apply this theory to school design and asserted that the spaces between formal learning areas are designed specifically for the purpose of informal learning: learning from peers, learning by application, and learning a range of highly sought-after 'soft' skills that are increasingly demanded by the business community as well as by anyone with a desire for safer neighbourhoods. Lastly, they have summarised that the checks of the Thoroughfare, the Meeting place and the Marketplace are useful indicators of a space's effectiveness at supporting a wide range of informal learning and socialising activities for students, and indeed supporting campus life between classrooms. The spatial categories on Marketplace, Thoroughfare and Meeting place are based on urban design. It is a good method to draw an analogy between campus spaces and the urban design element to interpret the learning environments. However, the paper has focused on school design and debates the possibility of meeting the demands of business marketing and security issues, but it does not focus on how to design the informal learning spaces in higher education.

The core issue of informal learning spaces is what makes a successful informal learning space, how to measure the efficacy and to debate how the informal learning spaces impact students' experiences. Boys (2010) claims that there is almost no data that exists to help assess the effectiveness of the new and adapted buildings that are currently being constructed across universities and colleges. With this challenge, researches have to do concerted research on the informal

learning spaces based on the case studies and attempts to find out research frameworks and principles of designing higher education's informal learning spaces. From a longitudinal, the quantitative and qualitative study at Sheffield Hallam University, Harrop and Turpin (2013) explore learners' behaviours, attitudes and preferences towards informal learning spaces in higher education, within and outside of the context of the academic library. Consequently, they have proposed a non-hierarchical typology for the nine learning spatial attributes framework: destination, identity, conversations, community, retreat, timely, human factors, resources and refreshment.

An imperative to develop the social experience of learning has led to the design of informal learning spaces within libraries. Little is known about how these spaces are used by students or how students perceive them. Academics have examined the impact of library spaces on student learning (Freeman et al., 2005; Crook & Mitchell, 2012). Similarly, the development of the social experience of learning has led to the design of informal learning spaces within social/communal spaces yet little is known about how these spaces are used by students or how students perceive them. In terms of social spaces, researchers do similar research on urban context (Jung, 2009; Lee & Lee, 2013; Mehta, 2013). More specifically, they see streets and squares as a social space and examine the impact of social spaces upon citizens' behaviours. The method they use can also be used in the research on the informal learning spaces.

In terms of evaluating learning spaces, a number of academics do research on how to evaluate learning spaces. In Boddington and Boys' book (2010), Bligh and Pearshouse note the difficulties of evaluating educationally relevant spaces:



*‘Evaluating spaces in terms of pedagogic intent is difficult because such intent either was never explicit in the mind of the designer or evidence of the intent was not available to the evaluators.’* (Bligh & Pearshouse, 2011: 4). Instead, seven evaluation models are listed to examine the values (success criteria) of the evaluations themselves (see Table 3-14).

Table 3-14: Typologies of Learning Spaces Evaluations.  
*Source from: Reshaping Learning – An Introduction (Boddington & Boys, 2011)*

<b>Evaluation Models</b>	<b>Characteristics</b>
<b>Demand model:</b>	<i>Quantitative analysis of conventional space metrics (occupant density, booking statistics), or financial income (external bookings, internal market calculations), etc.;</i>
<b>Outcomes model:</b>	<i>Evaluating changes in learning outcomes;</i>
<b>Satisfaction model:</b>	<i>Collecting data about the experiences and satisfaction of space users;</i>
<b>Scenario provision model:</b>	<i>Examining space provision (technology, configuration, size, etc.), in light of judgments about the activities which need to be supported;</i>
<b>Activity support model:</b>	<i>Evaluating activities undertaken within a space in practice, often using observation-based methods;</i>
<b>Spatial ecology model:</b>	<i>Examining configurations of, and relationships between, the variety of spaces available;</i>
<b>Brand model:</b>	<i>Evaluating spaces’ contribution to institutional image, as projected to entities including media, external partners, prospective and current students and staff, etc.</i>

The demand model is a conventional evaluation method. Through examining occupant density by observing or mapping, behavioural distributions can be presented and objectively reflected on in relation to student spatial demand. Outcomes models focus on formal learning and students’ learning outcomes. Satisfaction model emphasises the subjective experiences of space users. Questionnaires and interviews are mainly used as methods to collect subjective data on that. Scenario provision model and activity support models attempt to evaluate how student undertake activities in specific spaces. The spatial ecology model examines the relationship and configuration of spatial availability. The brand model reviews the spatial values on marketing and institutional brands. The paper by Pearshouse et al. (2009) summarises the pros and cons of the

different models on evaluating learning spaces. It includes almost all the methods on evaluating learning spaces. Even though there are no specific method focusing on informal learning spaces, we can also select some of them to support this.

There are many ways to improve the design quality of learning spaces. Earthman and Lemasters (1998) have published a review of research on the relationship between school buildings, student achievement and student behaviour. In that paper, they mention 15 aspects, *'school building age, thermal factors, visual factors, colour and interior painting, hearing factors, amount of spaces, open spaces, windowless facilities, underground facilities, site size, building utilisation, building maintenance, support facilities, special instructional facilities and size of school'* (Earthman & Lemasters, 1998: 4), demonstrating the relationship between student performance, both achievement and behavioural and the conditions of the built environment. The factor of influence varies from very weak in some early studies to a considerable degree of relationship in recent studies. Though some of the more important factors that were found to influence learning are those relating to the control of the thermal environment, proper illumination, adequate space, and the availability of the thermal environment and furnishings, some aspects like the sound environment and levels of spaciousness are also impacting the attitudes and subsequent behaviour of students. To some extent, this paper has given an obvious link between the building aspects and student achievement and performance. However, most of the evidences is focused on formal learning spaces and does not mentioned on the informal learning spaces. Furthermore, all the papers reviewed are for school buildings but not for higher education.

A number of research projects on the effects of space on student experiences has tacitly approved and been centred on the children's understanding of wayfinding and distance (Anooshian & Kromer, 1986; Blades & Spencer, 1987; Fabricius & Wellman, 1993; Piaget & Inhelder, 1967; Sommer, 1969). In recent years, related research on the learning environment has initiated an unprecedented interdisciplinary area of correlating educational performance and its built environment. Many groups and individuals have a stake in the success of new learning spaces including students, staff, senior administrators, technology managers, architects, builders and contractors, facilities and security managers, and timetable managers (Radcliffe et al., 2008). This requires rethinking pedagogy and its spaces from different perspectives. More specifically, they do research to evaluate the usage of educational facilities (Blyth et al., 2006; Oblinger & Lippincott, 2006; Wilson & Randall, 2010), to ameliorate learning environments (Dober, 2000; JISC, 2006; SMG, 2006; CABE, 2011), to design innovation spaces (Harrison & Hutton, 2013; Coulson et al., 2015), and to forecast trends in learning spaces in the 21<sup>st</sup> century (Denman, 2005; Vockley, 2007; Radcliffe et al., 2008; Wilson & Randall, 2010).

The methods of evaluating learning spaces and improving learning spaces are focused on overall learning spaces. Some research has even tacitly approved or defined formal learning space as their research scope (Hurst et al., 2013). The evaluating framework on the design qualities of the higher education informal learning spaces seems to be lacking. Therefore, this thesis is dedicated to filling this research gap. A number of authors have proposed either lists of design principles or sets of critical characteristics that contemporary learning spaces

should exhibit. Some of these lists of principles are aspirational while others imply that they are based on the empirical experiences. However, there is really very little empirical data based on well documented case studies or analyses that can be used to test these.

Table 3-15: The key design qualities of the informal learning spaces impact upon students' experiences.

*Source from: Summarised by author:*

Design Quality	Evaluating Index of Design Quality	Sources
<b>The Physical Comfort</b>	<i>Light; Acoustics; Temperature; Ventilation; Furniture (Colour/Material)</i>	<i>Dugdale &amp; Long, 2007; Earthman, 2002; Cairns et al., 2015; Neary et al., 2010; Siddall, 2006; SFC, 2006; Dober, 2000; JISC, 2006; SMG, 2006; CAFE, 2011</i>
<b>The Flexibility</b>	<i>Mobility; Adaptability; Diversity; Flexibility</i>	<i>Dugdale &amp; Long, 2007; Harrison &amp; Hutton, 2013; O'Neil, 2013; Boys, 2010; Crook &amp; Mitchell, 2012; McDonald, 2013; Cairns et al., 2015; JISC, 2006; Jamieson, 2009; Siddall, 2006; McDaniel, 2014; Keppell, et al., 2012</i>
<b>The Ambience</b>	<i>Socialising; Sense of Community; Informative; Attractiveness; Openness; Enclosure; Safety</i>	<i>Jamieson, 2009; O'Neil, 2013; Crook &amp; Mitchell, 2012; Chism, 2006; JISC, 2006; Florida, 2000; Mikunda, 2004; Neary et al, 2010; Harrison &amp; Hutton, 2013</i>
<b>The Functionality</b>	<i>Support group work and collaboration; Supports individual learning</i>	<i>Dugdale &amp; Long, 2007; McDaniel, 2014; riddle &amp; Souter, 2012; Crook &amp; Mitchell, 2012; JISC, 2006</i>
<b>The Situation</b>	<i>Location (continue classroom discussions immediately following class time); Outside Views</i>	<i>Nair &amp; Gehling, 2010;</i>
<b>The Spatial Hierarchy</b>	<i>Circulation; Legibility; Intelligibility; Privacy; Spacious</i>	<i>McDaniel, 2014; Chism, 2006; Cairns et al., 2015; CAFE, 2006; Hillier &amp; Hanson, 1989; Dai et al., 2015; Coelho &amp; Kruger, 2015; Sailer, 2015; Kaynar, 2005; Andrea &amp; Mario, 2015; Anooshian &amp; Kromer, 1986; Blades &amp; Spencer, 1987; Fabricius &amp; Wellman, 1993; Piaget &amp; Inhelder, 1967; Sommer, 1969</i>
<b>The Other Support</b>	<i>IT-rich environment; Wi-Fi Coverage; Plugs and Sockets; Food and Beverage</i>	<i>Dugdale &amp; Long, 2007; Harrop &amp; Turpin, 2013; Radcliffe et al., 2008; Cairns et al., 2015; jamieson, 2009; Siddall, 2006; Brown &amp; Lippincott, 2003; Bryant et al., 2009</i>

The considerations for the design qualities of learning environments are also correlated with a series of realms and tough topics, such as learning outcomes, retention, recruitment, etc. All these topics are also important but will not be discussed here because they are beyond this study's research aim. However, based on the literature reviews, an analytical framework is proposed (see Table

3-15), which provides a way to evaluate the spatial design of the informal learning spaces on student experiences. Due to limited research on the design quality and spatial organisation of the informal learning spaces, the resources are also generated from evaluation framework of the general learning spaces which were summarised in the previous section. All these design qualities of the informal learning spaces can be examined and tested through case studies. The framework emphasises the significant role of the design qualities and the spatial organisation of the informal learning spaces. The seven design qualities, including the Physical Comfort, the Flexibility, the Ambience, the Functionality, the Situation, the Spatial Hierarchy, and the Other Support, state the natural characteristics of the informal learning spaces, which propose an analytical framework to evaluate the design of the informal learning spaces in higher education.

## **4. CHAPTER 4: RESEARCH METHODOLOGY.**

This chapter explains how this research contributes to research techniques and approaches in the field of Environment Behaviour studies in higher education, through the conceptualisation, design and implementation of this inquiry. Firstly, the underpinning philosophical assumptions are initially set out, where an architectural and spatial design paradigm are discussed. Secondly, the definition and advantages of mixed methods design exploiting in this dissertation are examined. Thirdly, the rationale of the case study as the preferred method for this thesis are outlined. Lastly, a pilot study, the research at the Telford Exhibition Hall at the University of Nottingham, was carried out to examine the feasibility of the research methods and to adjust the research design for the case studies.

The research design argues for the adoption of a case study method. The specific outline of the case study method refers to the research rationale and the selection process of the informal learning spaces in this empirical research. The considerations given for the two cases of data generation, that constituted the case study evidence, are subsequently discussed, and the procedure of the case studies is then explained. This explanation states how the data were obtained for further discussions and which specific methods were used to collect data for studying the impact of the design quality of the spatial organisation of the informal learning spaces on student experiences. A comparative analysis

juxtaposing the two case studies was then defined as one of the analytical strategies to study.

## 4.1 PHILOSOPHICAL ASSUMPTIONS OF THIS RESEARCH.

Philosophical assumptions could be abstracted to underpin the validity and accuracy of the research. The clarification of the philosophical assumptions could help to understand deeply ingrained views about the types of problems that we need to study, what research questions to ask, or how we go about gathering data (Creswell, 2013). Hence, it is necessary to identify the philosophical assumptions of the research in order to justify the imperatives for this research, which are to: contribute to the existing body of knowledge in terms of the design of the informal learning spaces in higher education.

Table 4-1: Basic beliefs associated with the major paradigms.  
*Source: Research and Evaluation in Education and Psychology: Integrating Diversity with Quantitative, Qualitative, and Mixed Methods (Mertens, 2014: 11)*

Basic Beliefs	Pragmatic
<b>Axiology</b> (nature of ethical behaviour; what we value)	<i>Gain knowledge in pursuit of desired ends as influenced by the researcher's values and politics</i>
<b>Ontology</b> (nature of reality; how we understand what is)	<i>Asserts that there is a single reality and that all individuals have their own unique interpretation of reality</i>
<b>Epistemology</b> (nature of knowledge; relation between knower and would-be known; how we know what is)	<i>Relationships in research are determined by what the researcher deems as appropriate to that particular study</i>
<b>Methodology</b> (approach to systematic inquiry)	<i>Match methods to specific questions and purposes of research; mixed methods can be used as researcher works back and forth between various approaches</i>

In this section, four basic beliefs of this research (see Table 4-1) are discussed so that the process of the empirical study could justifiably provide knowledge pertaining to the design of the informal learning spaces.

#### **4.1.1 Axiology.**

Our values affect how we do research and what we value in the results of our research. The stronger these factors are, the more likely someone is to form a behavioural intention to do the action and consequently, act. In this research, the spatial design qualities of the informal learning spaces were selected as the factors for identifying how the student satisfactions with the design quality of the informal learning spaces impacted student behaviours. In return, the investigations of the student behaviours were carried out to examine how to better design the key features for the future informal learning spaces. As a part of the evidence-based design process, the research provides feedback on how successful the informal learning space is in supporting student experience. The value of this research attempts to fill the gap of this realm.

#### **4.1.2 Ontology.**

Ontology is how we understand what is. It asserts that there is a single reality and that all individuals have their own unique interpretation of reality (see Table 4-1). The student, as a type of key stakeholders, is targeted to be satisfied by the spatial design. That is to say, even though the issue of the design quality and spatial organisation of the learning space in higher education can be considered as an interdisciplinary subject, students' behaviours, attitudes and preferences should be mainly emphasised. It does not mean that the other key stakeholders were not useful. Interviewing key stakeholders, such as architects, estates, and managers could also be helpful for spatial design. However, this research targets on the students. The references from the other key stakeholders were also mentioned but only as supplementary materials to echo students' intentions. In



this thesis, students as inquiry entities, were studied to record their behaviours in the informal learning spaces and to measure their perceptions towards the design qualities of the informal learning spaces. All their unique interpretations of their behaviours and attitudes reflected a single reality – the design of the informal learning space.

#### **4.1.3 Epistemology.**

Epistemology refers to how we know what is. This thesis aims to acquire information and develop new knowledge and principles from the design of learning spaces within the student perspectives, as a necessary and sufficient consideration for better design of the informal learning spaces in higher education. The design qualities of the spatial organisation of the informal learning spaces were derived from physical elements that provided the thesis' theoretical proposition. With efficient or inefficient spatial arrangements, the physical environment affects student behaviour, which influences student engagement and involvement in the informal learning spaces (Holley & Dobson, 2008; Crook & Mitchell, 2012). The informal learning space is not only a place for student socialising but also for holding students in the informal learning spaces. The social style and informal learning styles of student interaction, while using informal learning spaces, affects how they manage their behaviours and use the informal learning spaces on the campus. The evolution of the pedagogical theory has affected student-learning styles and consequently, increasing informal learning activities have occurred hence the imperative for the informal learning space is emphasised in the higher education learning environment.

#### **4.1.4 Methodology.**

The three objectives of this research requested different research methods to solve the problems. Hence, the mixed methods design was used to generate data as well as the consequent interpretations in this research. Many researchers have used mixed methods because this seems intuitively obvious to them, that the strategy would enrich their ability to draw broad-based conclusions about the problem under study.



Figure 4-1: An overview of research approach.

*Source from: Edited by author.*

In this research, the data regarding the usage of the functional zones were collected through observation. The data of the frequency of the student activities and that of the time periods of the usage of the informal learning spaces, were collected by both observation and questionnaires. The data for the reasons for using the informal learning spaces were collected by questionnaires while the levels of student satisfaction with the design quality of the informal learning spaces upon the frequency of student socialising and informal learning activities

were generated by a quantitative analysis approach based on questionnaires. The discussions of the impacts were articulated by qualitative analyses based on the interviews and focus groups (see Figure 4-1).

In summary, this section discusses the philosophical assumptions of this research based on the description of four basic beliefs and a paradigm – pragmatism. The pragmatic paradigm determined mixed methods design as the tool for inquiry into the design of the informal learning spaces in higher education. There are also a number of ways to discuss this topic, considering that the pragmatism also has its limitations. However, in this section, it is argued that the conceptualisation of this research is appropriate for the research inquiry. Meanwhile, the philosophical assumptions and research methods, which informed the researcher's worldview, were both validity in research terms and the design of the informal learning spaces in general. The following section will discuss the rationale of the case study selected as the preferred method for this thesis.

## **4.2 THE RATIONALE FOR THE CASE STUDY AS THE PREFERRED METHOD FOR THIS THESS.**

This section explains the focus of the research and why a case study method is selected as the preferred method for this thesis.

Researchers focused on how to design the informal learning spaces to support and benefit student experience from different perspectives (see chapter 3 section 3). Nevertheless, there is still a lack of empirical studies on informal learning

spaces in higher education. It has been clearly shown that there is a strong correlation between human behaviour and the use of spaces according to Environment Behaviour theory (Ajzen, 1985). However, the extent to which the design qualities of the informal learning spaces shape student experience needs to be further explored.

Hence, this research aims to answer three research questions. Firstly, the research investigated student experiences in the informal learning spaces. More specifically, it includes the student activities in relation to where, when and what they use in the informal learning spaces. Secondly, the research examined the impact of student satisfactions with the design quality of the spatial organisation of the informal learning spaces on the frequencies of student activities. This research objective attempts to discuss the correlation between the design quality of the informal learning spaces and student activities. Thirdly, based on the investigation explored, this research objective identified the spatial design strategy to better support an ideal informal learning space in higher education. It could be clearly seen that the three research objectives were linked to each other and follow a sequential research form: one type of data provided a basis for the collection of another type of data (Mertens, 2014). It seems that the research firstly investigated student usage of the informal learning spaces and student preferences of the informal learning spaces. After that the frequency of student activities within the informal learning spaces and student preferences of the design qualities of the informal learning spaces were correlated and the relationship between them was analysed. Also, the strategy for a better design of the informal learning spaces was advocated.

A case study is relevant the more research questions seek to explain some present circumstances. This address: how and why some social phenomena work or if the research questions require an ‘in-depth’ description of some social phenomenon (Yin, 2013). The insight for the research questions addressing ‘why’ and ‘how’ is best found in extensive in-depth descriptions of the phenomenon, in this case the informal learning spaces as a place for student socialising and informal learning activities in university campuses. Hence, the case study method was selected to answer research questions and achieve the research aim. Before the case study was carried out, it is necessary to define the theoretical scope and proposition to narrow down the research realm. The next section states the theoretical scope and proposition of this research.

### 4.3 CASE STUDY CRITERIA.

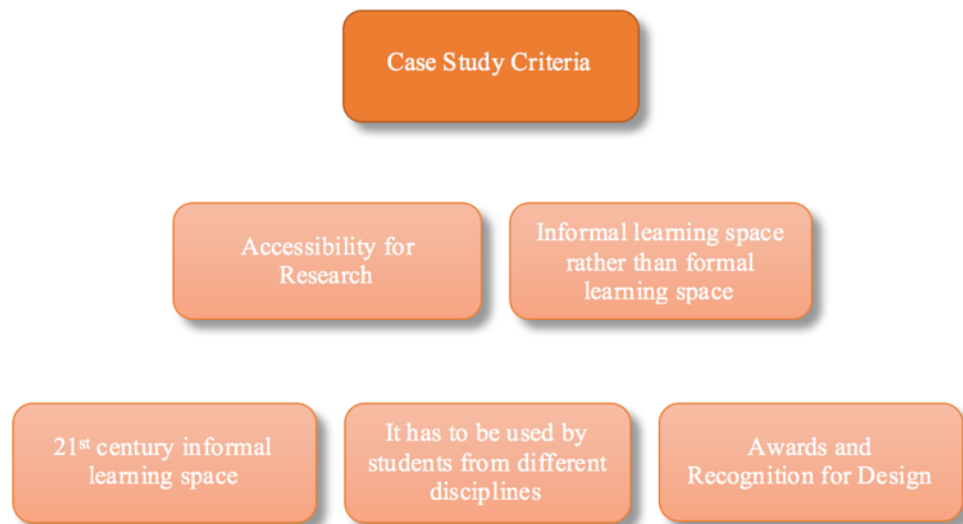


Figure 4-2: The overall set of case criteria that built a strong case study analysis for this research.

*Source from: Edited by author.*

An exploited case study method exploited enables a researcher to closely examine the data within a specific context. It is important to enable the theoretical proposition being tested in order to validate the objective of this

thesis. Therefore, the case study criteria were stated in this section to ensure the validity of the selected case studies for this research.

The condition of the case study criterion is important in order to test the proposition accurately in order to specify a good outcome for the research questions. To ensure the accuracy and validity of the research, a series of inquiries was designed to protect the concentration of the context of this research. The inquiries consist of the case study criteria, which should be proven before examining the scope of the study. The more a case study is built within the scope of a specific criterion to test, the more it will stay focused within its test limit (Yin, 2013). It also helps to narrow down the body of knowledge to be discovered. Most importantly, the body of knowledge achieved in this thesis can be adapted within the scope based on the conditions that essentially defined this research: Spatial Design Strategy of the Design Quality and Spatial Organisation for Higher Education Informal Learning Spaces. This case study is based on five lists of criteria that were derived from the literature review and theoretical propositions for this thesis (see Figure 4-2). The criteria are discussed below.

#### ***4.3.1 Accessibility for Research.***

The accessibility of the cases should be firstly considered beyond the other case study criteria. It is not easy to get access and do research in the high-rise educational facilities. Even though the informal learning spaces in the New School and the Columbia University Medical Building, which are located in New York (see Table 2-2), are identified as the perfect cases for this research, it cannot be successfully carried out without permission. Hence, before

confirming the selection of the cases, the possibility of accessibility to the research context, as a requirement for the criteria should be checked to ensure the realisation of the research project.

#### **4.3.2 Informal Learning Spaces Rather Than Formal Learning Space.**

The case study must be a real informal learning space rather than a formal learning space. Informal learning defines, according to McDaniel (2014), as the informal learning spaces. These were divided into four models. The four types and characteristics are shown in Table 4-2 below.

Table 4-2: Four types of informal learning spaces.  
Source from: *Every Space is a Learning Space – Encouraging Informal Learning and Collaboration in Higher Education Environments* (McDaniel, 2014)

Type of the informal learning spaces	Characteristics
<b>Information Commons</b>	<i>Provide a diverse environment, offering a combination of spaces that support individual activity and research as well as social learning activities (Attis &amp; Koproske, 2013). IT-rich environment (Lippincott, 2006)</i>
<b>Learning Commons</b>	<i>The often centralised learning commons is conceived around the notion that 'the learning process' is 'enhanced when it occurs in a dynamic social context'. Offering a wide range of academic opportunities, this model of informal learning space addresses a number of services, including skills training, multimedia development, and student IT support, media labs, individual spaces for presentations, training, and distance learning, academic support services, career resources, and collaborative study areas (Jamieson, 2009). The learning commons can often be integrated into an existing space or exist as an independent informal social and learning place (Villa, 2013)</i>
<b>The Classroom – Beyond Four Walls</b>	<i>Many of the strategies for designing informal learning environments are being incorporated in formal learning areas In addition to good sight lines, acoustics, and indoor environmental quality, classrooms now feature design strategies, such as easily moveable furniture and perimeter-clad white boards, to successfully support group work and collaboration for more active learning approaches.</i>
<b>Leveraging Circulation Areas to Encourage Collaboration</b>	<i>'Front porches,' or spaces immediately outside formal spaces, provide opportunities for conversations that continue classroom discussions immediately following class time (O'Neill, 2013). 'Learning streets' activate circulation spaces and encourage impromptu encounters among students and between students and faculty. These spaces are most efficiency when planned as part of the overall program that includes formal learning environments and support areas to determine of square-footage allocation for a new facility or renovation.</i>

More specifically, the first one is defined as the modern library. Traditionally, the campus library served as the higher education institution's 'knowledge centre' (McDaniel, 2014: 4). Due to the development of IT technology and the

revolution of the pedagogical theory, the library has been redefined. The modern library, provides students with a diverse and IT-rich environment (Lippincott, 2006), offering a combination of spaces that support individual activity and research as well as social learning activities (Attis & Koproske, 2013).

The second model of informal learning spaces, Learning Commons, offers a wide range of academic opportunities and services, including skills training, multimedia development, and student IT support (Jamieson, 2009). The learning commons are often integrated into an existing space or exist as an independent informal social and learning place (Villa, 2013).

The third model is more directly about rethinking the formal learning space – the classroom. Except for the basic design quality of the formal learning spaces, such as good sight lines, acoustics, and indoor environmental quality, the classroom has increased the informal design strategies, such as moveable furniture and perimeter-clad white boards, etc., to successfully support group work and collaboration for more active learning approaches.

The fourth model of the informal learning space characterises the learning street, which leverage circulation areas to encourage collaboration. O'Neill (2013) states that the learning street provides, immediate external formal spaces and provides opportunities for conversations that continue classroom discussion immediately following class time.

The four models of the informal learning spaces cover almost all the types of the informal learning spaces. In this thesis, one of the significant criteria of the case study are the type of the informal learning spaces. The two key



characteristics of the case study should be considered: 1) it should be a real informal learning spaces rather than the third model, the updated formal learning spaces; 2) it should support both socialising activity and informal learning activity.

#### ***4.3.3 The 21<sup>st</sup> Century Informal Learning Space.***

The case study should be designed within the 21<sup>st</sup> century. It is impossible to provide a better strategy for the future if the cases were built over 20 years ago. The spatial strategy of the learning spaces has been continuously updated by the designers based on the development of the pedagogical theory and the evolution of the technology. Furthermore, student behaviour and learning styles are also changing. Therefore, recently built cases are better to support the validity of the research.

#### ***4.3.4 It Has to be Used by Students from Different Disciplines.***

In order to test the proposition, the cases must be in ‘public’ use by any students from different disciplines. Private informal learning spaces used by single department may hinder in-depth analysis and create bias based on similar time schedule of the department. And consequently, this may hinder comprehensive data to conclude the objective of this thesis. As an analysis of the higher education informal learning space, it should be located in the heart of the campus, surrounded by the formal learning spaces and used by students who can freely get involved if they wish. If the informal learning spaces were used for specific groups of students, they would draw weak results regarding the diversity and multifunctional usage of the space in the site. The objective of this

criterion is in response to the thesis's inquiry addressing the informal learning spaces as a place for socialising and informal learning activities. The socialising and informal learning activities would be impacted by the accessibility of the space, spatial control and management. The proposition must be tested in an informal learning space where it is open to all the students in order to create a strong legitimacy for the case.

#### ***4.3.5 Awards and Recognition for Design.***

A case study that has received awards and recognition for architectural design will help to create stronger grounds to test its validity. The awards and recognition within the architectural realm imply that the spatial organisation of the cases was accepted as an innovation of its spatial design. The awards will also create strong evidence that can be reviewed repeatedly to consolidate the argument for its usage and effectiveness, to test whether or not the design of the learning spaces confirms its recognition. Furthermore, if the awards are specifically focused on the subject topic of informal spaces, that will add quality to the case, therefore providing greater validity to the results. This would further strengthen the inquiry and focus on the most important inquiry on the case, 'Do the selected case studies work for answering the research questions?'

## **4.4 THE SELECTION AND THE CONTEXT OF CASE STUDIES.**

In this section, possible cases are listed, and it is explanations provided as to why the Diamond at the University of Sheffield and the Newton at Nottingham

Trent University are selected as cases for this research. After that, the contexts of the two cases are described.

#### ***4.4.1 The Selection of the Case Studies.***

Selecting proper cases is important for the empirical research. Typical, Diverse, Extreme, Deviant, Influential, Most Similar and Most Different are the seven techniques for case selections (Seawright & Gerring, 2008). Yin (2013) also summarises four types of case study methods on the number of case selections. Comprehensively, based on the case study criteria, two of the cases were selected from the listed cases (see chapter 2 section 6): The Diamond at the University of Sheffield and the Newton at Nottingham Trent University.

The Diamond at the University of Sheffield and the Newton at Nottingham Trent University provide the perfect places to investigate the informal learning spaces in higher education. More specifically, the Diamond is mainly designed for supplementing of the learning spaces in the university campus, where the spaces are immediately outside the formal spaces, provide opportunities for conversations that continue classroom discussions immediately following class time (O'Neill, 2013). The Newton was designed for a passageway, where the university provided a learning environment for student socialising as well as informal learning activities. Both cases were designed and created a series of informal learning spaces beyond the formal learning spaces to support student experiences in the campus. With the existence of these purposely built informal learning spaces, students did a variety of activities there. The case studies inquiry will cover many variables of interests, relying on multiple sources of evidence, converging and triangulating with each other with a guide from prior

theoretical propositions suggested in the literature review (Yin, 2013). In essence, the inquiry based on the case studies is an all-encompassing method covering the logic of the methodology, data techniques, and specific approaches to data analysis. Case studies are generalisations to theoretical propositions with the goal of expanding theories (analytical generalisation). This, therefore establishes this research as a theoretical extension for rethinking the architecture of post compulsory education in relation to place making.

#### ***4.4.2 The Context of the Case Studies.***

Two cases, the Diamond at the University of Sheffield (fly through can be seen in the link below: [https://www.youtube.com/watch?v=RnS\\_R-gKHKM](https://www.youtube.com/watch?v=RnS_R-gKHKM)) and the Newton at Nottingham Trent University (360° panoramas of central court can be reviewed in the link below: [http://www4.ntu.ac.uk/about\\_ntu/media/97515.swf](http://www4.ntu.ac.uk/about_ntu/media/97515.swf)) are studied in this thesis. This section explains the context of the case studies in higher education.

##### ***4.4.2.1 The Diamond at the University of Sheffield.***

With £81 million investment funded on teaching and learning facilities, the Diamond at the University of Sheffield is 19,500 sq. It was designed by Twelve Architects and it opened its doors to students on September 28<sup>th</sup>, 2015. The building aims to create a place for modern interdisciplinary teaching and to enrich student experiences in higher education. Many prizes such as those from the Yorkshire and Humber Region Royal Institute of Chartered Surveyors (RICS) and the Royal Institute of British Architects (RIBA), were awarded to acknowledge the innovation and revolutionary makeup and function of the

learning spaces for the 21<sup>st</sup> century. Located in the centre of the University of Sheffield (See Figure 4-3) and three minutes walking distance from the Information Commons (IC), the Diamond provides an extra place to support and improve student learning experiences. As Keith Lilley, who is the director of Estates and Facilities Management, stated, *'The Diamond is the single largest academic project the University has undertaken, and is a truly unique and inspiring facility'* (see <https://www.sheffield.ac.uk/diamond/history>). The building aims to provide a unique interdisciplinary learning environment.



Figure 4-3: Campus Map of the University of Sheffield.

Source from: [https://www.sheffield.ac.uk/polopoly\\_fs/1.432139!/file/campus-map-dec2014.pdf](https://www.sheffield.ac.uk/polopoly_fs/1.432139!/file/campus-map-dec2014.pdf)

Including basement floor, the six-storey learning settings integrate a range of lecture theatres, seminar rooms, open-plan learning spaces, a library and IT services. It has space for informal study including a café on the ground floor and next to the main entrance and the reception. The spaces of the basement floor (Level A) are mainly used as large lecture spaces. Linked with staircases, the basement atrium is mainly used for evacuating and as a temporary space for

waiting without chairs and tables (see Figure 4-4). As a ground floor (Level B), spacious entrance spaces with a 24-hour reception (security at night) and a café corner are provided for everyone (see Figure 4-5). Level C, D, E and F (See Figure 4-6, Figure 4-7, Figure 4-8, and Figure 4-9) provide various learning and teaching spaces, including ‘corridor’ learning spaces and ‘open’ learning spaces. The computing area offers over 1,000 study spaces available 24/7 for all students and staff across the University. The building’s 19 laboratories offer students more practical learning opportunities with a chemical engineering pilot plant, a clean room, an aerospace simulation lab and a virtual reality suite. The enriched teaching and learning spaces were centralised and vertically organised by a four-floor height atrium and enlarged corridor spaces (see Figure 4-10).

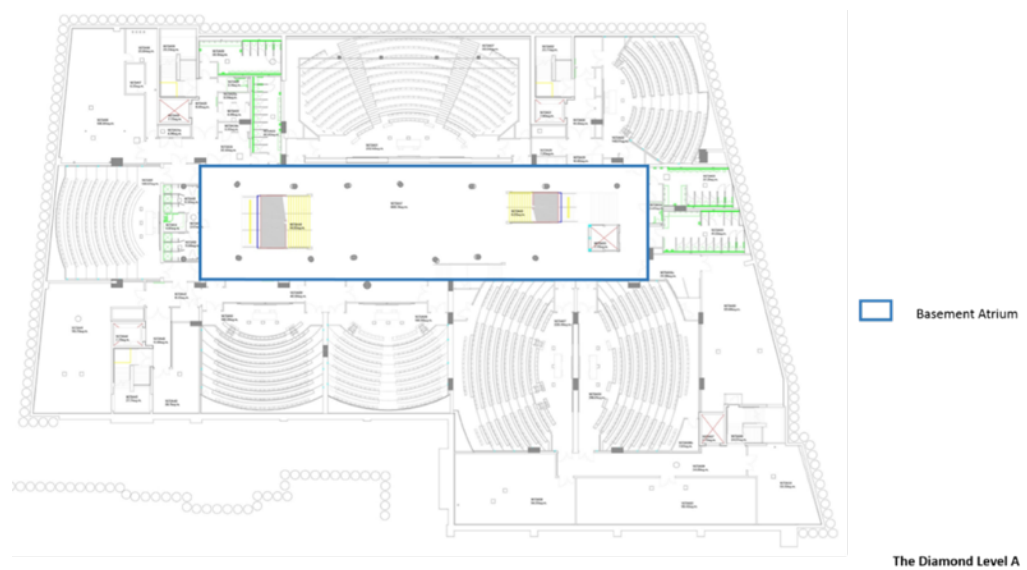


Figure 4-4: Level A of the Diamond at the University of Sheffield.

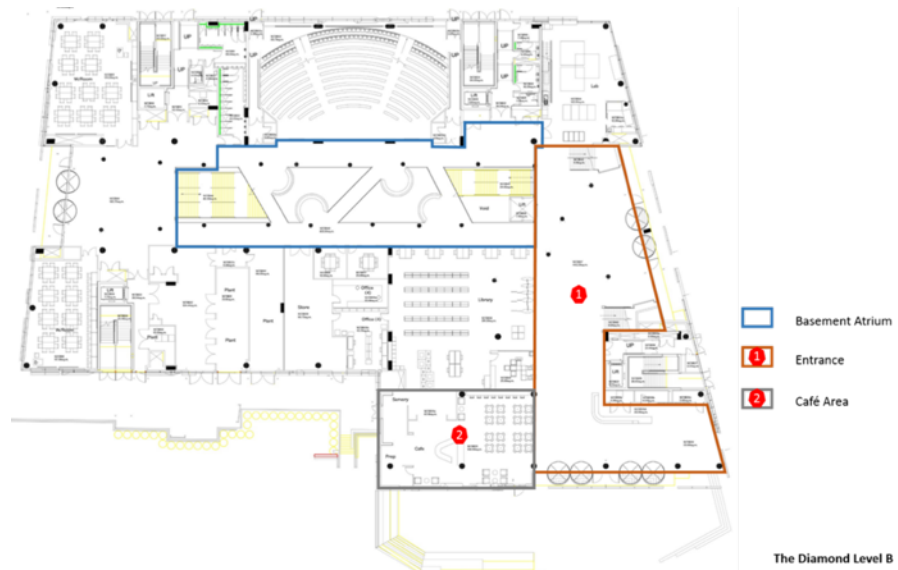


Figure 4-5: Level B of the Diamond at the University of Sheffield.



Figure 4-6: Level C of the Diamond at the University of Sheffield.

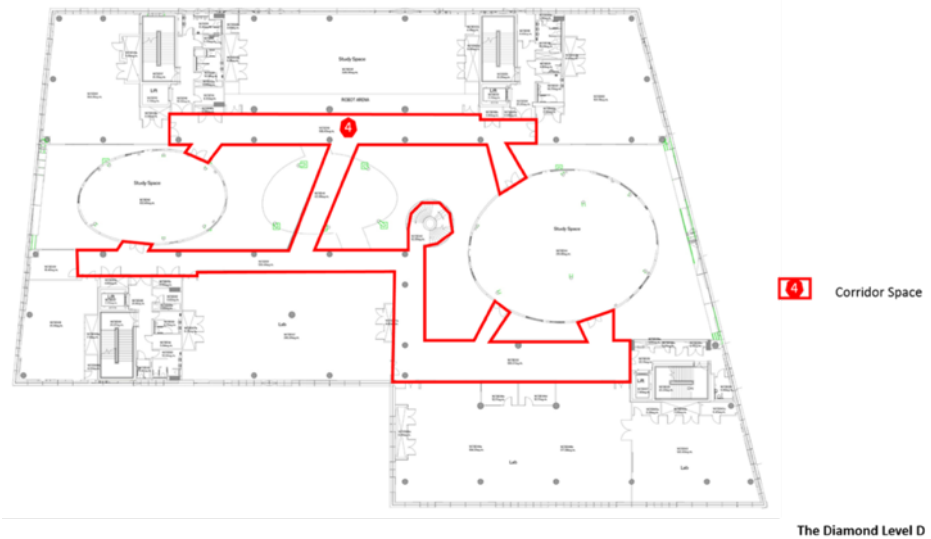


Figure 4-7: Level D of the Diamond at the University of Sheffield.



Figure 4-8: Level E of the Diamond at the University of Sheffield.



Figure 4-9: Level F of the Diamond at the University of Sheffield.



Figure 4-10: The Atrium Space at the Diamond.

*Source from: Photo by author.*



#### 4.4.2.2 *The Newton at Nottingham Trent University.*

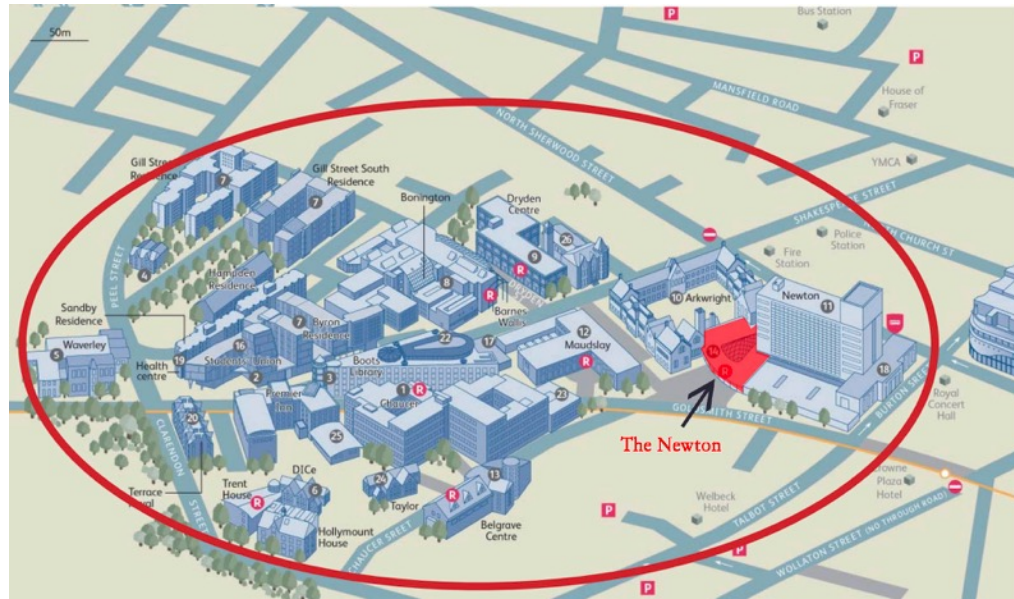


Figure 4-11: Campus Map in Nottingham Trent University.

Source from: [http://www4.ntu.ac.uk/map\\_files/City\\_2D.pdf](http://www4.ntu.ac.uk/map_files/City_2D.pdf)

Designed by the Hopkins Architects in 2009, the redevelopment of the 1877 Arkwright and the 1950 Newton Buildings in Nottingham Trent University (31,610 sq.), has created a vibrant new social heart for the city-centre campus. The project secured the future of both historically significant Grade II listed buildings, providing extensive renovation and modernisation to their dated, inefficient and incoherent spaces. With £90 million funding in the regeneration of two Grade II listed buildings, the Newton and Arkwright, at the heart of the City Campus (see Figure 4-11), the architects generated a linking space with an atrium, the Central Court, to organise the function of the spaces between the Newton and Arkwright building.

The south part of the informal learning space is mainly used by students in the Nottingham Business School and for Nottingham Conference Centre. The north part links the school of Architecture, Design and the Built Environment. With large lecture spaces, computer rooms and small seminar spaces, the Central

Court is seen as an in-between learning space. With a student service, a career hub and three Food Bars and one main canteen, the Central Court supports the student campus life in higher education. The heart of this area is organised by a glass roof and wooden frame atrium – Central Court (see Figure 4-12). The transparent roof allows light into the space and the wooden frame leave the shadow on the floor. It provides a vibrant space for students. Flexible furniture arrangements and plots meet different requirements for the activities. The Central Gallery (see Figure 4-13) can be booked for Exhibitions and reviews. During the vacation time, tables and chairs can be organised by the student themselves to shape their own learning environments.



Figure 4-12: Central Court at Nottingham Trent University.  
Source from: <http://www.hopkins.co.uk/projects/16/113/>



Figure 4-13: Central Gallery being used as final review for architecture students.  
Source from: Photo by author.

The area on Level 0 consists of a service lobby, Central Court and Hall 0 (see Figure 4-14). The service-lobby is a space next to the main canteen. It provides extra spaces for the canteen. The Hall 0 is an enlarged corridor space with chairs and tables and sockets, where students could discuss topics immediately after the lecture. Level 1 consists of a main entrance with a Food Bar, Central Gallery and Hall 1 (see Figure 4-15). The function of Hall 1 is the same as that of Hall 0. As an enlarged corridor space, it can also be used for exhibitions, reviews and group studies.



Figure 4-14: Newton Spaces in Level 0.

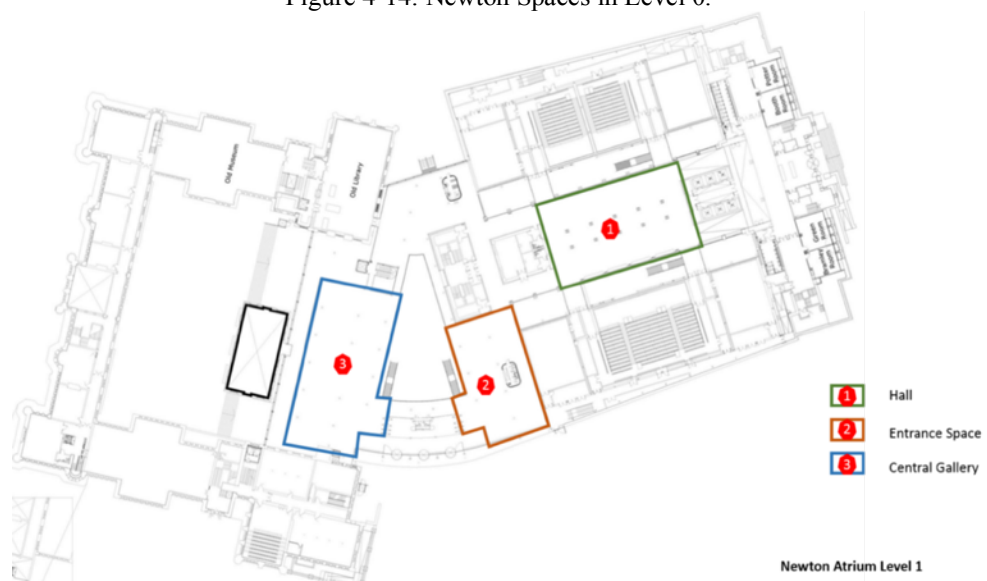


Figure 4-15: Newton Spaces in Level 1.

## 4.5 PILOT STUDY.

### 4.5.1 Study Area.

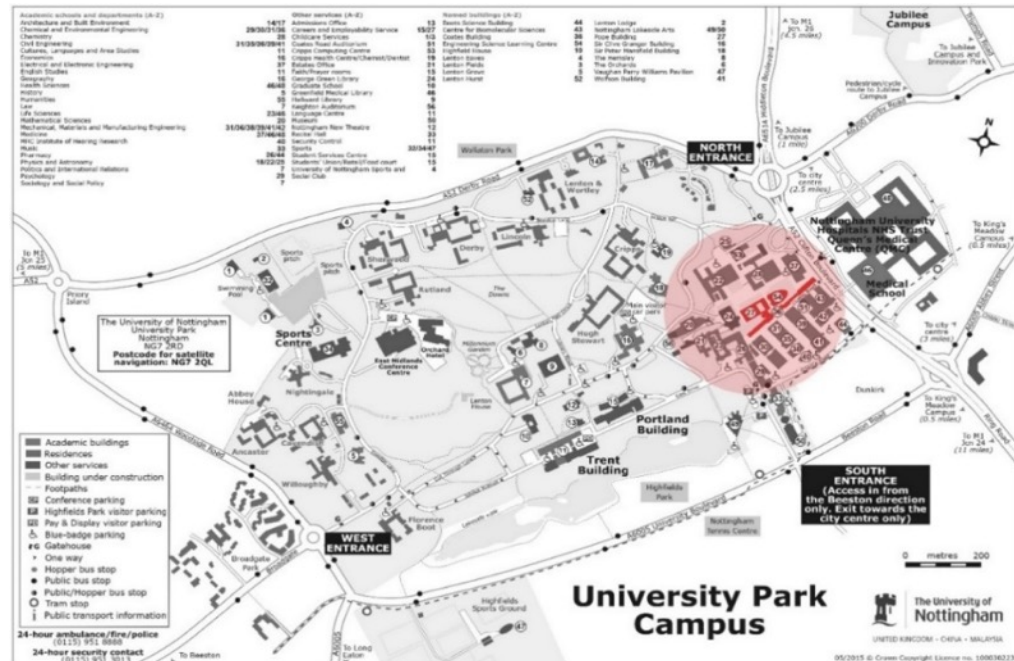


Figure 4-16: The location of Telford area at the University of Nottingham.

Source from:

<https://www.nottingham.ac.uk/sharedresources/documents/mapuniversitypark.pdf>

In order to test the feasibility and validity of the methods, a pilot test study was carried out. The primary pilot study was conducted in the Telford Exhibition Hall (T) at the University of Nottingham. From a large scale, the Telford area is located in the University Park campus and is in the heart of the Engineering Faculty (see Figure 4-16). The space of the Coates Building (C) is multi-functionally used for staff, postgraduate researchers and students. A new building named the Pope Building (P) is used mainly to hold student activities for courses, lectures and using the computer room. T (see Figure 4-17) is mainly used to bridge C and T, to show case Open Days and student Portfolio Shows as well as to undertake the function of providing public social spaces (socialising). T is a three-floor-height atrium (see Figure 4-18) and each floor is linked by a flight of stairs. Several seats are arranged in the cafe area and



alongside the corridor on the ground floor. The first floor mainly includes some public computer spaces and two tables with chairs. Only some seats can be found alongside the corridor on the second floor. My research occurred between the exams period and the term period. The space is open to everyone during the day-time and during weekdays and to all students 24 hours 365 days in a year.

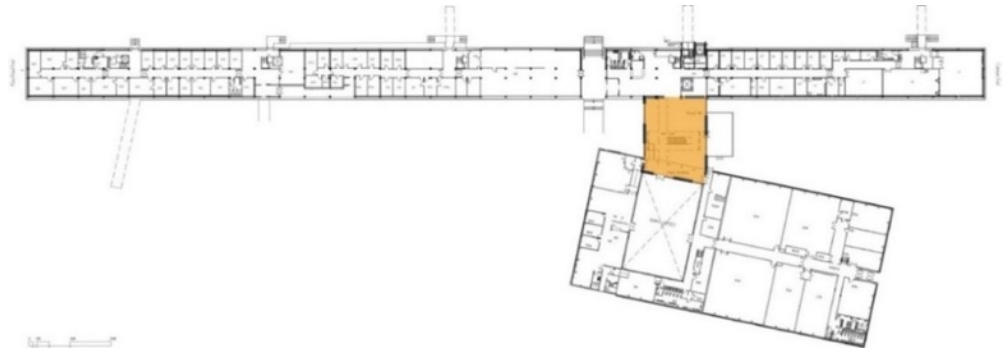


Figure 4-17: The Floor Arrangement of C, T and P Building.

*Source from: Estate Office in the University of Nottingham and Edited by author.*

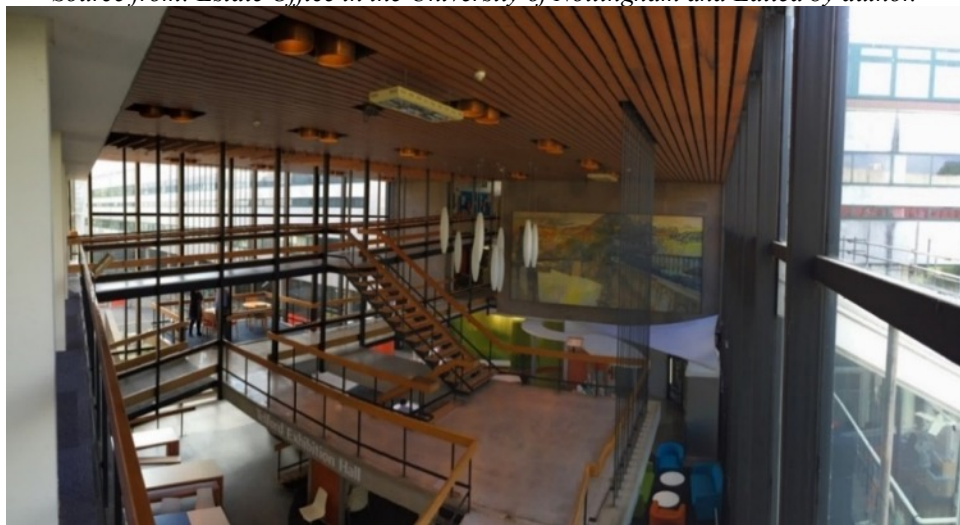


Figure 4-18: Three Floor Atria of T.

*Source from: Photo by author.*

#### **4.5.2 Methods used in the pilot study.**

##### **4.5.2.1 Observation.**

The observations were carried out over 10 working days and 4 weekend days in two weeks which included an assessment (examination) week and a typical Semester week, from 11<sup>th</sup> to 17<sup>th</sup> of January and from 25<sup>th</sup> to 31<sup>th</sup> of January 2016 (see Figure 4-19). The observations started at 8 am and ended at 5 pm on



The observation recorded students` patterns, distribution and length of stay of using the T. The observation attempted to record people`s every behaviour even though they were just using T as a passageway. The behaviours were recorded in the map and summarised into a table for better analysis (see Figure 4-21).

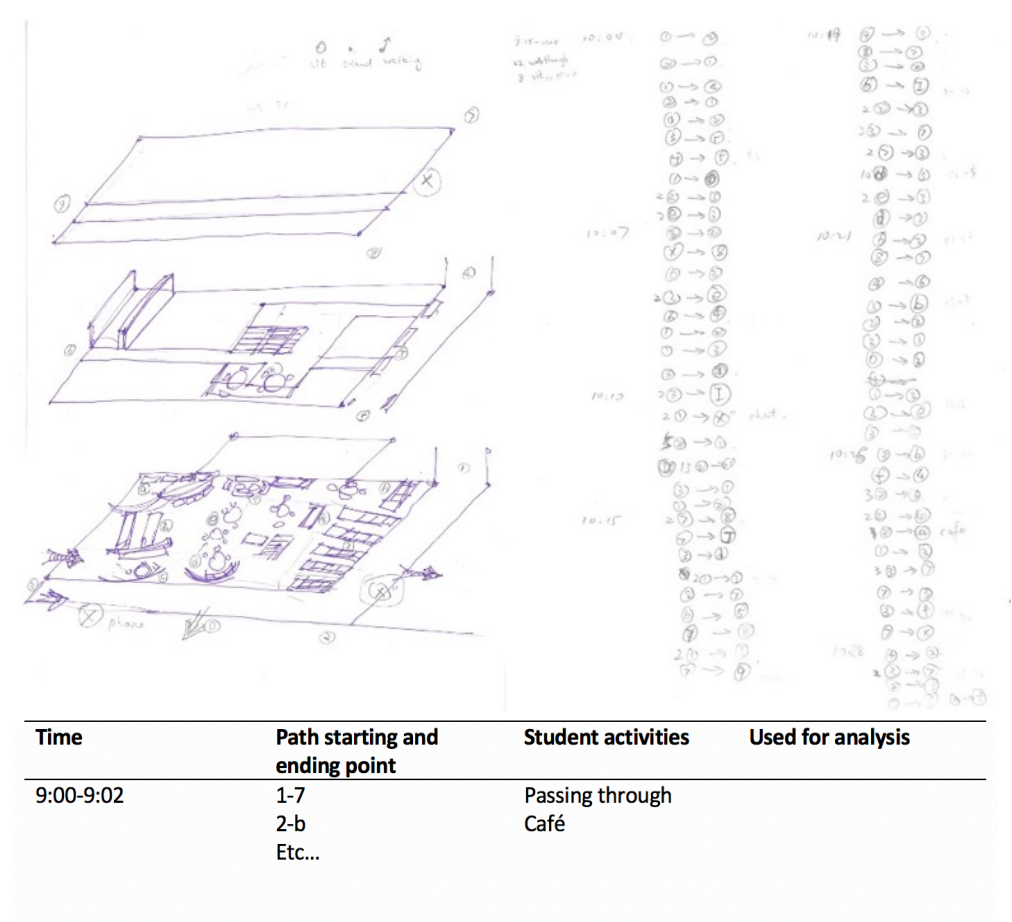


Figure 4-21: Mapping students' usage of T

Participants were made aware of the observation process through usage of posters displayed in the vicinity of the T. The posters were displayed on the information boards and other visible places (see Figure 4-22). The poster illustrated the purpose of the usage of the data and the contact email for the researcher. All the methods used were strictly in accordance with the University of Nottingham`s code of conduct and research ethics approval was obtained in advance.



Figure 4-22: Photography Notice posted in T

#### 4.5.2.2 Interviews.

In understanding environmental-behaviour relationships, the research provides ‘answers to these five questions: What was done (act), when or where was it done (scene), who did it (agent), how he [or she] did it (agency), and why (purpose)’ (Asplund, 1979). The observations provided information on students’ activities in the informal learning spaces regarding what, when or where, who and with whom, and how, and consequently on students’ needs in the informal learning spaces. To fully determine the needs in the informal learning spaces we must also know why people did (or did not) do what they



were intended to do. Interviews were done in the two stages. The first stage occurred between the 8<sup>th</sup> and 16<sup>th</sup> of June 2015, the end of a semester. A total of 8 respondents were selected to get the results. Seven participants were individually interviewed, and three people were interviewed together as a group. The second stage occurred between 8<sup>th</sup> and 12<sup>th</sup> March 2016. Based on the lessons of the first stage, an extra seven individuals were selected to get the results. The selection of the respondents includes both student and staff. All the other languages were translated into English. All the records were scripted into Microsoft Word and analysed using NVivo 11. The data was coded to interpret the data collected by observation and used for designing questionnaires.

#### *4.5.2.3 Surveys.*

The purpose of the survey was to gather statistical information on student activities, time period of using the space, the frequency of student activities and their preferences of the design quality of the informal learning spaces. The questionnaires were collected on 10 weekdays in two weeks from the 29<sup>th</sup> of February to the 4<sup>th</sup> of March 2016, and from the 2<sup>nd</sup> of May to the 6<sup>th</sup> of May 2016. The design of the questionnaire is a semi objective question-based method. In other words, I read every question to the respondents and tried to let them give an answer without pressure and with time to think. Meanwhile, depending on their answers, I asked some extra open questions and made notes on the questionnaires. The total number of questionnaires is 106 and 104 questionnaires were returned. 86 valid questionnaires were collected with 82.7% efficiency. The response rate was 98.1%.

#### **4.5.2.4 Syntactical Analysis.**

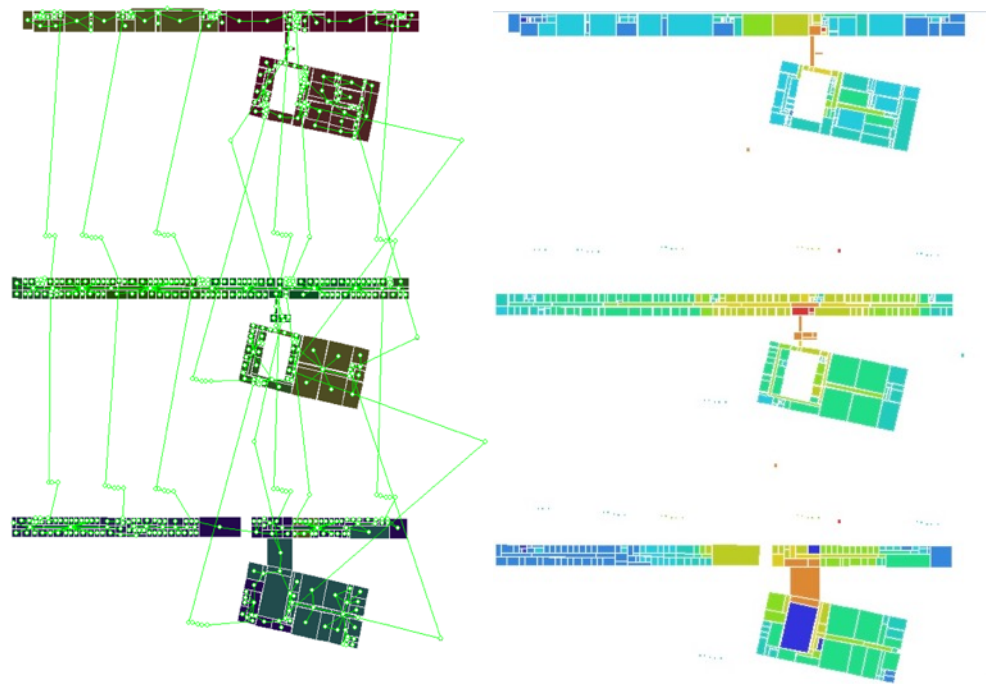


Figure 4-23: Connectivity of Telford Exhibition Hall  
*Source from: Created by author.*

Based on the space syntax theory, the pilot study used the convex map to compare the connectivity and integration of the spaces around the area (see Figure 4-23). This helps to compute and predict the use of space and occupancy rates of different areas characterised by integration and connectivity values of the visibility or movement paths around T.

#### **4.5.3 Discussions.**

Pilot study helped to test the feasibility of the employed research methods. It provided a small-scale test of the methods and procedures to be used in the case studies. In this section, it shortly summarised what was learnt from the pilot study.

The strategy of the vantage point used in the pilot study helped to record most of student activities. However, it is really important to see the situation case by

case. This strategy has been extended to four points in each space in case studies to ensure the student activities were collected.

The pilot study showed that in areas of movable activity it was not possible to observe and record all the requisite information. Often people not only do one activity in that space, while two or three activities occurred spontaneously instead. This information could not be recorded accurately. To response this issue, the observation in the cases studies was changed to a series of scan sessions (5 minutes at each vantage point) to capture student activities at a specific time. This action cannot reduce the errors or mistakes of the observation but could extremely enhance the quality of the data. Meanwhile, the task of recording all this information for the whole day from 8am to 5pm including both weekdays and weekend led to observer fatigue, which compromised the quality of the gathered data. As a result, and in the interest of improving the quality of data, I reduced the time of observation from a whole day to selected hours in one day (from 8am to 10am, from 12pm to 2pm, from 5pm to 7pm, from 8pm to 10pm) in order to address the problem of observer fatigue.

Furthermore, the pilot study in one space within different weeks (including the assessment week and term week) was done. The Assessment week is only an exceptional case and should be eliminated in the case studies. The cases should focus on term-time weeks when students do daily activities normally. At least three different spaces could be investigated to examine the relationships between student activities and perceptions gathered in the informal learning spaces. In that case, student activities, subjective preferences and perceptions of the spaces could be compared based on the same spatial characters.

Space syntax can be used to examine the structure of spatial configuration and thus, the potential possibilities of communication and information delivery in the informal learning space. It can also imply the opportunities of socialising and informal learning activities. It is also extremely helpful for understanding the usage of spaces in 'street' dimensions. However, the frequency of student activities and spatial values of connectivity, integration and intelligibility cannot be correlated based on this observation in this research. It also cannot help to emphasise the impact of other design qualities on student activities, such as comfort, and the other supports. I would not continue to use Space Syntax theory and methods in the case studies. However, this method enhanced the understanding of how students use the spaces (or how spaces figure the usage in the informal learning space. All the generalisations and imaginations increased the understanding of the informal learning space and produced other perspectives to understand the reason for selecting and using the informal learning space. Consequently, a paper is generated to identify how spatial configuration shapes students' experiences in the educational complexes (Wu et al., 2017).

The survey in the pilot study provided a significant support to determine and interpret research objectives. In the case studies, the enquiries in questionnaires would be updated to guarantee high quality and effective data collection. The wording of questionnaires should be slightly changed based on different contexts. For example, when I asked the comfort levels in terms of acoustics, some participants required me to explain what that meant. As a result, this situation influenced questionnaires design to be as simple and clear as possible. Meanwhile, the quantitative results need to be interpreted in depth. The

interview helped to generate the draft of the questionnaires and enhance the qualitative analysis of the informal learning spaces. However, a distinct qualitative research is needed. Consequently, focus group is added to interpret obtained quantitative results and to explore how the design qualities of the informal learning spaces impact the students' activities and preferences. The open response format of a focus group provides an opportunity to obtain large and rich amounts of data in the respondents' own words. The researcher can obtain deeper levels of meaning, make important connections, and identify subtle nuances in expression and meaning (Stewart & Shamdasani, 2014).

## **4.6 PROCEDURE.**

As earlier mentioned in this chapter, a mixed methods design was employed. More specifically, the Observation, Questionnaire, Interview and Focus Group methods, were employed in the two cases (see Table 4-3). The questionnaire and observation were done first, and interviews and focus groups were done after, to ensure the quantitative data provided a basis for triangulating the inquiry of using qualitative of data. This sequential form (Creswell, 2013) ensures the validity of the research.

All the students who used the informal learning spaces in the cases were random sampled (Bryman, 2003) and voluntarily offered to participate. The participants were made aware of the observation process through the usage of posters displayed in the vicinity of the informal learning spaces. The posters were displayed on the information boards and other visible places. The poster illustrated the purpose of the usage of the data and the contact email for the researcher. Any published photos would use blurred out faces, so people

remained anonymous. All the methods used were strictly in accordance with the University of Nottingham's code of conduct and research ethics as approved by the faculty of the University of Nottingham.

Table 4-3: The mixed methods design approach in this thesis

Methods	The Diamond at the University of Sheffield	The Newton at Nottingham Trent University	Content
Observation	128 hours/64 sessions/16 working days in 4 term week, four sessions per day (8-10 am, 12-2 pm, 5-7 pm, 8-10 pm)	72 hours/12 working days in 4 term week, three sessions per day (8-10 am, 12-2 pm, 5-7 pm)	<ul style="list-style-type: none"> <li>• Student activities</li> <li>• Functional Zone</li> <li>• Duration</li> <li>• Resources in use</li> </ul>
Survey	148 valid questionnaires with 94.3% efficiency	97 valid questionnaires with 93.3% efficiency	<ul style="list-style-type: none"> <li>• Frequency of activities</li> <li>• Time period</li> <li>• Reason of using the space</li> <li>• Preferences of design qualities</li> <li>• Satisfaction of the informal learning space</li> </ul>
Interview	4 participants	4 participants	<ul style="list-style-type: none"> <li>• Frequency, activity and Reasons</li> <li>• Perceptions of the informal learning spaces</li> <li>• Usage of the space</li> </ul>
Focus Group	1 hour with 9 participants in one group	1 hour with 5 participants in one group	<ul style="list-style-type: none"> <li>• Student experiences</li> <li>• Design qualities</li> <li>• Space in between</li> </ul>

Before discussing the fieldwork, it is necessary to know the quantitative and qualitative rule of the Thumb (see Table 4-4 and Table 4-5). Using power analysis formulas, Onwuegbuzie and Leech (2004) calculated the size of samples needed for correlational, causal comparative, and experimental research in order to find a, '*medium...one-tailed and/or two-tailed statistically significant relationship or difference with .80 power at the 5% level of significance*' (Collins et al., 2007: 273). The recommended sample sizes for multiple regression and survey research can be traced in Gall et al.'s research (2007).

The sample size decisions are a bit more dynamic in qualitative research than in quantitative research. Nevertheless, rules of thumb for sample size in qualitative

research provide an estimate of the number of observations needed for different kinds of qualitative research (see Table 4-5).

Table 4-4: Rule of thumb sample sizes in quantitative research.

Source from: *Collecting research data with questionnaires and interviews* (Gall et al., 2007)

Type of Research	Recommended Sample Size
Correlational	64 participants for one-tailed hypotheses; 82 participants for two-tailed hypothesis
Multiple regression	At least 15 observations per variable
Survey	100 observations for each major subgroup; 20-50 for minor subgroups
Causal comparative	51 participants per group for one-tailed hypotheses; 64 for two-tailed hypotheses
Experimental or quasi-experimental	21 participants per group for one-tailed testing

Table 4-5: Recommended sample size in qualitative research.

Source from: *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods* (Mertens, 2014)

Type of Research	Recommended Sample Size
Ethnography	Approximately 30-50 interviews
Case studies	Can be only 1 case or can be multiple cases
Phenomenology	Approximately 6 to 10 participants
Ground theory	Approximately 15-30 interviews
Participative inquiry	Small working team; whole communities for meetings; samples for surveys (see quantitative rules of thumb)
Focus groups	5-9 people per group; 4 group for each major audience

With the guide of the rule of thumb, the fieldwork at the Diamond took place over 20 days, spread across four weeks before the Easter vacation (from 8<sup>th</sup> March to 31<sup>st</sup> March 2017), while the study at the Newton took place over 20 days spread across four weeks after the Easter vacation and before the exam period (from 19<sup>th</sup> April to 10<sup>th</sup> May 2017).

The schedule of observations can be seen in Table 4-6 and Table 4-7. The schedule of collecting data through questionnaires and interview was done in-between the observation sessions. Focus Groups were scheduled according to the availability of the participants. The Focus Group at the Diamond was scheduled on the 29<sup>th</sup> April 2017 and the Focus Group at the Newton was scheduled on the 23<sup>rd</sup> May 2017. Prior to starting, notices were displayed announcing the presence of a researcher across the specified dates for collecting

research data in the informal learning spaces. The following section explains the procedure of the four research methods, observation, questionnaires, interview, and the focus group in detail.

Table 4-6: Observation Schedule of the Diamond at the University of Sheffield.

	06.03 Monday	07.03 Tuesday	08.03 Wednesday	09.03 Thursday	10.03 Friday	11.03 Saturday	12.03 Sunday
8-10 am			Pilot Study	Pilot Study	Entrance Space	N/A	N/A
12-2 pm			Pilot Study	Pilot Study	Café Area	N/A	N/A
5-7 pm			Pilot Study	Pilot Study	Open Level C	N/A	N/A
8-10 pm			Pilot Study	Pilot Study	Corridor Level D	N/A	N/A
	13.03 Monday	14.03 Tuesday	15.03 Wednesday	16.03 Thursday	17.03 Friday	18.03 Saturday	19.03 Sunday
8-10 am	Corridor Level D	Open Level C	Café Area	Corridor Level E	Open Level F	N/A	N/A
12-2 pm	Entrance Space	Corridor Level D	Open Level C	Open Level E	Corridor Level E	N/A	N/A
5-7 pm	Café Area	Entrance Space	Corridor Level D	Corridor Level F	Open Level E	N/A	N/A
8-10 pm	Open Level C	Café Area	Entrance Space	Open Level F	Corridor Level F	N/A	N/A
	20.03 Monday	21.03 Tuesday	22.03 Wednesday	23.03 Thursday	24.03 Friday	25.03 Saturday	26.03 Sunday
8-10 am	Corridor Level F	Open Level E	Corridor Level D	Entrance Space	Café Area	N/A	N/A
12-2 pm	Open Level F	Corridor Level F	Open Level C	Corridor Level D	Entrance Space	N/A	N/A
5-7 pm	Corridor Level E	Open Level F	Café Area	Open Level C	Corridor Level D	N/A	N/A
8-10 pm	Open Level E	Corridor Level E	Entrance Space	Café Area	Open Level C	N/A	N/A
	27.03 Monday	28.03 Tuesday	29.03 Wednesday	30.03 Thursday	31.03 Friday	01.04 Saturday	02.04 Sunday
8-10 am	Open Level C	Open Level F	Corridor Level E	Open Level E	Corridor Level F	N/A	N/A
12-2 pm	Café Area	Corridor Level F	Open Level F	Corridor Level E	Open Level E	N/A	N/A
5-7 pm	Entrance Space	Open Level E	Corridor Level F	Open Level F	Corridor Level E	N/A	N/A
8-10 pm	Corridor Level D	Corridor Level E	Open Level E	Corridor Level F	Open Level F	N/A	N/A

Table 4-7: Observation Schedule of the Newton at Nottingham Trent University.

	17.04 Monday	18.04 Tuesday	19.04 Wednesday	20.04 Thursday	21.04 Friday	22.04 Saturday	23.04 Sunday
8-10 am			Pilot Study	Service Lobby	Hall in Level 1	N/A	N/A
12-2 pm			Pilot Study	Hall in Level 0	Entrance Space	N/A	N/A
5-7 pm			Pilot Study	Central Court	Central Gallery	N/A	N/A
8-10 pm			Pilot Study	N/A	N/A	N/A	N/A
	24.04 Monday	25.04 Tuesday	26.04 Wednesday	27.04 Thursday	28.04 Friday	29.04 Saturday	30.04 Sunday

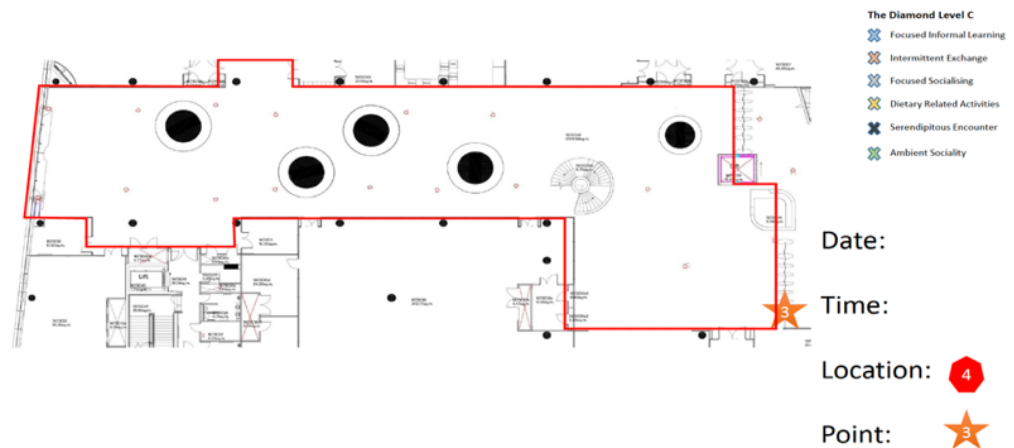
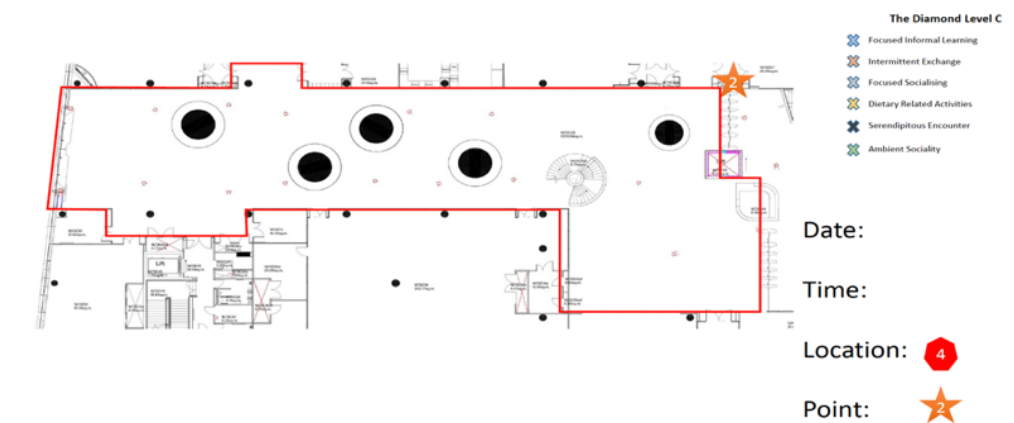
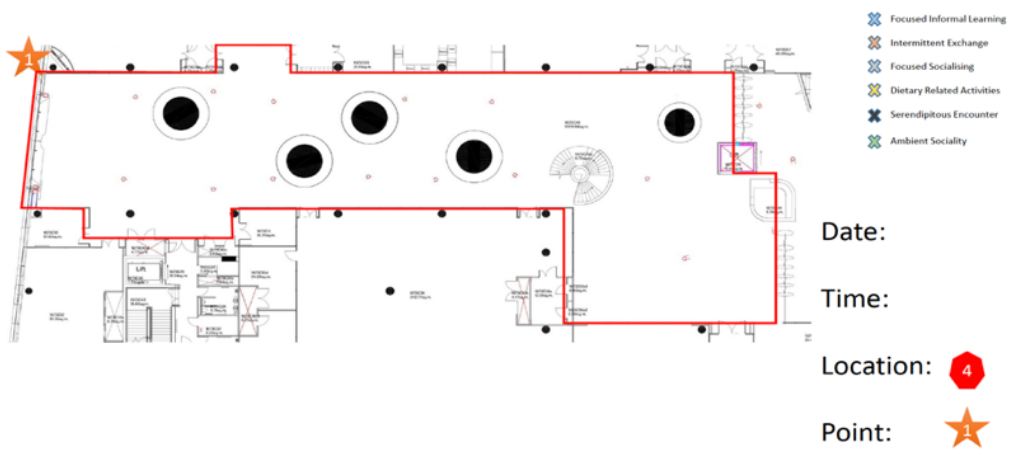


8-10 am	Hall in Level 0	Hall in Level 1	Mini Open Day	Central Court	Entrance Space	N/A	N/A
12-2 pm	Hall in Level 1	Central Court	Mini Open Day	Hall in Level 1	Central Gallery	N/A	N/A
5-7 pm	Service Lobby	Hall in Level 0	Mini Open Day	Central Gallery	Hall in Level 1	N/A	N/A
8-10 pm	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	01.05 Monday	02.05 Tuesday	03.05 Wednesday	04.05 Thursday	05.05 Friday	06.05 Saturday	07.05 Sunday
8-10 am	Bank Holiday	Central Gallery	Service Lobby	Entrance Space	Hall in Level 0	N/A	N/A
12-2 pm	Bank Holiday	Service Lobby	Hall in Level 0	Service Lobby	Central Court	N/A	N/A
5-7 pm	Bank Holiday	Entrance Space	Hall in Level 1	Hall in Level 0	Service Lobby	N/A	N/A
8-10 pm	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	08.05 Monday	09.05 Tuesday	10.05 Wednesday	11.05 Thursday	12.05 Friday	13.05 Saturday	14.05 Sunday
8-10 am	Central Gallery		Central Court			N/A	N/A
12-2 pm	Entrance Space		Central Gallery			N/A	N/A
5-7 pm	Central Court		Entrance Space			N/A	N/A
8-10 pm	N/A		N/A			N/A	N/A

#### **4.6.1 Observation.**

The observations at the Diamond were carried out in 2 days as a pilot study and in 16 working days in four weeks from the 8<sup>th</sup> to the 31<sup>st</sup> of March 2017 (see Table 4-6) while the observations at the Newton were carried out on one day as a pilot study and in 12 working days in four weeks from the 19<sup>th</sup> of April to the 10<sup>th</sup> of May 2017 (see Table 4-7). The observations at the Diamond ran for four sessions on each day (from 8am to 10am, from 12pm to 2pm, from 5pm to 7pm and from 8pm to 10 pm) while the observation at the Newton ran for three sessions on each day (from 8am to 10am, from 12pm to 2pm and from 5pm to 7pm). Each ‘session’ lasted two hours. Each session includes six 20-minute time period and was scan-sampled (Altmann, 1974) four times, once every five minutes (Crook & Mitchell, 2012). The vantage points and recorded student activities can be seen in a series of maps with notations. Take Figure 4-24 as an

example, it can be clearly seen that the Diamond Level C open space maps with notations present four vantage points and six types of student activities.



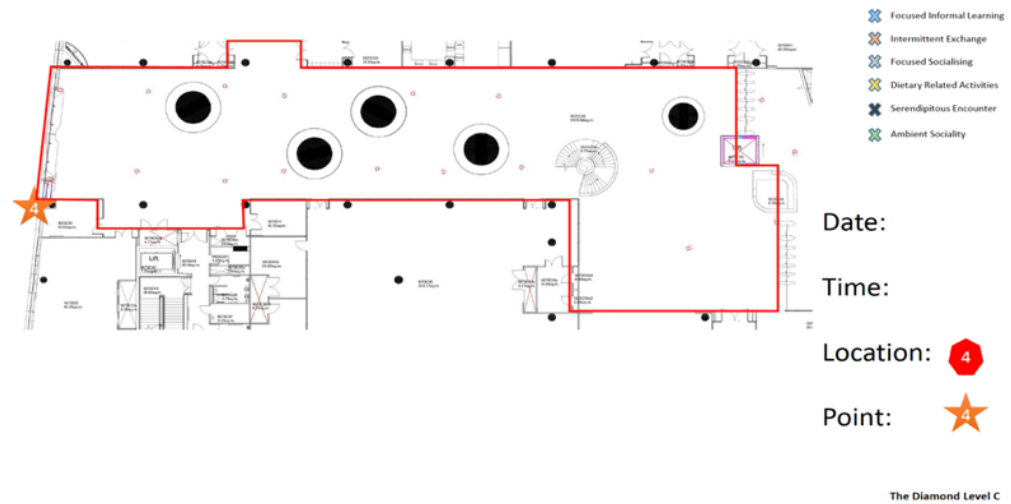


Figure 4-24 The Diamond Level C open space map with notations (four vantage points and six types of student activities)  
 Source from: Edited by author.

Based on the pilot study, one session occurred in the evening and three in the day during every observation week-day at the Diamond while only three sessions occurred in the day time at the Newton. Eight spaces at the Diamond (see Table 4-8) and six spaces at the Newton (see Table 4-9) were observed during the selected sessions. The four functional zones, Entrance Space, Café Area, Corridor Space and Open Space, are used to analyse the informal learning spaces in higher education. In these four functional zones, six types of student socialising and informal learning activities, categorised based on the different degree of the informal learning process, were recorded based on the observation.

Table 4-8: Selected informal learning spaces at the Diamond.

Selected Space	Spatial Plan	Photo of the Space
Entrance Space (492.95sqm)		

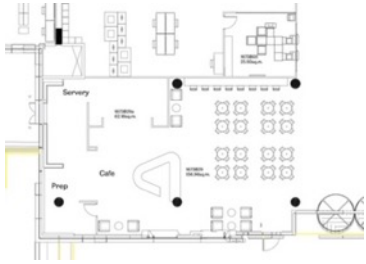

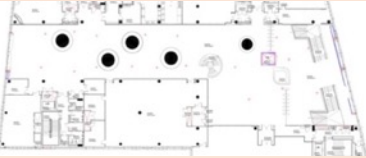

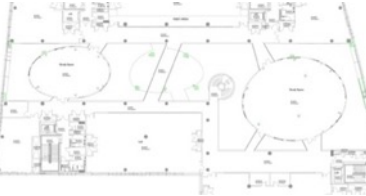

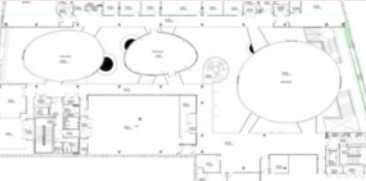

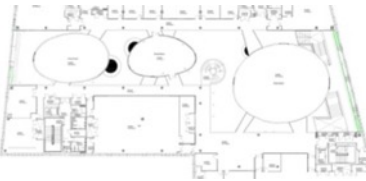



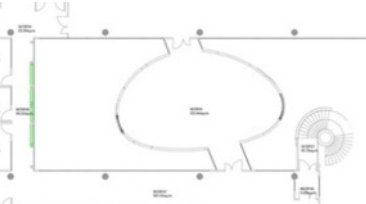



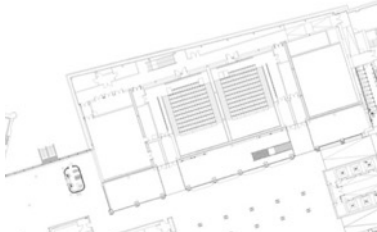




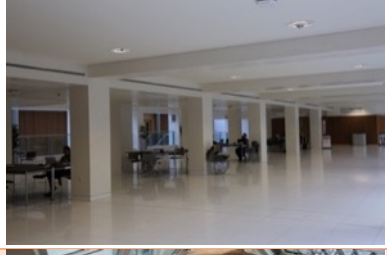



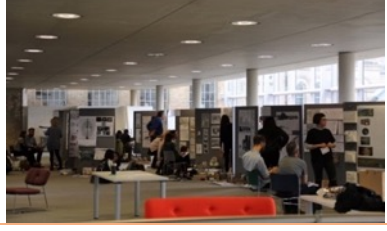
<p><b>Café Area (156.96sqm)</b></p>		
<p><b>Open Space Level C (1009.84sqm)</b></p>		
<p><b>Corridor Level D (460.46sqm)</b></p>		
<p><b>Corridor Level E (467.91sqm)</b></p>		
<p><b>Open Space Level E (457.81sqm)</b></p>		
<p><b>Corridor Level F (475.07sqm)</b></p>		
<p><b>Open Space Level F (122.40sqm)</b></p>		

Table 4-9: Selected informal learning spaces at the Newton.

Selected Space	Spatial plan	Photo of the space
<b>Entrance Space</b> (468.66sqm)		
<b>Service Lobby</b> (234.11sqm)		
<b>Hall in Level 0</b> (1459.06sqm)		
<b>Hall in Level 1</b> (688.28sqm)		
<b>Central Court</b> (1073.69sqm)		
<b>Central Gallery</b> (619.01sqm)		

Walk-bys and timed observations were used to record the location and the number of people and to identify the activities they engaged in. It is important because the students' activities can be captured and observed to the largest



extent. It is also a preferred approach because it provides an overview of the informal learning space and helps observers know and record the place better and more efficiently.

Through observation, the data of 22 types of activities were obtained throughout the observation period. They were recorded according to the numbers of involved students, the functional properties of the spaces, and their length of stay. The different observed components above are important aspects in that they justify the importance of engagement and provide crucial information for the research by providing further analysis of student activities.

#### **4.6.2 Questionnaires.**

The method helps to obtain data and information based on the views and opinions of the students in the informal learning spaces. In addition, this method also helps researchers to collect the initiative of users' perspectives on the informal learning spaces and to identify the strengths and weaknesses found in the informal learning spaces more accurately. It is because all the available data is obtained from users who have experienced in the informal learning spaces. The data from the questionnaires was collected in-between the observation sections (see Table 4-6 and Table 4-7). The questionnaires used in this study covered several aspects pertaining to the usage of the informal learning spaces. The questionnaires were structured in three ways to examine: a) student experiences in the informal learning spaces; b) the spatial evaluation of the design quality of the informal learning spaces; c) personal identity. The purpose of the survey was to gather statistical information on student experiences, their preferences of the design quality of the informal learning spaces, and the

respondents' personal background information. The student experiences included the frequency of student activities, the time period of using the informal learning spaces, and the reasons for selecting and using the informal learning spaces. The following sections explain these three ways in detail.

#### *4.6.2.1 Student Experiences in the Informal Learning Spaces.*

In this section, the participants were required to describe their student experiences in the informal learning spaces. The student experiences included the frequency of student socialising and informal learning activities (see Table 4-10), time periods of usage of the informal learning spaces (see Table 4-12), and the reasons for selecting and using the informal learning spaces (see Table 4-13). Based on the different levels of the informal learning process, the frequencies of students' 22 types of socialising and informal learning activities in the informal learning spaces per week were collected. The degree of the frequency of activities, including never, 1-2 times per week (slightly frequently), 3 times per week (frequently), 4-5 times per week (more frequently), and more than 5 times per week (most frequently), is marked by a five-level Likert Scale from 1 to 5 (1 representing never; 2 representing slightly frequently; 3 representing frequently; 4 representing more frequently; 5 representing most frequently).

Table 4-10: Socialising and informal learning activities that occurred in the informal learning spaces.

- 
1. *Prepared coursework*
  2. *Discussed ideas from reading books or lectures*
  3. *Worked with others on coursework*
  4. *Study alone*
  5. *Talked about career plans*
  6. *Study alone, but with occasional interaction with others*
  7. *Worked with others on activities other than coursework*
  8. *Received prompt feedback from the faculty on academic performance*
  9. *Tutored or taught other students*

10. *Had serious conversations with students of a different program or department than your own*
  11. *Had a meal*
  12. *Had a snack*
  13. *Took a call*
  14. *Used of tablet, laptop or phone*
  15. *Casual Chatting*
  16. *Took a break from studies with friends*
  17. *Met a friend of someone you know, but neither of you planned to*
  18. *Attended events such as Exhibitions, Open Days or Coursework Shows*
  19. *Found the space as a way to a lecture room or gathering for going to another place together*
  20. *Used as a meeting point before or after lectures*
  21. *People watching*
  22. *Had a rest*
- 

The socialising and informal learning activities were analysed by using the Principal Components Analysis, which is a method of data reduction. It was used to reduce the 22 measures into a few principal components. Before the Principal Components Analysis, the correlations between variables were checked using the value of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity. These tests provide a minimum standard which should be passed before a principal components analysis could be conducted. After the tests, the Principal Components Analysis was used to generate reproduced correlation matrix. The reproduced correlation matrix is the correlation matrix based on the extracted components. The researcher would want the values in the reproduced matrix to be as close to the values in the original correlation matrix as possible. This means the residual matrix, which contains the differences between the original and the reproduced matrix, should be close to zero. If the reproduced matrix is very similar to the original correlation matrix, then you know that the components that were extracted accounted for a great deal of the variance in the original correlation matrix, and these few components do a good job of representing the original data. The



numbers on the diagonal of the reproduced correlation matrix are presented in the Communalities table in the column labelled Extracted (see Table 4-11).

Table 4-11: Principal Component Analysis of student activities in the Diamond

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.535	20.614	20.614	4.535	20.614	20.614
2	3.187	14.488	35.102	3.187	14.488	35.102
3	1.818	8.263	43.366	1.818	8.263	43.366
4	1.445	6.569	49.935	1.445	6.569	49.935
5	1.204	5.471	55.406	1.204	5.471	55.406
6	1.065	4.842	60.248	1.065	4.842	60.248
7	.959	4.360	64.608			
8	.889	4.042	68.650			
9	.837	3.804	72.454			
10	.799	3.633	76.087			
11	.728	3.311	79.398			
12	.635	2.887	82.285			
13	.568	2.583	84.868			
14	.546	2.480	87.348			
15	.524	2.381	89.729			
16	.450	2.046	91.775			
17	.432	1.964	93.738			
18	.387	1.759	95.497			
19	.308	1.398	96.896			
20	.250	1.139	98.034			
21	.242	1.101	99.135			
22	.190	.865	100.000			

The participants were required to select their preferred time period of the usage of the informal learning spaces (see Table 4-12) and the reasons for selecting and using the informal learning spaces (see Table 4-13). Since these were multiple-choice questions, the participants could select their duration of regularly using the informal learning spaces and the reasons of the impact of selecting and using the informal learning spaces by ticking ‘✓’. The results can be examined by Multiple Response Analysis (Norusis, 1993). Based on the pilot study, the time period was divided into eight periods: from 8am to 10am; from 10am to 12pm; from 12 pm to 2 pm; from 2 pm to 5 pm; from 5 pm to 7 pm; from 7 pm to 10 pm; from 10 pm to 0 am; and from 0 am to 8 am. The result for these times and the activities could be done by a Multiple Response Analysis.

Table 4-12: Time period of usage of the informal learning spaces.

<b>Time Period of Usage of the Informal Learning Spaces</b>	
1.	8 am to 10 am
2.	10am to 12pm
3.	12 pm to 2 pm
4.	2 pm to 5 pm
5.	5 pm to 7 pm
6.	7 pm to 10 pm
7.	10 pm to 0 am
8.	0 am to 8 am

Table 4-13: The reason of selecting and using the informal learning spaces.

<b>The reason of selecting and using the informal learning spaces</b>	
1.	<i>Provides comfortable light environments</i>
2.	<i>Provides comfortable noise environments</i>
3.	<i>Provides comfortable temperature</i>
4.	<i>Provides comfortable ventilation</i>
5.	<i>Provides comfortable colour/material of furniture</i>
6.	<i>Is flexible, adaptable and diverse</i>
7.	<i>Provides informal ambience</i>
8.	<i>Support individual and group work</i>
9.	<i>Provides good views for seeing what other people are doing</i>
10.	<i>Provides good outside views</i>
11.	<i>Makes people find it easy to find the way</i>
12.	<i>Is easily accessible</i>
13.	<i>feels generous, open and spacious.</i>
14.	<i>Provides other support (such as Wi-Fi, enough plugs and sockets, IT-rich environment)</i>
15.	<i>Other, please specify: _____</i>

14 reasons for selecting and using the informal learning spaces were listed in the questionnaires and one open ended question, were left behind. This was used for mentioning details by the participants themselves. The reasons stressed the significance of the design qualities of the informal learning spaces (see Table 4-13). Again, as multiple-choice questions, the data was analysed by Multiple Response Analysis.

#### 4.6.2.2 *Spatial Evaluation.*

Table 4-14: Student satisfactions with the design quality of the informal learning spaces.

1.	<i>Light</i>
2.	<i>Acoustics</i>
3.	<i>Temperature</i>
4.	<i>Ventilation</i>
5.	<i>Furniture (Colour/Material)</i>
6.	<i>Movement flows</i>
7.	<i>Adaptability</i>
8.	<i>Diversity</i>
9.	<i>Flexibility</i>
10.	<i>Socialising</i>
11.	<i>Sense of community</i>

12. *Informative*
  13. *Attractiveness*
  14. *Openness*
  15. *Enclosure*
  16. *Safety*
  17. *Supports group work or collaboration*
  18. *Supports individual learning*
  19. *Continue classroom discussions immediately following class time*
  20. *Outside views*
  21. *Circulation*
  22. *Legibility*
  23. *Privacy*
  24. *Spacious*
  25. *IT-rich environment*
  26. *Wi – Fi coverage*
  27. *Plugs and sockets*
  28. *Food and beverage*
- 

The second part of the questionnaire consisted of student satisfactions with the design quality of the informal learning spaces (see Table 4-14). The levels of student satisfactions with the design quality of the informal learning spaces were collected through the 28 descriptions of the design qualities of the informal learning spaces. These descriptions are stressed into seven key design qualities, which are the Physical Comfort, the Flexibility, the Ambience, the Functionality, the Situation, the Spatial Hierarchy, and the Other Support (see Table 3-15). By analysing statements such as, '*I feel that I am satisfied with...in this space*', the data on student satisfactions with design quality were collected by using a five-level Likert Scale from 1 to 5 (1 representing strongly disagree; 2 representing disagree; 3 representing neither disagree nor agree; 4 representing agree; 5 representing strongly agree). The Principal Components Analysis was used again to reduce dimensions of the student satisfactions with the design quality of the informal learning spaces.

#### *4.6.2.3 Personal Identity.*

Questions about the personal data were left until the end when the respondents had committed themselves to answering more involving questions and they are

less likely to refuse giving such data. The personal background information includes seven questions (see Table 4-15). These questions help to obtain the participants identities to better understand the results of the questionnaire. In this questionnaire, the participants were all students. Hence, it is necessary to ask if they are international or local students, their gender, department, mode of study, level of study, type of programme, and in which year they are in. The participants with different personal backgrounds could require different forms of usage of the informal learning spaces.

Table 4-15: Questions about the personal identity in the questionnaire.

<b>Questions about personal background information</b>
<i>Are you an international student? Please circle: Yes/No</i>
<i>Gender, please circle: Male/Female/wish not to say</i>
<i>Which department do you study or work in? Please write down: _____</i>
<i>Mode of Study, please circle: Full time/Part time</i>
<i>Level of Study, please circle: PhD/Undergraduate/Masters</i>
<i>Type of Programme, please circle: Lecture-based/Studio-based/Lab-based</i>
<i>Year (How many years have you studied here), please circle: less than 1/1-2/3-more</i>

Table 4-16: Personal identity of the two case studies by questionnaires.

Category	Diamond	Newton
<b>Total number of questionnaires</b>	157	104
<b>Valid questionnaires</b>	148	97
<b>Male/Female</b>	63/85	40/57
<b>International/Local</b>	71/77	19/78
<b>Undergraduates/Postgraduates</b>	102/46	86/11
<b>Lecture-based/Studio-based/Lab-based</b>	122/6/20	90/3/4

The design of the questionnaire was a semi objective question-based method. In other words, I read every question to the respondents and tried to let them give an answer without any pressure and with time to think. Meanwhile, depending on their answers, I would ask some extra open questions and make notes on the questionnaires. Based on the total number of students across the city site campus, 261 questionnaires in total (157 at the Diamond and 104 at the Newton) were collected. 148 valid questionnaires at the Diamond were collected with 94.3% efficiency and 97 valid questionnaires at the Newton were collected with

93.3% efficiency. The response rate was 98.1%. More information on personal identity can be seen in Table 4-16.

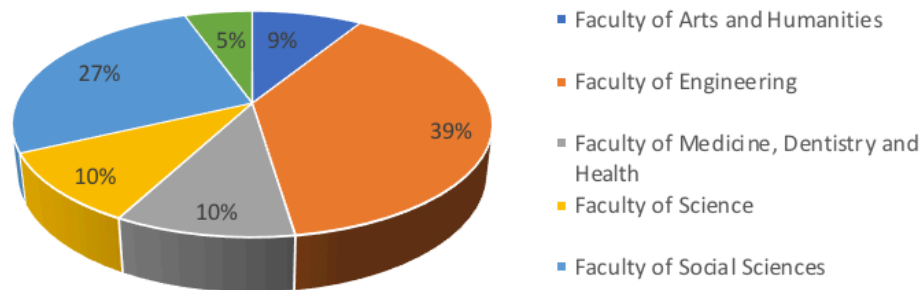


Figure 4-25: Population composition of participants at the Diamond.

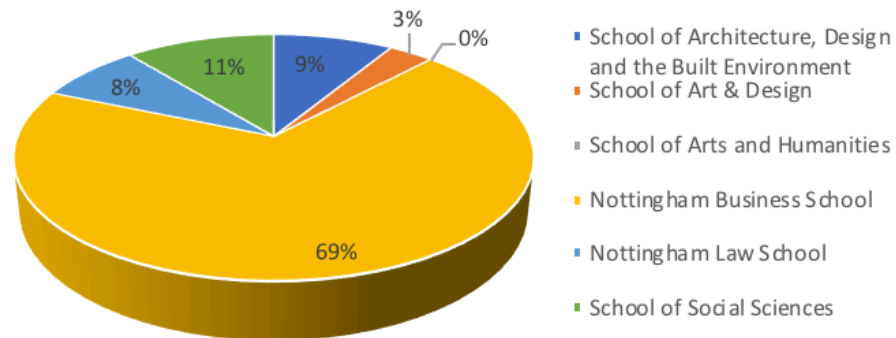


Figure 4-26: Population composition of participants at the Newton.

#### **4.6.3 Interview.**

The semi-structured interview was employed in this study. The data from the interviews were conducted face to face and collected after the process of questionnaire and observation. The interviews were recorded for revisiting and reflection on the information provided. The interviewees were randomly selected in the informal learning spaces. Most of questions were based on research on the users' behaviours and preferences in the learning environment and public spaces (Matthews et al., 2011; Mehta, 2013; etc.).

Table 4-17: Participant information on the interviews based on the research at the Diamond.

Participants	Gender	Study	Subject
ID1	Female	Postgraduate	Zoology
ID2	Female	First Year Undergraduate	Law
ID3	Male	First Year Undergraduate	Chemistry
ID4	Male	Undergraduate	History

Table 4-18: Participant information of interviews based on the research at the Newton.

Participants	Gender	Study	Subject
INA1	Male	Postgraduate	Business
INA2	Female	Postgraduate	Business
INA3	Female	Undergraduate	Psychology and Criminology
INA4	Male	Undergraduate	Economics and management and banking

Four respondents were selected to get results in each case and the personal information of respondents was listed in Table 4-17 and Table 4-18. All eight participants in total were individually interviewed. These students all had experiences of using the informal learning spaces. The audio records were transcribed into Microsoft Word. All the other languages of the transcripts were translated into English. All the transcripts were transferred and analysed using NVivo 11 software. The contents of the interviews were included in the five parts: Personal background information, Frequency, activity and reasons, Student perceptions of the informal learning spaces, Usage of the space and Student voice. The interview questions are listed below (see Table 4-19). The qualitative research helped to interpret the data of the observation and the questionnaires collected.

Table 4-19: Draft of Interview questions.

<b><i>Personal Background Information</i></b>
1. Could you please introduce yourself? a. What's your name and are you an international or local student? b. Which department are you in? what's your subject? Which year are you studying? c. Where is your nearest classroom or workplace?
<b><i>Frequency, Activity and Reasons</i></b>
2. What brings you here?
3. Which types of activities do you normally do there? If yes, please answer the following questions. If not, skip questions 3 and proceed to question 4.
4. Which types of activities do your friends normally do there?
5. How often do you use this space as a whole? Why?

---

***Student perceptions of the informal learning spaces***

---

6. Who do you (all) think this space was designed for?

---

***Usage of the space:***

---

7. How do you (all) think this space should be used?

8. How do you (all) use it?

9. How do you think using the informal learning space impacts on students' academic performance?

10. What are the three most important things about this space that you would not want to change?

11. What are the three most important things that you would like to change or add on this spaces?

---

***Student voice:***

---

12. What is your favourite about the informal learning spaces, story/memory?

---

#### ***4.6.4 Focus Group.***

The participants' usages and preferences of the design quality of the informal learning spaces were collected by using the questionnaires and the observations provided information on the students' activities in the informal learning spaces regarding what, when or where, who and with whom, and how, and consequently information based on the students' needs in the informal learning spaces. To fully determine the needs in the informal learning spaces, subjective studies enable us to know why people did (or did not) do what they intended to do.

Hence, one Focus Group for each case study was done. All the other languages were translated into English. Interviewees were the people who used the informal learning spaces and agreed to share their ideas and views on this research. They were randomly selected in-between the observation sessions. All the records of the interviews were scripted into Microsoft Word and analysed using NVivo 11 software. The data was coded to answer the research questions and used for generating the probes of the focus group. Posters were attached on information desks and social media used to attract the attention of the students (see Figure 4-27). Nine participants were selected as participants for the Focus

Group at the Diamond and five participants at the Newton. The participant information of the Focus Group at the Diamond and the Newton are listed in the Table 4-20 and Table 4-21.

Table 4-20: Participant information of the focus groups at the Diamond.

Participants	Gender	Age	Subject
PD1 Kelsey	Femal	24	Architectural Design
PD2 Mian	Male	24	Robotics
PD3 Among	Male	28	Architecture
PD4 Connie	Female	23	Finance Economics
PD5 Shirley	Female	23	Financial Economics
PD6 Lily	Female	24	Financial Economics
PD7 Margarete	Female	24	Landscape Architecture
PD8 Dan	Male	26	Advanced Software Engineering
PD9 Hua	Male	28	Architectural Design

Table 4-21: Participant information of the focus groups at the Newton.

Participants	Gender	Age	Subject
PN1 Lousia	Female	26	Interior Architecture
PN2 Natalze	Female	19	Business Management & Marketing
PN3 Cynthia	Female	23	Interior Architecture
PN4 Caroline	Female	24	Interior Architecture
PN5 Chloe	Female	21	Business Account & Marketing



Figure 4-27: Posters of focus groups at the Diamond and the Newton.  
Source from: Edited by author.

Focus Group Discussion Guides were prepared prior to the Focus Group fieldwork. The guide highlighted the length of the Focus Group activity, the



number of Consent forms, recorder information, registration form and the key question drafts of Focus Group. The process of the Focus Group included four parts, and these are listed in the appendix (see Appendix – Focus Group Form). The questions meant for the focus group were slightly different based on the different contexts and followed the designed guide.

## **4.7 LIMITATIONS.**

The research project was not without challenges and concerns, however. There are still some limitations to this thesis, which are discussed below.

It requires a rigorous sequential form to infer conclusions step by step. The same circumstances can be explained twice with different research methods, which makes the narrative of the thesis to be overlapped. For instance, in order to determine the frequency of student socialising and informal learning activities in informal learning spaces, both observation and questionnaire can be used to collect the data. However, there is no way of indicating which one of these research methods is better. More specifically, through one single method, take observation as an example, it is difficult to collect the proper data for this thesis. Particularly, it can be seen as a complex phenomenon when the students' behaviours and preferences is related. As Harling (2012) emphasised, more variables and factors have to be studied for the phenomenon in question particularly when humans are involved. Especially, the observation cannot record every nuance difference in six types of the student activities based on the degree of the learning process (from Focused Informal Learning to Ambient Sociality) occurring in higher education informal learning spaces. However,

multiple resources collected by a mixed methods design approach can help to reduce its impact. Consequently, the triangulation, proposed by Yin (2013), is used in the data collection. The principle of triangulation aims to bring multiple data sources or multiple methods together in a case study research. The triangulation is defined that using different data collection techniques within one study in order to ensure that the data are telling you what you think they are telling you (Yin, 2013). It provides an important way of ensuring the validity of case study research. Ultimately a clearer research and satisfactory research structure emerged.

In terms of the methodology, I also considered Space Syntax as one of the methods to determine the impact of the spatial configuration of the informal learning spaces on student activities. However, instead of committing myself to exploring an extra research method in my PhD career, I'd rather use the current research frame to explore higher education informal learning spaces in-depth. Two experiences of giving presentations in the Space Syntax Symposium in 2015 and 2017 with the result of one published paper, titled as '*Spatial configuration shapes student social and informal learning activities in educational complexes*' (Wu et al. 2017), have already indicated the potential of the application of Space Syntax Theory on evaluating learning environments in higher education. Limited by the spirit and time of my PhD period, this method is not explored and could be discussed in the further research.

Furthermore, the discussion on analysing spatial characteristics and design qualities is complex. Most of time, it is difficult to be analysed one by one. Instead, the design qualities of the informal learning spaces are more linked and

impacted by each other. All the design qualities of the informal learning spaces generate the socialising ambience and learning atmospheres, which help to shape student socialising and informal learning activities and promote student learning experiences. To response this limitation, this research applied a succinct structure to interpret the student preferences of the design qualities and their impacts on student experiences in higher education.

Another limitation for this research is the consideration of the changes of the student patterns due to academic arrangements at different time period of the year. The pilot study tried to collect data during the term week and the examination period and the two case studies only collected data before and after the Easter vacation. This is because that there is no evidence to emphasise the impact of different time periods of the year due to academic arrangement on student experiences in the learning environment. However, it is necessary to consider the impact in higher education informal learning spaces. To response this limitation, the future research should be done within different time periods, such as three terms times of the year, vacation and assessment week, to identify its impact on student experiences in the informal learning spaces and analytical framework of evaluating higher education informal learning spaces.

Moreover, the research on exploring the design qualities and the spatial organisation of the informal learning spaces requires more empirical studies. Two representable case studies can only be used to do a limited comparison and analysis. Considering the worth of informal learning spaces in academic environments, more empirical studies are necessary especially in a comparative nature, to cover more academic institutions together so as to know the students'

opinions and behaviour regarding the informal learning spaces. The spatial design strategy should be examined in a number of case studies to better evaluate the impact of the design qualities of the spatial organisation of the informal learning spaces upon student experiences and further examine the validity and effectiveness of the generated analytical framework. A PhD study is like a project, which should consider the limited time and accessibility of the cases. More distinct and stunning cases can be selected as main cases. However, the time period and accessibility of the learning settings restricted the choices. What I learnt from this process was to learn how to balance your research ambitions with realistic decisions. Even though there are still better options for the research in the future, it is really important to consider the feasibility of the best choices made.

## **4.8 SUMMARY.**

In this chapter, the research methodology on higher education informal learning spaces has been explained. More specifically, the philosophical assumptions for this research have been interpreted and applied. The four basic beliefs of the pragmatism paradigms, Axiology, Ontology, Epistemology, and methodology are explained to ensure the feasibility and validity of the research. Consequently, a mixed methods design was required to answer the research questions. The section emphasizes that the philosophical assumptions and research methods of this research, which informed the researcher's worldview, are both valid and provide a solid philosophical foundation in research and to the design of the informal learning spaces in higher education.

Secondly, the rationale of the case study as the preferred method for this thesis has been stated. The insight for the research questions of ‘why’ and ‘how’ are best found in the extensive in-depth description of the phenomenon: the informal learning spaces as a place for student socialising and informal learning activities in the university campus. Therefore, the case study method is used to answer the research questions.

The third part of this chapter justified the theoretical scopes and propositions for this research. This research identifies the spatial design of the informal learning space as the scope of the research. Theoretical scopes determine the research boundaries of the informal learning spaces and the student experiences. More specifically, the research subject is based on student preferences regarding the spatial design quality of the informal learning spaces and student experiences (the usage of the functional zones, the frequency of the socialising and informal learning activities, the time period of using the informal learning spaces, and the reason for using informal learning spaces) as the object. Using the mixed methods design approach, the relationship between the subject and the object are discussed in-depth in the informal learning spaces. Furthermore, based on the environment behaviour theory, the theoretical proposition for this research is that the effective informal learning spaces support student experiences. The theoretical scope and propositions narrow down the body of knowledge to be discovered and help to find the focus of the research.

The fourth part of this chapter explains the case study criteria, which is used to ensure the validity of the selected cases for this research. More specifically, five lists of criteria were highlighted to ensure the validity of the process of the cases

selection (see Figure 4-2). The five case study criteria are developed as a framework for identifying proper case studies in support of this research. They holistically consider the accessibility of the cases, the definition of the spaces, the influential aspects of the cases and so on, to ensure the quality of the case study selections.

Furthermore, the fifth part of this chapter states why the two cases, the Diamond at the University of Sheffield and the Newton at Nottingham Trent University were selected as cases rather than others based on the case study criteria and case selection techniques (Seawright & Gerring, 2008). Consequently, the context of the two cases are introduced.

The sixth part of this chapter explains an employed pilot study in order to test the feasibility and validity of the methods and the seventh part of this chapter descriptively explains the quantitative and qualitative methods used in this research. Based on the pilot study, the procedure of the research is listed in the seventh part of this chapter, which explicitly interpret the procedure of the methods employed in the cases. The next chapter interprets the data collected from these methods and generates findings for further analysis.

## **5. CHAPTER 5: STUDENT EXPERIENCES IN THE INFORMAL LEARNING SPACES.**

### **5.1 INTRODUCTION.**

This section analyses the data collected on student experiences in the informal learning spaces at the Diamond at the University of Sheffield and the Newton at Nottingham Trent University from the students' perspective. The investigation of the student experiences in the informal learning spaces answers the research question regarding of the student experiences on where they did activities, when they did activities, why they selected and used the informal learning spaces, and what activities they did in the informal learning spaces.

Through the observation and questionnaire methods, this chapter presents student experiences in the informal learning spaces, based on the two cases: The Diamond at the University of Sheffield and the Newton at Nottingham Trent University. The student experiences include four parts:

- 1) The usage of the functional zones in the informal learning spaces;
- 2) The time period of regularly using the informal learning spaces;
- 3) The reason for selecting and using the informal learning spaces;
- 4) Student socialising and informal learning activities in the informal learning spaces.

The following sections interpret the findings in detail.

## **5.2 THE USAGE OF THE FUNCTIONAL ZONES IN THE INFORMAL LEARNING SPACES.**

The students' experiences varied based on different types of the informal learning spaces. Four functional zones of the informal learning spaces are investigated to interpret the student experiences in the informal learning spaces. In this section, the number of student activities occurring in the different functional zones of the informal learning spaces are recorded based on observation.

As the procedure of the observation section mentioned, the observations at the Diamond ran four sections on each day (from 8am to 10am, from 12pm to 2pm, from 5pm to 7pm and from 8pm to 10 pm) while the observation at the Newton ran three sections on each day (from 8am to 10am, from 12pm to 2pm and from 5pm to 7pm). Each 'section' lasted two hours. Based on the pilot study, one section occurred in the evening and three in the day during every observing week day at the Diamond while only three sections occurred in the day time at the Newton. Eight spaces at the Diamond and six spaces at the Newton are observed in selected sections. The spaces selected came down to four functional zones: Entrance Space, Café Area, Corridor Space and Open Space (Atrium Space). The observation records the total number of people conducted based on the spot counts. In terms of the total number of people that socialised and did informal learning activities at the Diamond and the Newton, the total number of participants are 6089 and 898, respectively. Meanwhile, the total number of



those walking through at the Newton recorded (N=12428) are almost twice of the amount of those socialising and doing informal learning activities in both cases (N=6987). This proves that the Diamond is mainly a place for staying (for both socialising and learning) while the Newton is mainly a place for walking through.

Table 5-1: Taxonomy of informal learning spaces of the Diamond based on the observation.  
Source from: adjusted from DEGW (2008)

		Entrance Space	Café Area	Corridor Space	Atrium
<b>Group Size</b>	<b>Single Person</b>	✓	✓	✓	✓
	<b>Small Group</b> 2-6 people	✓	✓	✓	✓
	<b>Medium Group</b> 7-20 people	✓			✓
	<b>Large Group</b> 21+ people				✓
<b>Boundary Control</b>	<b>None</b> e.g. Open area with no visible separation from adjacent settings		✓		✓
	<b>Minor</b> e.g. furniture groupings, low screens, plants as dividers	✓	✓	✓	✓
	<b>Major</b> e.g. use of partitions and screens to divide space				✓
	<b>Total</b> e.g. enclosed room			✓	
<b>Technology Provision</b>	<b>Basic</b> e.g. wireless network access	✓	✓	✓	✓
	<b>Enhanced</b> e.g. data projector, smart board, large display	✓		✓	✓
	<b>Advanced</b> e.g. multi-screen displays, immersive or simulation environment			✓	✓
<b>Ability to reconfigure space</b>	<b>Fixed</b> Fixed furniture or technology limits possibilities for other uses	✓		✓	✓
	<b>Moderate</b> Furniture/technology can be reconfigured by staff for alternate uses	✓	✓	✓	✓
	<b>Flexible</b> Users can reconfigure space and technology at will for other activities		✓	✓	✓
<b>Ambience</b>	<b>Formal</b> Conventional setting reconfigured for research or work			✓	✓
	<b>General</b> Setting can be used for both formal and informal activities depending on configuration and user requirements	✓	✓	✓	✓
	<b>Informal</b> Casual settings for research, work and social activities	✓	✓	✓	✓

Table 5-2: Taxonomy of the informal learning spaces at the Newton based on the observation.  
Source from: adjusted from DEGW (2008)

		Entrance Space	Café Area	Corridor Space	Atrium
<b>Group Size</b>	<b>Single Person</b>	✓	✓	✓	✓
	<b>Small Group</b> 2-6 people	✓	✓	✓	✓
	<b>Medium Group</b> 7-20 people	✓	✓		✓
	<b>Large Group</b> 21+ people		✓		✓
<b>Boundary Control</b>	<b>None</b> e.g. Open area with no visible separation from adjacent settings		✓		✓
	<b>Minor</b> e.g. furniture groupings, low screens, plants as dividers	✓	✓	✓	✓
	<b>Major</b> e.g. use of partitions and screens to divide space			✓	✓
	<b>Total</b> e.g. enclosed room		✓	✓	✓
<b>Technology Provision</b>	<b>Basic</b> e.g. wireless network access	✓	✓	✓	✓
	<b>Enhanced</b> e.g. data projector, smart board, large display	✓		✓	✓
	<b>Advanced</b> e.g. multi-screen displays, immersive or simulation environment			✓	✓
<b>Ability to reconfigure space</b>	<b>Fixed</b> Fixed furniture or technology limits possibilities for other uses	✓		✓	✓
	<b>Moderate</b> Furniture/technology can be reconfigured by staff for alternate uses		✓	✓	✓
	<b>Flexible</b> Users can reconfigure space and technology at will for other activities		✓	✓	✓
<b>Ambience</b>	<b>Formal</b> Conventional setting reconfigured for research or work			✓	✓
	<b>General</b> Setting can be used for both formal and informal activities depending on configuration and user requirements	✓	✓	✓	✓
	<b>Informal</b> Casual settings for research, work and social activities	✓	✓	✓	✓

According to the taxonomy of future learning settings created by DEGW (2008), the spaces could be reconfigured based on the capacity of holding group size, boundary control, technology provision, ability to reconfigure space and ambience. Accordingly, the taxonomy of the informal learning spaces of the Diamond and the Newton are respectively shown in Table 5-1 and Table 5-2.

Observation reveals an interesting snapshot of student socialising and informal learning activities in the informal learning spaces in two cases. But the research

is also interested in investigating what supports these student activities and why they occur in some places more than others. If we can quantify the presence of people engaged in the student activities at a given location and also quantify the characteristics of the location, we can correlate the two to find out what qualities of the informal learning spaces are correlated with student activities. To do so, the number of all types of student activities are calculated along with the area of the functional zones and the duration of observation into a tangible number, which is called the Usage Index. The Usage Index is determined for each of the functional zones by calculating the number of students engaged in functional zones at the setting per hour and per 100 square metres. Each person observed in a socialising and informal learning activity in 100 square metres of the functional zone per hour accounted for one unit score.

The Figure 5-1 shows a bar chart, which shows that the score of the Usage Index in different functional zones based on the observation. The score of the Usage Index, at the Diamond at the University of Sheffield, was recorded based on four observation sections each day totalling sixteen term working days, while the score of the Usage Index, at the Newton at Nottingham Trent University, was recorded based on three observation sections each day totalling twelve term working days. The total area of the informal learning spaces in the two cases are similar. They are both around six thousand square meters. However, there are different areas of functional zones. More specifically, the area of the Entrance Space, the Café Area, the Corridor Space, and the Open Space at the Diamond at the University of Sheffield are 492.95sqm, 156.96sqm, 1403.44sqm, and 1590.05sqm respectively, while the areas of the Entrance Space, the Café Area, the Corridor Space, and the Open Space at the Newton at Nottingham

Trent University are 468.66sqm, 234.11sqm, 2766.35sqm, and 1073.69sqm, respectively. The score of the Usage Index presented in the figure is calculated in different functional zones per hour per 100sqm.

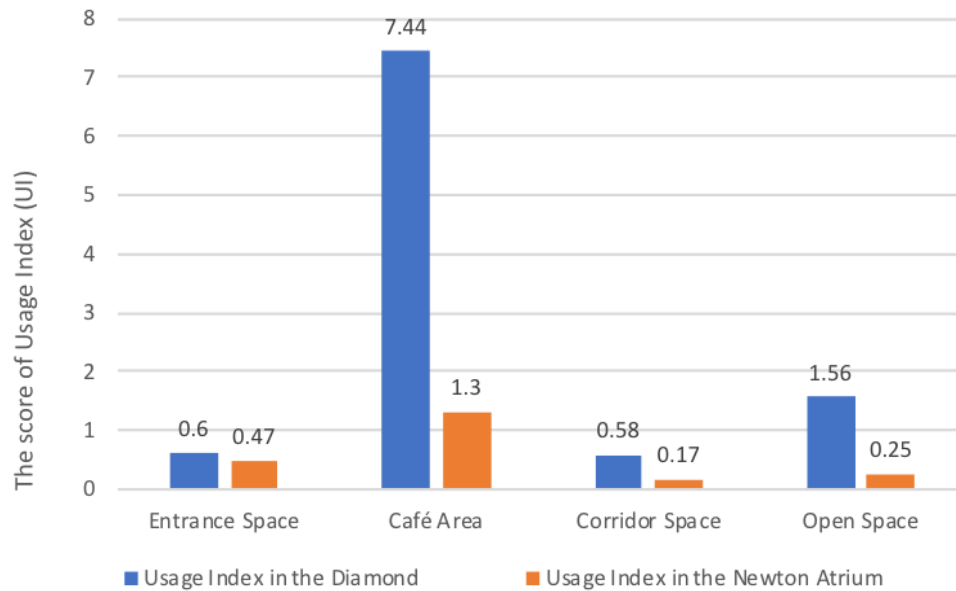


Figure 5-1: The score of the Usage Index in different functional zones, based on the observation.

As the figure shows, there are more students doing socialising and informal learning activities in the Entrance Space of the Diamond (UI=0.60) than of the Newton (UI=0.47). The Entrance Space of the Diamond was designed with more functional areas. Sofas and tables provided students a comfortable space for waiting or relaxing. Meanwhile, the digital screen introduced the architectural design of the Diamond and published news about the University of Sheffield. Moreover, the Entrance Space was directly linked with the library Connect, where students could easily return or collect ordered books. All these promoted the students' socialising and informal learning activities in the Entrance Space. Compared with the Entrance Space of the Diamond, there was only a reception and a rest area for students at the Entrance of the Newton. Mainly, the Entrance Space of the Newton was used for just passing through.

The second cluster of columns in Figure 5-1 described the Usage Index of the Café Area at the Diamond and at the Newton, which are 7.44 and 1.3, respectively. As the only place for the students eating space, the Café Area at the Diamond attracted a huge number of students using it. The UI score reached 7.44, which means, there were almost 8 people using the Café Area per 100 square metres per hour. Students studying at the Diamond were not allowed to eat hot food in the learning spaces. Hence, the Café Area of the Diamond, which is opened from early morning to late night (8am – 10pm) was very popular all day, especially during lunch time and dinner time. Moreover, the students who ordered the delivery food from outside are also utilised a space for eating in the Café Area. Furthermore, the Café Area has easy access and the location of the Diamond is in the centre the campus. Therefore, students prefer to choose the Café Area as a space for gathering together and having a cup of coffee. Compared with the usage of the Café Area at the Diamond, the score of the Usage Index of the Café Area of the Newton is only 1.3. The score of the UI in the Café Area of the Newton is relatively lower than that of the Diamond for some reasons. Firstly, the Café Area at the Newton is only open for serving breakfast and lunch. The opening times limit the usage of the space. Secondly, there are two more canteen café bars around the Newton. Students have more options to eat during the lunch time. They could also use the provided tables and chairs next to the café bar instead of using the Café Area at the Newton. Furthermore, the whole Newton at Nottingham Trent University is designed as a linking space, like a street in the city, where students were allowed to eat and drink wherever they wanted. All these reasons resulted in the score of the UI of the Café Area at the Newton being lower than at the Diamond.

The third cluster of columns in Figure 5-1 describe the Usage Index of the Corridor Space at the Diamond and at the Newton, which are 0.58 and 0.17, respectively. The results by observation, recorded the Corridor Space at the Diamond, show that there are quite a number of students doing socialising and informal learning activities, which is over 4 times higher than the number of students at the Newton. At the Diamond, the Corridor Space was also mainly used as a learning space. It provided enough sockets and plug-ins, the tables and chairs in the Corridor Space of the Diamond are very popular. In terms of the Corridor Space at the Newton, the area of the Corridor Space of the Newton is sufficient, where students were gathered to have group reviews and individual tutorials. Quite a few students used the Corridor Spaces of the Newton as a place for relaxing before or after lecture. Meanwhile, because lots of people walked through the Corridor Space of the Newton, there were not many tables and chairs organised there.

The right cluster of columns of Figure 5-1 describe the Usage Index of the Open Space at the Diamond and at the Newton, which were 1.56 and 0.25, respectively. The Open Space of the Diamond was mainly used for student learning activities. Sufficient tables and chairs plus computers and monitors were available for students to make full use of the spaces for learning and other related activities. However, the Open Space of the Newton provided a reverse situation. With only a few tables and chairs, more spaces were left to ensure an efficient walking flow during the peak hours. Furthermore, the Open Space of the Newton is a place for different events, such as job fairs, Graduation Shows, and so on. Even though the score of the Usage Index of the Open Space at the Newton is low, it is one of the busiest learning spaces in the whole campus.

Figure 5-1 presents the total number of people in socialising and informal learning activity in 100 square metre of the functional zone per hour. In one functional zone, how students used the informal learning spaces could not be shown in the figure. Hence, the following paragraphs interpret the percentage of the six types of student activities in the four functional zones. Similar with the Usage Index, the frequency of student activity in the four functional zones was calculated based per 100sqm of the functional zones and per hour. The percentage of the student activities in the different functional zones of the Diamond and the Newton were shown in Figure 5-2 and Figure 5-3, respectively. Six types of student activities, Focused Informal Learning, Intermittent Exchange, Serendipitous Encounter, Dietary Related Activities, Focused Socialising, and Ambient Sociality were marked in the same colour. The darker of the colours means that the activity tended towards more informal learning while the brighter of the colours means that the activity tended to be more about socialising.

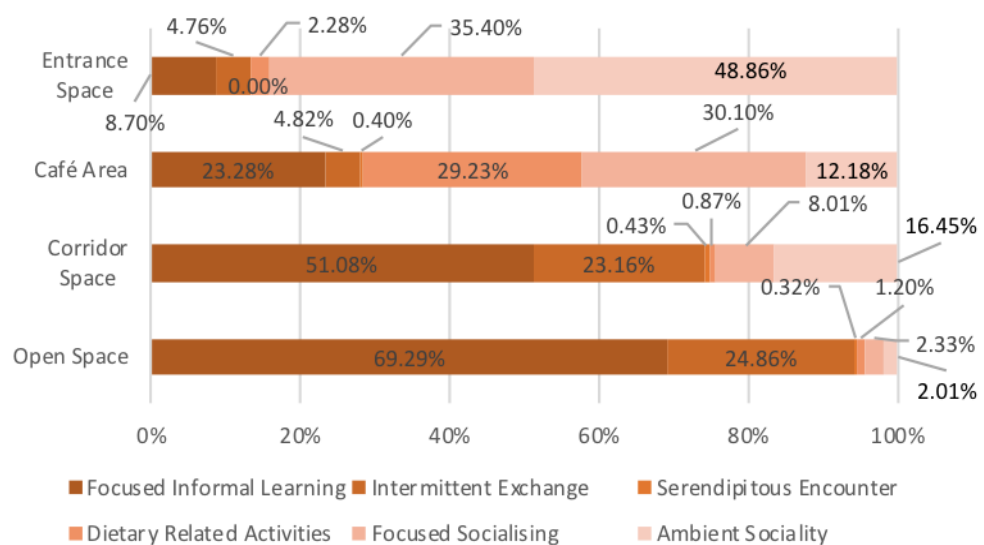


Figure 5-2: The percentage of student activity occurred in different functional zones of the Diamond based on the observation.

As Figure 5-2 shows, the percentage of student activity occurred in four functional zones of the Diamond are presented. The first bar indicates the percentage of student activity in the Entrance Space of the Diamond. It can be seen that over 80% of the activities were socialising activities and less than a 20% rate of the activities were informal learning activities. A majority of the activities that occurred in the Entrance Space were Focused Socialising activities and Ambient Sociality activities, which was occupied 35.40% and 48.86%, respectively. Similar to the results that the observation shows, sofas and coffee tables and other support services were provided in the Entrance Space of the Diamond, where students preferred to wait, linger, relax and so on. Meanwhile, there were still around 8.7% students who chose to do Focused Informal Learning activities at the Entrance Space at the Diamond.

The second bar reflects the percentage of student activities in the Café Area of the Diamond. The same with the Entrance Space of the Diamond, a majority of the student activities were characterised by socialising, which accounted for over 70%. A majority of the Dietary Related Activities occurred in the Café Area of the Diamond. However, the Dietary Related Activities only occupied nearly 30% of all the activities. It can be explained that before and after the Dietary Related Activities, students also did this along with other socialising activities and even informal learning activities. Sometimes, Dietary Related Activities occurring in the Café Area prompted Serendipitous Encounters and some series of informal learning activities.

The third bar indicates the percentage of student activities in the Corridor Space of the Diamond. On the contrary, the Corridor Spaces provided a place for



informal learning activities which occupied the main activities in the setting. More specifically, 51.08% of the student activities were Focused Informal Learning and Intermittent Exchange which occupied 23.16%. Even though there were only 0.43% of the Serendipitous Encounter activities, the total percentage of the Informal Learning Activities occupied over 75%. According to this percentage, the Corridor Space of the Diamond could be seen as a place where its design of it was for learning.

The bottom-bar indicates the percentage of student activities in the Open Space of the Diamond. Clearly, the percentage of the informal learning activities were almost occupied 95% of all the activities. More specifically, over 69.29% of the students did Focused Informal Learning and 24.86% of students did Intermittent Exchange activities in the Open Space of the Diamond. With sufficient physical learning supports, such as tables, chairs, sockets and plugins, and ample spatial organisation, the students could always find a suitable place to learn and have discussions.

Compared with the percentage of student activity that occurred in the different functional zones of the Diamond, the results from observing activities at the Newton presented a different situation. As Figure 5-3 shows, the percentage of student activity occurring in the four functional zones of the Newton were presented. The first bar indicated the percentage of student activities in the Entrance Space of the Newton. It can be seen that, as a whole, almost 85% of the activities were socialising activities and that there was less than 15% of the activities that were informal learning activities. A majority of the activities that occurred at the Entrance Space were Focused Socialising and Ambient

Sociality, which was occupied 34.40% and 38.85%, respectively. Different from the design of the Entrance Space of the Diamond, the Entrance Space of the Newton was mainly used for access, where students could wait for someone or for relaxing. A café bar, along with limited tables and chairs, was allocated next to the Entrance Space of the Newton, which provided a lot of opportunities for students. With food and drink and tables and chairs, there were still around 5.10% and 7.64% of students that did Focused Informal Learning and Intermittent Exchange activities in the Entrance Space of the Diamond, respectively.

The second bar indicates the percentage of student activities in the Café Area of the Newton. 78.9% of student activities occurring in the Café Area were Dietary Related Activities. With limited opening times of the canteen, there was no student doing Focused Informal Learning and Serendipitous Encounters in the Café Area. However, there were 7.34% and 11.01% of students that did Focused Socialising and Ambient Sociality activities.

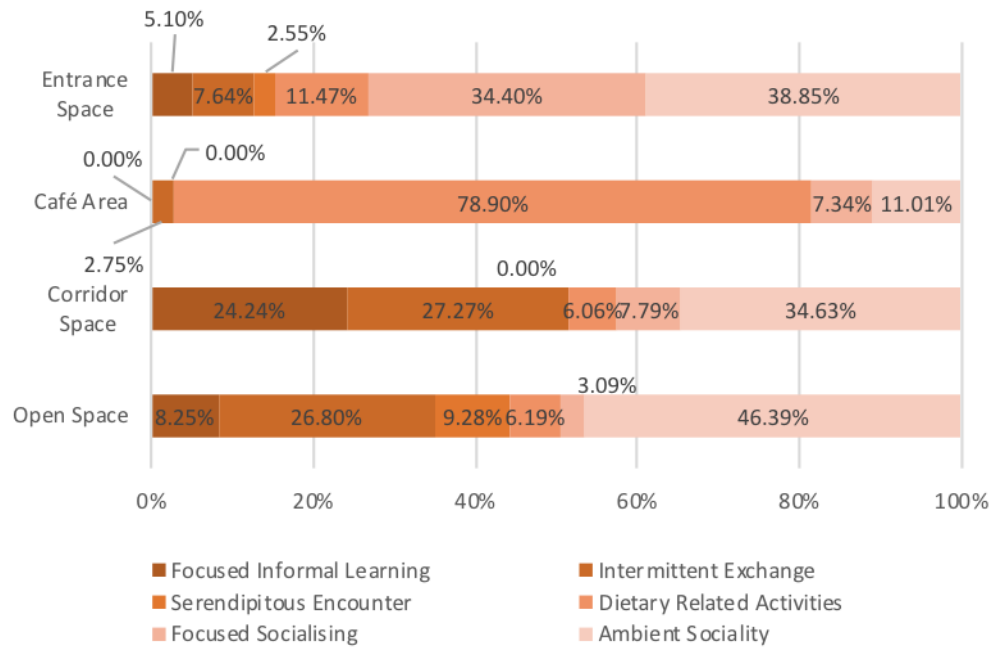


Figure 5-3: The percentage of student activity that occurred in different functional zones of the Newton based on the observation.

The third bar indicates the percentage of student activities in the Corridor Space of the Newton. On the contrary, informal learning activities, occurring in the Corridor Space, occupied over the half of all the activities in the setting. More specifically, 24.24% of the student activities were based on Focused Informal Learning while Intermittent Exchange activities was accounted for 27.27%. As a space for passing through, there were no people doing Serendipitous Encounter activities. Meanwhile, different from the requirement of the Diamond, the informal learning spaces at the Newton allowed students to do whatever they wanted to do, including Dietary Related Activities. Accordingly, there were 6.06% of students doing Dietary Related Activities. Furthermore, linked with the Nottingham Business School, the Nottingham Conference Centre and a series of lecture rooms, the Corridor Space provided students more spaces to wait for lectures, gather together, etc. Hence, students had more opportunities to do Focused Socialising and develop Ambient Sociality. As a

result, 7.79% of student activities were Focused Socialising activities and 34.63% were focused on Ambient Sociality.

The bottom bar indicates the percentage of student activities in the Open Space of the Newton. Contrary to the Open Space of the Diamond, the Open Space of the Newton was occupied by different student activities. More specifically, 8.25% of the students did Focused Informal Learning and 26.8% of the students did Intermittent Exchange activities in the Open Space of the Newton. 9.28% of student activities were based on Serendipitous Encounter, which characterised the chore function of the Open Space of the Newton. Meanwhile, there were 6.19% of students doing Dietary Related Activities and 3.09% of students doing Focused Socialising activities. Furthermore, there were 46.39% of students doing Ambient Sociality activities in the Open Space of the Newton. Designed with a glazed centre court with a walk-round balcony, the Open Space of the Newton provided a good learning environment and a gathering place for improving student experiences on the campus.

### **5.3 TIME PERIOD OF REGULAR USE IN INFORMAL LEARNING SPACES.**

In terms of student experiences in the informal learning spaces, it is necessary to investigate the times students regularly use the informal learning spaces. It also helps to better understand the usage of the informal learning spaces. This section presents the data of the time period of regularly using the informal learning spaces through the use of questionnaires.

The questionnaire (see appendix - questionnaire) investigated the frequency of the time period that the participants occupied the informal learning spaces. The time period of regularly using the informal learning space were divided into eight periods: from 8am to 10am; from 10am to 12pm; from 12 pm to 2 pm; from 2 pm to 5 pm; from 5 pm to 7 pm; from 7 pm to 10 pm; from 10 pm to 0 am; and from 0 am to 8 am. Each participant gave their multiple responses by ticking '✓' on their time period of using the informal learning spaces. In total, there were 157 respondents and 104 respondents that filled the questionnaire at the Diamond and at the Newton, respectively. There were 148 valid questionnaires from the Diamond and 97 valid questionnaires from the Newton that were collected. The data was analysed by using a Multiple Response Analysis (See Methodology chapter 5: Research Methodology - section 2) using SPSS BIM 23 software. The results of the Multiple Response Analysis of the Diamond and the Newton are respectively summarised in Table 5-3 and Table 5-4.

Table 5-3: The number and percentage of students selecting time periods of regularly using the informal learning spaces of the Diamond based on questionnaires responses.

		How many times was the time period mentioned?	Percentage based on respondents	Percentage based on answers
Which is the most frequency time period of using informal learning spaces?	8-10 am	47	9.0%	31.8%
	10-12 am	87	16.6%	58.8%
	12-2 pm	89	17.0%	60.1%
	2-5 pm	102	19.5%	68.9%
	5-7 pm	78	14.9%	52.7%
	7-10 pm	78	14.9%	52.7%
	10-0 am	32	6.1%	21.6%
	0-8 am	11	2.1%	7.4%
	Total	524	100.0%	

As Table 5-3 shows, the table presents the number and percentage of students selecting time periods of regularly using the informal learning spaces of the

Diamond as based on questionnaires. The second left column presents eight-time periods as mentioned earlier. The third column represents how many times the respondents selected in each option. More specifically, there were 47 respondents selecting the time period of using the informal learning spaces at 8-10 am. However, the number of ticks doubled to 87 and 89 after two time periods of using the informal learning spaces at 10-12 am and 12-2 pm, respectively. The number of the respondents (N=102) ticking the time period of using the informal learning spaces reached a peak between 2-5 pm. After that, the number of the respondents ticking the time periods of using informal learning spaces between 5-7 pm and 7-10 pm decreased but still maintain to a relatively high number, at 78 for each time period. After that, the number of the respondents decreased to 32 between 10-0 am and further cut down to 11 between 0-8 am. The right two columns showed two sets of percentages. The left one uses the total number of responses (N=524) as a base value for the percentages and the other column uses the number of cases (N=148) as a base.

The results of the Multiple Response Analysis showed some interesting results. Firstly, the busiest time period of the Diamond between 2-5 pm, where over 68.9% participants (N=102) presented their time period for using the informal learning space at the Diamond. Meanwhile, the time period for using the informal learning spaces of the Diamond between 10-12 am and 12-2 pm also maintained a high percentage of the population, 58.8% and 60.1%, respectively. Instead of getting up early, the students preferred to study at the Diamond, starting from 10 am. However, the number of students using the informal learning spaces of the Diamond reached a peak in the afternoon. Secondly, the respondents using the informal learning spaces at the Diamond between the time

period of 5-7 pm and 7-10 pm were also occupied a very high percentage, both presenting 52.7%. Interestingly, even during the dinner time period, there were still quite a lot of students studying at the Diamond. And the number continued to 10 pm at night. Last but not least, there were still some participants using the informal learning spaces of the Diamond between 0-8 am. The number of participants using the informal learning spaces of the Diamond between 0-8 am accounted for 7.4%. It can be clearly seen that the informal learning spaces of the Diamond were extremely busy and different students chose to use the space in the different time periods.

Table 5-4 presents the number and percentage of students selecting the time period of regularly using the informal learning spaces of the Newton based on questionnaires. Similar to Table 5-3, the second left column of Table 5-4 presents eight-time periods mentioned as well. The third column represents how many times the respondents selected in each option. More specifically, there were 21 respondents that selected the time period of using the informal learning spaces at 8-10 am. However, the number of ticks increased to 60 between 10-12 am and reached a peak (N=71) at 12-2 pm. After that, the number of the respondents ticking the time periods for using informal learning spaces between 5-7 pm decreased but still maintained a relatively high number (N=43). After that, the number of the respondents decreased to 17 between 5-7 pm and further dropped down to 9, 2 and 1 between 7-10 pm, 10-12 pm and 0-8 am, respectively. The two right-hand side columns show two sets of percentages. The left one uses the total number of responses (N=224) as a base value for the percentages and the other column uses the number of cases (N=97) as a base.

Table 5-4: The number and percentage of student selecting time periods of regularly using the informal learning spaces of the Newton based on questionnaires.

		How many times was the time period mentioned?	Percentage based	Percentage based
			on respondents	on answers
Which is the most frequency time period of using informal learning spaces?	8-10 am	21	9.4%	22.1%
	10-12 am	60	26.8%	63.2%
	12-2 pm	71	31.7%	74.7%
	2-5 pm	43	19.2%	45.3%
	5-7 pm	17	7.6%	17.9%
	7-10 pm	9	4.0%	9.5%
	10-0 am	2	0.9%	2.1%
	0-8 am	1	0.4%	1.1%
	Total	224	100.0%	

The results of Multiple Response Analysis showed some interesting results. Firstly, the busiest time period of the Newton is between 12-2 pm, where over 74.7% participants (N=71) presented their time periods for using the informal learning space at the Newton. The students mainly used the informal learning spaces of the Newton as a place for relaxing and having lunch. Meanwhile, the time period for using the informal learning spaces of the Newton from 10-12 am and 2-5 pm also kept a high percentage of the population, at 63.2% and 45.3%, respectively. The informal learning spaces of the Newton are closely linked with lecture spaces and studios, where students did formal learning activities, which provided an opportunity for them to use the informal learning spaces of the Newton between lectures. Rather than selecting a learning space far away from the next lecture room, they used the informal learning spaces of the Newton for socialising and chatting with their friends there. Hence, the number of students from 10 am -5 pm was relatively high. Secondly, there were still some students doing socialising and informal learning activities in the informal learning spaces of the Newton from 5 to 7 pm. The percentage of the population accounted for 17.9%. Furthermore, the number of students using the informal learning spaces of the Newton between 7-10 pm, was less. This



occupied only 9.5% of the total number of the responses. Last but not least, there are almost no participants that preferred staying at the Newton during the 10-0 am and 0-8 am time spaces. As a linking space, the students did not recognise the space as a learning space. Instead, they could choose the Boots Library to study or go to their halls of residence or bars for socialising. Located in the heart of the Nottingham city centre, the students could more easily engage with into the city life rather than stay in the informal learning spaces of Nottingham Trent University.

## **5.4 REASONS FOR SELECTING AND USING THE INFORMAL LEARNING SPACES.**

For students, there are many reasons for using the informal learning spaces. For a better understanding of student experiences in the informal learning spaces, the reasons of selecting and using the informal learning spaces should be investigated. Based on the literature review and pilot study, the questionnaires were designed to list 15 possible reasons. The respondents of the questionnaires use multiple choice options and in total 245 valid questionnaires (148 questionnaires collected from the Diamond and 97 questionnaires from the Newton), were collected and the Multiple Response Analysis (see Table 5-5 and Table 5-6) was carried out to present the responses to the question: *I select and use this social space because the space...?* (See questionnaire) The multiple-choice questions were analysed through a Multiple Response Analysis in the SPSS (IBM) 23 software.

Table 5-5: The number and percentage of students selecting the reason for selecting and using the informal learning spaces of the Diamond based on the given questionnaires.

		How many times was the time period mentioned? <sup>b</sup>	Percentage based on respondents	Percentage based on answers
Reason for Choosing Informal Learning Spaces <sup>a</sup>	1. Provides comfortable light environments	121	10.6%	81.8%
	2. Provides comfortable noise environments	82	7.2%	55.4%
	3. Provides comfortable temperature	92	8.0%	62.2%
	4. Provides comfortable ventilation	65	5.7%	43.9%
	5. Provides comfortable colour/material of furniture	74	6.5%	50.0%
	6. Is flexible, adaptable and diverse	78	6.8%	52.7%
	7. Provides informal ambience	76	6.6%	51.4%
	8. Support individual and group work	101	8.8%	68.2%
	9. Provides good view of seeing what other people are doing	41	3.6%	27.7%
	10. Provides good outside views	50	4.4%	33.8%
	11. Makes people feel easy for way finding	44	3.8%	29.7%
	12. Is easily accessible	100	8.7%	67.6%
	13. Feels generous, open and spacious.	96	8.4%	64.9%
	14. Provides service support (such as Wi-Fi, enough plugs and sockets, IT-rich environment)	119	10.4%	80.4%
	15. Others	7	0.6%	4.7%
Total		1146	100.0%	

a. Dichotomy group tabulated at value 1.

b. Out of 148 questionnaires in total

As Table 5-5 shows, the table presented the number and percentage of students selecting the reasons for selecting and using the informal learning spaces of the Diamond, as based on the questionnaires. The second left column presents 14 fixed reasons for selecting and using informal learning spaces and one more option – Others, to make sure the possible reasons covered all the possibilities. The third column represents how many times the respondents selected in each option. More specifically, a lot of the respondents believed that the informal learning spaces provided comfortable light environments (N=121). The reason for providing service support (such as Wi-Fi, enough plugs and sockets, IT-rich environment) was chosen at similar times and reached 119 times. On the contrary, the fifteenth reasons ‘Others’ was only selected by 7 times, which means that the reasons listed covered almost all of the possibilities. The two

right-hand columns show two sets of percentages. The left one uses the total number of responses (N=1146) as the base value for the percentages and the other column uses the number of cases (N=148) as the base.



Figure 5-4: Natural and artificial light throughout the atrium of the Diamond (left) and Glass Curtain Wall with a cellular pattern of interconnected diamond shapes provided sufficient natural light for the Diamond (right).

It can be clearly seen from Table 5-5 that there are six main reasons for selecting and using the informal learning spaces of the Diamond. More specifically, providing comfortable light environments (81.8%) and necessary service support (80.4%) are the top two options for selecting and using the informal learning spaces of the Diamond. Organised by a four-foot atrium, the whole informal learning spaces of the Diamond provide natural light from the rooftop. It makes the whole learning spaces bright with natural light. Furthermore, the glass curtain wall on the east side, north side and west side of the building extended from the ground floor to the top floor, which also provided good natural light (see Figure 5-4 right). Meanwhile, a sufficient artificial lighting system make sure that the learning environment is bright. Even those places where natural light could not reach to could also use sufficient artificial light (see Figure 5-4 left). Meanwhile, based on the observation, there are always tables and chairs with sockets and plugins. This service supports student

socialising and informal learning activities when they use their own laptops. Therefore, compared with the other two learning spaces (Information Commons and Western Bank Library), the students prefer to select and use the informal learning spaces of the Diamond.

Meanwhile, sufficient learning furniture such as tables and chairs were allocated all around the informal learning spaces of the Diamond. The tables and chairs were movable and could be reorganised by students according to the students' learning styles. Therefore, the respondents indicated that supporting learning styles on either individual or group work (68.2%) was one of their main reasons for selecting and using the informal learning spaces of the Diamond. A similar percentage gave the reason for supporting learning styles to either individual or group-based work. The accessibility of the informal learning spaces of the Diamond was also one of the key reasons, which accounted for 67.6%. As a learning space for students utilising the 24/7 opening hours, they could easily go in and out by swiping their student cards.

Furthermore, the number of students selecting and using the informal learning spaces of the Diamond are mainly because they feel that the space is generous, open and spacious, and provides comfortable temperature. The percentage of students selecting these two reasons are also above the sixty percentages points of 64.9% and 62.2%, respectively. The results can probably be explained by the design of the informal learning spaces of the Diamond. As discussed above, the students prefer to do socialising and informal learning activities in a bright space. The generous, open and spacious design helps the students to appreciate the perception of the light environment.

In addition, the reasons for providing good views to see what other people are doing and the ease of finding the way are not the major reasons why students select and use the informal learning spaces of the diamond. The percentage of the two reasons are both below 30% (27.7% and 29.7%, respectively).

Table 5-6 presents the number and percentage of students selecting the reason for selecting and using informal learning spaces of the Newton based on the questionnaires. The second left column presents 14 fixed reasons for selecting and using informal learning spaces and one more option – Others, to make sure the possible reasons covered all the possibilities. The third column represented how many times the respondents selected in each option. More specifically, the main reason for students selecting and using the informal learning space of the Newton was that the space is easily accessible indicated by 80.4% of the respondents. It is not only because the participants could be able to get access, but also that it is quite an open space next to the lecture space. In there, they could discuss directly as soon as they finished the lecture. Meanwhile, there are a lot of the respondents that believed that the informal learning spaces provided comfortable light environments (N=71). The reason for providing service support (such as Wi-Fi, enough plugs and sockets, and an IT-rich environment) was selected at similar times, reaching 65 times. On the contrary, the fifteenth reason – Others was only indicated by 2 times, which means that the reasons listed covered almost all of the possibilities. The two right-hand columns show two sets of percentages. The left one uses the total number of responses (N=705) as the base value for the percentages and the other column uses the number of cases (N=97) as the base.

Table 5-6: The number and percentage of students selecting the reason for selecting and using informal learning spaces of the Newton based on the questionnaires.

			How many times was the time period mentioned <sup>b</sup>	Percentage based on respondents	Percentage based on answers
Reason for Choosing Informal Learning Spaces <sup>a</sup>	1.	Provides comfortable light environments	71	10.1%	73.2%
	2.	Provides comfortable noise environments	44	6.2%	45.4%
	3.	Provides comfortable temperature	59	8.4%	60.8%
	4.	Provides comfortable ventilation	42	6.0%	43.3%
	5.	Provides comfortable colour/material of furniture	48	6.8%	49.5%
	6.	Is flexible, adaptable and diverse	53	7.5%	54.6%
	7.	Provides informal ambience	35	5.0%	36.1%
	8.	Support individual and group work	52	7.4%	53.6%
	9.	Provides good view of seeing what other people are doing	28	4.0%	28.9%
	10.	Provides good outside views	25	3.5%	25.8%
	11.	Makes people feel easy for way finding	42	6.0%	43.3%
	12.	Is easily accessible	78	11.1%	80.4%
	13.	Feels generous, open and spacious.	61	8.7%	62.9%
	14.	Provides service support (such as Wi-Fi, enough plugs and sockets, IT-rich environment)	65	9.2%	67.0%
	15.	Others	2	0.3%	2.1%
Total			705	100.0%	

a. Dichotomy group tabulated at value 1.

b. Out of 97 questionnaires in total

Similar to the reasons for selecting and using the informal learning spaces of the Diamond, the percentage for selecting and using the informal learning spaces where students felt contented, experienced an open and spacious environment which provided comfortable temperatures at the Newton, were also over the sixty percentage (62.9% and 60.8%, respectively). In line with the investigation at the Diamond, providing good views for seeing what other people were doing was also not a major reason for the participants to select and use the informal learning spaces at the Newton. Furthermore, providing good external views occupied the least percentage, which accounted for 25.8%.

## **5.5 STUDENT SOCIALISING AND INFORMAL LEARNING ACTIVITIES IN THE INFORMAL LEARNING SPACES.**

The previous three sections have interpreted the usage of the functional zones in the informal learning spaces (where), when students regularly use informal learning spaces, and why they selected and used the informal learning spaces. This section explores what students did in the informal learning spaces.

Based on the literature review and pilot study, the data of the frequencies of 22 types of student activities within six types of socialising and informal learning activities, which were measured through questionnaires at the Diamond at the University of Sheffield and the Newton at Nottingham Trent University. By investigating the question: *How often have you done these activities in this social space per week?* (see appendix - questionnaire), the respondents selected the frequency of activities by ticking one from five options: Never, Slightly Frequently, Frequently, More Frequently, and Most Frequently, which was developed by Likert (1931), who described and then developed this technique for the assessment of attitudes (See Chapter 4: Research Methodology – section 7). Based on this technique, the frequencies of student activity were captured according to the students' subjective evaluation. The frequencies of student activities were statistically collected through questionnaires, analysed by using SPSS BIM 23 software and presented in the form of tables and pie charts.

### **5.5.1 The Frequency of Focused Informal Learning Activities.**

The data of Focused Informal Learning activities were collected from four specific activities: ‘preparing coursework’, ‘discussing ideas from reading books or lectures’, ‘working with others on coursework’, and ‘studying alone’. The data of Focused Informal Learning activities collected from the respondents at the Diamond is summarised in Table 5-7. In order to better present the percentage of the selections, the data was transferred into pie charts, as shown in Figure 5-5.

Table 5-7: Student frequencies of the Focused Informal Learning activities at the Diamond per week, based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
Focused Informal Learning	1. Prepared Coursework	14	28	50	35	21	148
	2. Discussed ideas from reading books or lectures	24	63	33	22	6	148
	3. Worked with others on coursework	19	32	45	37	15	148
	4. Study alone	3	22	31	44	48	148

In terms of ‘preparing coursework’, as it can be seen from Table 5-7, 50 respondents selected ‘Frequently’, 35 selected ‘More Frequently’, 28 selected ‘Slightly Frequently’, and 21 selected ‘Most Frequently’. Only 14 people selected ‘Never’ as their responses. Obviously, those who chose ‘Frequently’, ‘More Frequently’, and ‘Most Frequently’ far outnumber those that chose ‘Never’ and ‘Slightly Frequently’. The pie charts of ‘preparing coursework’ in Figure 5-5 contained the calculated the percentage for each set of responses to the five options in the questionnaire. More specifically, 9% participants give an indication that they prefer preparing coursework activities in the informal learning spaces at the Diamond one time per week, while 19% believe that they



prefer preparing coursework twice per week. The percentages of the respondents, who give an indication that they prefer preparing coursework by selecting ‘Frequently’, ‘More Frequently’, and ‘Most Frequently’, are respectively at 34%, 24%, and 14%. Accordingly, an average of 72% of the respondents believes that ‘preparing coursework’ occurred frequently or much more than ‘Frequently’. That is to say, preparing coursework is one of their activities that occurred frequently in the informal learning spaces of the Diamond. Sufficient lighting and service support provided a convenient and comfortable learning environment, where students would like to prepare their coursework in the setting.

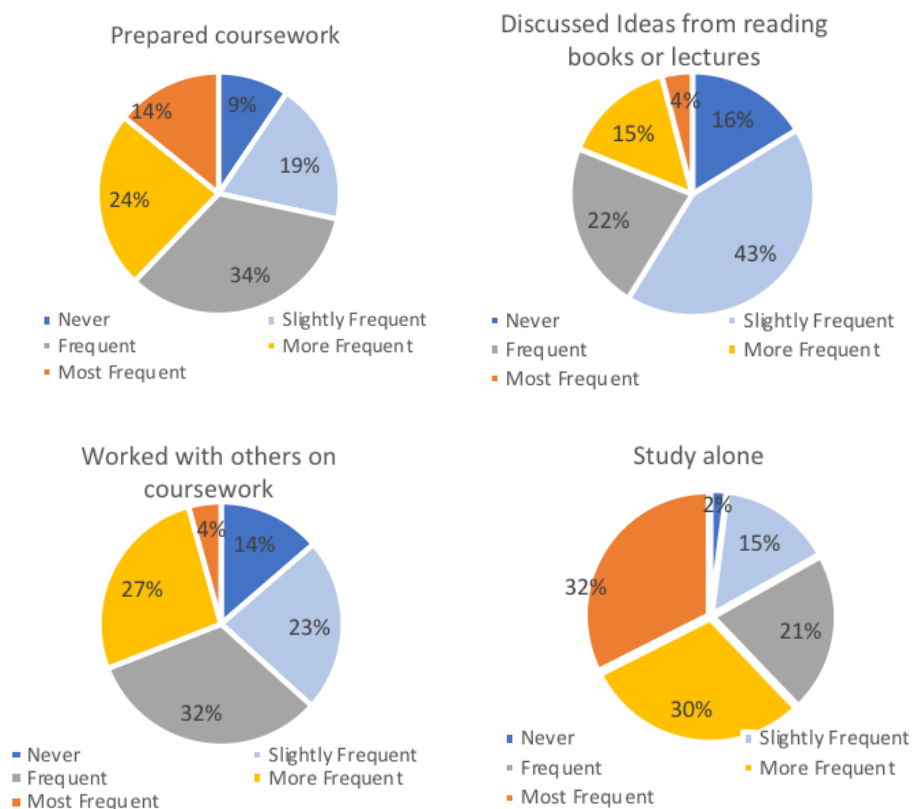


Figure 5-5: The percentage of the frequencies of Focused Informal Learning activities of the Diamond, per week based on the questionnaires.

Different from the frequency of ‘preparing coursework’, only 6 respondents selected ‘Most Frequently’ at discussing ideas from reading books or lectures.

Furthermore, 22 selected 'More Frequently', 33 selected 'Frequently', 63 respondents selected 'Slightly Frequently', and 24 selected 'Never'. As the pie chart (see Figure 5-5) shows, it can be clearly seen that 59% of the respondents stressed that they 'never' or 'Slightly Frequently' discussed ideas from reading books or lectures. That is to say, only 41% of the respondents stressed that they discussed ideas from reading books or lectures at the Diamond 3 or more than 3 times per week. With limited discussion activities occurring in the informal learning spaces of the Diamond, the noise level was fairly low. Therefore, increasingly, students chose the informal learning spaces of the Diamond as a place for their individual study. Even in the open space, where normally it was recognised as a public space, one could also see a lot of students preparing their coursework.

Similar with 'prepared coursework', most of the respondents (N=45) indicated that they worked with others on coursework average 3 times per week. Furthermore, 37 selected 'More Frequently', 32 selected 'Slightly Frequently', 15 selected 'Most Frequently', and 19 selected 'Never'. The pie chart (see Figure 5-5) recorded the calculated percentage for each set of responses to the five options in the questionnaire. 14% of the respondents gave an indication that they never work with others on coursework in the Diamond while 23% believed that they worked with others on coursework 1-2 time per week. The remaining respondents, indicating working with others on coursework 3 times per week and 4-5 times per week, account for respectively at 32% and 27%. There were only 4% selecting 'Most Frequently' on working with others on coursework. Accordingly, the total 37% of the respondents did not or 1-2 times working with others on coursework every week; that is, an average of 63% of the respondents

believed that ‘working with others on coursework’ was occurred ‘Frequently’ or much more than ‘Frequently’.

More participants believed that they ‘study alone’ more often. More specifically, 48 respondents selected ‘Most Frequently’, 44 selected ‘More Frequently’, 31 selected ‘Frequently’, and 22 selected ‘Slightly Frequently’. Only 3 people selected ‘Never’. Obviously, those who chose ‘Frequently’, ‘More Frequently’, and ‘Most Frequently’ far outnumber those choosing ‘Never’ and ‘Slightly Frequently’. The pie chart indicates that only 2% respondents gave an

Indication that they ‘Never’ study alone, while 15% of the respondents believed that they studied here alone 1-2 times every week. The percentages of the remaining respondents selecting ‘Frequently’, ‘More Frequently’ and ‘Most Frequently’ were at 21%, 30% and 32%, respectively. Accordingly, only 17% of the respondents did not or did 1-2 times studying alone every week; that is, an average of 83% of the respondents believed that ‘Study alone’ was occurred ‘Frequently’ or much more than ‘Frequently’.

Table 5-8: Student frequencies of Focused Informal Learning activities of the Newton per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
Focused Informal Learning	1. Prepared Coursework	13	29	32	15	8	97
	2. Discussed ideas from reading books or lectures	22	32	23	16	4	97
	3. Worked with others on coursework	14	26	27	19	11	97
	4. Study alone	13	19	19	26	20	97

Similar with the query at the Diamond, the questionnaires were also collected in the informal learning spaces of the Newton. The results of student frequencies

of Focused Informal Learning activities are presented in Table 5-8 and in Figure 5-6. In terms of 'preparing coursework', as it can be seen from Table 5-8 that there were 32 respondents selected 'Frequently', 15 selected 'More Frequently', 29 selected 'Slightly Frequently', and 13 selected 'Never'. Only 8 people xx on 'Most Frequently'. Obviously, the number of those who chose 'Never' and 'Slightly Frequently' are more than those choosing 'More Frequently' and 'Most Frequently'. The pie charts for 'prepared coursework' in Figure 5-6 contained the calculated percentage for each set of responses to the five options in the questionnaires. Consequently, 12% of the respondents gave an indication that they 'Never' prepared coursework at the Newton, while 26% believed that they prepared coursework here 1-2 times per week. The remaining respondents indicated their frequencies of preparing coursework at the Newton 3, 4-5, more than 5 times per week were respectively at 29%, 14%, and 19%. Accordingly, 38% of the respondents did not or did 1-2 times studying alone every week; that is, an average of 62% of the respondents believed that 'preparing coursework' was occurred 'Frequently' or much more than 'Frequently'. Compared with 72% of the respondents believing that the activity of preparing coursework had occurred 'Frequently' or much more than 'Frequently' in the informal learning spaces of the Diamond, there were also 62% of the respondents giving indication of preparing coursework in the informal learning spaces of the Newton 3 or 3 times per week. That is to say, preparing coursework was also one of their activities occurring in the informal learning spaces of the Newton frequently.

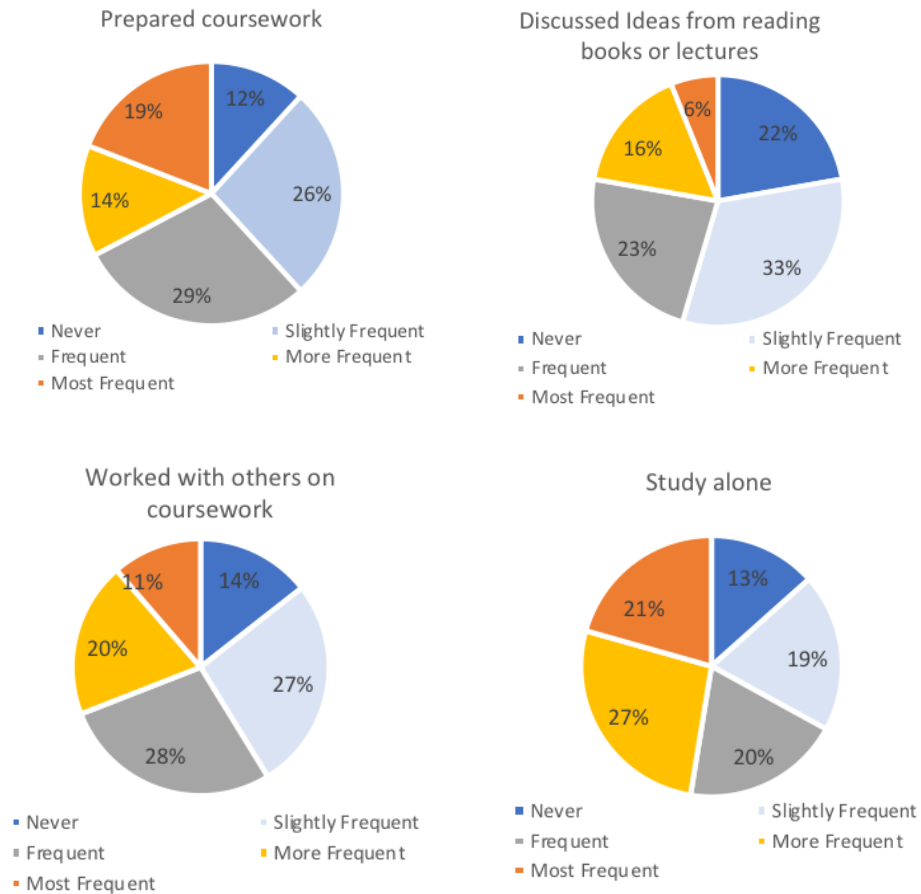


Figure 5-6: The percentage of frequencies of Focused Informal Learning activities of the Newton per week based on the questionnaires.

In terms of ‘discussing ideas from reading books or lectures’ at the Newton, only 4 respondents selected ‘Most Frequently’. Furthermore, 16 selected ‘More Frequently’, 23 selected ‘Frequently’, 32 respondents selected ‘Slightly Frequently’, and 22 selected ‘Never’. As the pie chart shows, it can be clearly seen that 55% believed they were ‘never’ or ‘Slightly Frequently’ discussing ideas from reading books or lectures. That is to say, only 45% of the respondents in total discussed ideas from reading books or lectures 3 or more than 3 times per week at the Newton, which was similar with the Diamond. It could be seen that even though less activities of preparing coursework occurred, the frequency of discussing ideas from reading books or lectures stayed at the same level. It could be assumed that more socialising or discussing activities occurred in the

informal learning spaces of the Newton. This was also in accordance with the settings of the Newton – providing a more relaxed and social environment for promoting communication.

In terms of working with others on coursework in the informal learning spaces of the Newton, 27 selected 'Frequently'. Furthermore, 19 selected 'More Frequently', 26 selected 'Slightly Frequently', 11 selected 'Most Frequently', and 14 selected 'Never'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaires. Consequently, 14% indicated that they 'Never' work with others on coursework at the Newton, while 27% believed that they 'Slightly Frequently' worked with others on coursework. The remaining respondents indicated that they worked with others on coursework at the Newton 3, 4-5, more than 5 times were respectively at 28%, 20% and 11%. Accordingly, 59% of the respondents indicated that they worked with others on coursework at the Newton every 3 or more than 3 times per week; that is to say, an average of 59% of the respondents believed that 'working with others on coursework' occurred 'Frequently' or much more than 'Frequently'. Similar with the results in the informal learning spaces of the Diamond, the percentage of the frequency of the informal learning spaces reached almost 60%, which reflects the social use of the informal learning spaces of the Newton. More specifically, the students tended to use the informal learning spaces of the Newton for discussion and for working with others.

Similarly, the results of the questionnaire used at the Diamond, had more participants who believed that they 'study alone' more often at the Newton. More specifically, 20 respondents selected 'Most Frequently', 26 selected

'More Frequently', 19 selected 'Frequently', and 19 selected 'Slightly Frequently'. 13 people indicated that they 'Never' study alone at the Newton. Obviously, those who chose 'Frequently', 'More Frequently', and 'Most Frequently' far outnumber those choosing 'Never' and 'Slightly Frequently'. The pie chart (see Figure 5-6) indicates that only 13% of the respondents gave an indication that they 'Never' study alone at the Newton, while 19% believed that they 'Slightly Frequently' study alone. The remaining respondents indicated that the percentages of them studying alone 3, 4-5 and more than 5 times per week were respectively at 20%, 27% and 21%. Accordingly, only 32% of the respondents stressed that they studied alone at the Newton less than 3 times per week; that is, an average of 68% of the respondents believed that studying alone occurred frequently or much more than frequently. Compared with the frequency of studying alone in the informal learning spaces of the Diamond, the frequency of studying alone in the informal learning spaces of the Newton is relatively low. As a linking space in Nottingham Trent University campus, a lot of students passed through the informal learning spaces, which made a loss of student studying alone in there. However, the percentage of students studying alone staying at 68% presented the usage of the informal learning spaces of the Newton. With sufficient furniture and necessary service supports, the learning environments provided a convenient space. Even though the informal learning spaces were noisy most of the time, students still prefer to study alone here because of the convenience.

### **5.5.2 The Frequency of Intermittent Exchange Activities.**

The data of Intermittent Exchange activities were collected from six specific activities: ‘talking about career plans’, ‘studying alone but with occasional interaction with others’, ‘working with others on activities other than coursework’, ‘receiving prompt feedback from the faculty on your academic performance’, ‘tutoring or teaching other students’, and ‘having serious conversations with students of a different program or department than your own’. The data for the Intermittent Exchange activities collected from the respondents of the Diamond is summarised in in Table 5-9. In order to better present the percentage of the selections, the data has been translated into pie charts. This is shown in Figure 5-7.

In terms of ‘talking about career plans’, 26 respondents selected ‘Frequently’, 51 selected ‘Slightly Frequently’, and 66 selected ‘Never’. Only 3 people selected ‘More Frequently’ and 2 people indicated ‘Most Frequently’. Obviously, those who chose ‘Never’, ‘Slightly Frequently’, and ‘Frequently’ far outnumber those choosing ‘More Frequently’ and ‘Most Frequently’. The pie charts about ‘talking about career plans’ in Figure 5-7 contained the calculated percentage for each set of responses to the five options in the questionnaire. 45% of the respondents indicated that they ‘Never’ talking about career plans at the Dimond, while 34% believed they ‘Slightly Frequently’ talked about career plans. The remaining respondents stressed that the percentages of talking about career plans at the Diamond of 3, 4-5, and more than 5 times per week were respectively at 26%, 3%, and 2%. Accordingly, the total percentage of the respondents talking about career plans at the Diamond



was 31%; that is, an average of 69% of the respondents believes that ‘talking about career plans’ generated the response, ‘Never’ or ‘Slightly Frequently’.

Table 5-9: Student frequencies of Intermittent Exchange activities of the Diamond per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Intermittent Exchange</b>	5. <i>Talked about career plans</i>	66	51	26	3	2	148
	6. <i>Study alone, but with occasional interaction with others</i>	4	28	45	30	41	148
	7. <i>Worked with others on activities other than coursework</i>	26	45	42	25	10	148
	8. <i>Received prompt feedback from the faculty on your academic performance</i>	70	43	25	7	3	148
	9. <i>Tutored or taught other students</i>	83	35	19	10	1	148
	10. <i>Had serious conversations with students of a different program or department than your own</i>	57	53	21	16	1	148

Different from the frequency of ‘talking about career plans’, only 4 respondents selected ‘Never’ regarding ‘Studying alone, but with occasional interaction with others’. Furthermore, 28 selected ‘Slightly Frequently’, 45 selected ‘Frequently’, 30 respondents selected ‘More Frequently’, and 41 selected ‘Most Frequently’. As the pie chart shows (see Figure 5-7), it can be clearly seen that 78% believed their ‘Frequently’ or ‘More Frequently’ and ‘Most Frequently’ talked about career plans. That is to say, only 22% of the respondents indicated

that ‘studying alone, but with occasional interaction with others’ was occurred less than 3 times per week.

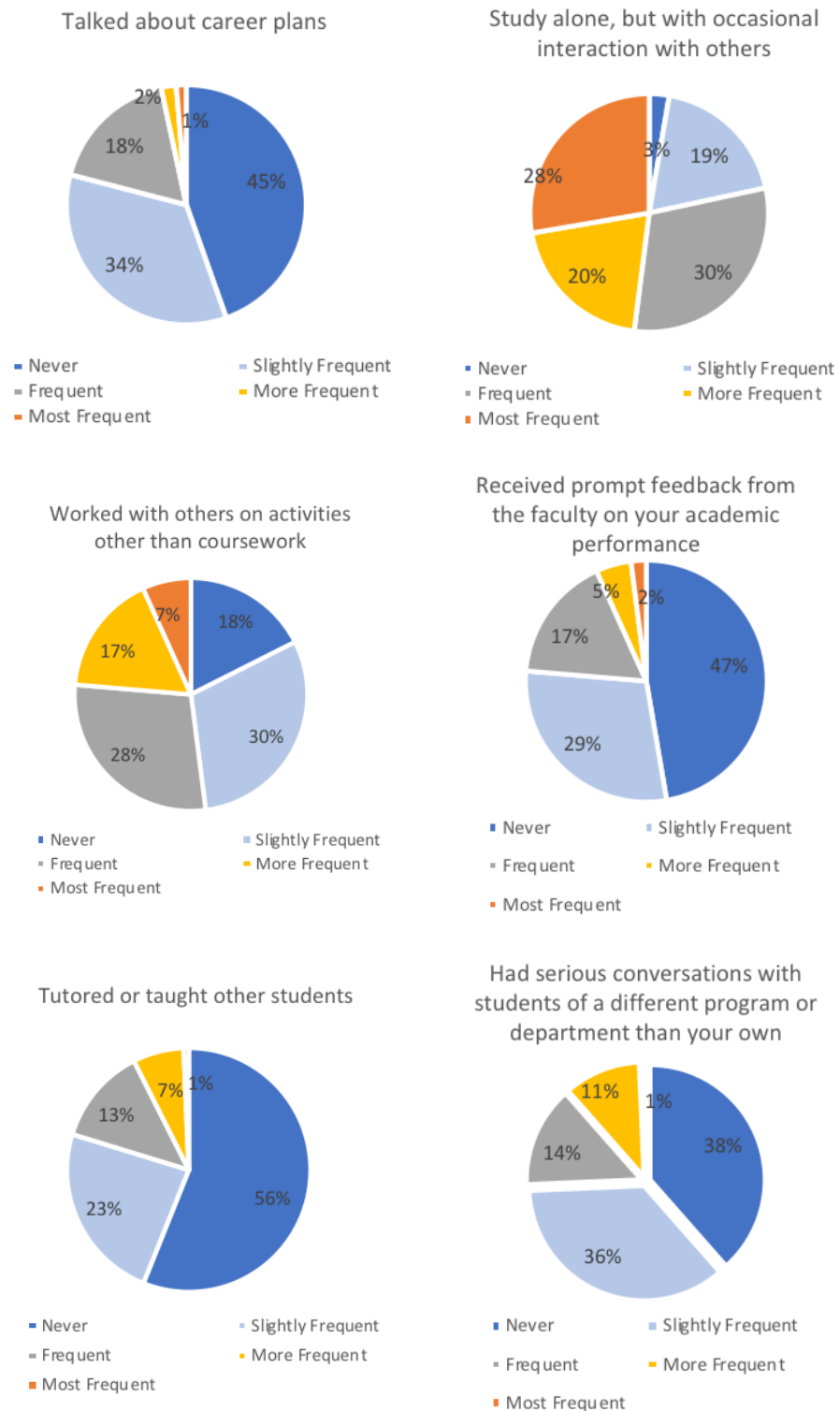


Figure 5-7: The percentage of the frequencies of Intermittent Exchange activities of the Diamond per week based on the questionnaires.

In terms of 'working with others on activities other than coursework' in the informal learning spaces of the Diamond, 45 selected 'Slightly Frequently'. Furthermore, 42 selected 'Frequently', 25 selected 'More Frequently', 10 selected 'Most Frequently', and 26 selected 'Never'. The pie chart (see Figure 5-7) represents the calculated percentage for each set of responses to the five options in the questionnaires. 18% of the respondents gave an indication that they 'Never' work with others on activities other than coursework, while 30% believed that they 'Slightly Frequently' worked with others on activities other than coursework. Accordingly, the total percentage of the respondents who indicated that the percentage of working with others on activities other than coursework occurred more than 3 times per week was 52%; that is to say, an average of 52% of the respondents believes that 'working with others on activities other than coursework' occurred 'Frequently' or much more than 'Frequently'.

In terms of receiving prompt feedback from the faculty on their academic performance in the informal learning spaces of the Diamond, only 3 people selected 'Most Frequently' and 7 selected 'More Frequently'. Furthermore, 25 selected 'Frequently', 43 selected 'Slightly Frequently', and 70 selected 'Never'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 47% of the respondents indicated that 'Never' receive prompt feedback from the faculty on their academic performance in the informal learning spaces of the Diamond, while 29% believed that they were 'Slightly Frequently' received prompt feedback from the faculty on their academic performance. The remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were

respectively at 17%, 5% and 2%. Accordingly, the total percentage of respondents indicating that receiving prompt feedback from the faculty on their academic performance in the informal learning spaces of the Diamond was 24%; that is to say, an average of 76% of the respondents believed that the activity of 'receiving prompt feedback from the faculty on their academic performance' was occurred less than 3 times per week.

In terms of 'tutoring or teaching other students' in the informal learning spaces of the Diamond, only 1 person selected the frequency as 'Most Frequently', 10 selected 'More Frequently', and 19 selected 'Frequently'. Furthermore, 35 selected 'Slightly Frequently' and 83 selected 'Never'. The pie chart portrays the calculated percentage for each set of responses to the five options in the questionnaires. 56% of the respondents indicated they 'Never' did tutoring or teaching other students in the informal learning spaces at the Diamond, while 23% believed that they were 'Slightly Frequently' tutored or taught other students'. The remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were respectively at 13%, 7% and 1%. Accordingly, the total 21% of the respondents indicated that they did tutoring or teaching other students in the informal learning spaces at the Diamond 3 and more than 3 times per week. That means, an average of 79% of the respondents believed that the activity of 'tutoring or teaching other students' was occurred 'Never' and 'Slightly Frequently'.

Similarly, with the 'tutoring or teaching of other students' at the Diamond, only 1 person selected 'Most Frequently' at 'having serious conversations with students from a different program or department than their own'. Moreover, 16

selected 'More Frequently', 21 selected 'Frequently', 53 selected 'Slightly Frequently', and 57 selected 'Never'. The pie chart indicated that in total 74% of the respondents selected 'Never' and 'Slightly Frequently' regarding 'having serious conversations with students of a different program or department than their own'. The remaining respondents selected 'Frequently', and 'More Frequently', and 'Most Frequently' respectively at 14%, 11% and 1%. Accordingly, 26% of the respondents indicated that they had serious conversations with students of a different program or department than their own every 3 or more than 3 times per week; that is to say, an average of 74% of the respondents believed that the activity of 'having serious conversations with students from a different program or department than their own never occurred or occurred 'Slightly Frequently'.

Similar with the query at the Diamond, the questionnaires were distributed at the Newton. The results of the frequency of Intermittent Exchange activities are presented in Table 5-10 and in Figure 5-8. In terms of 'talking about career plans', as it can be seen from Table 5-10, that 24 respondents selected 'Frequently', 12 selected 'More Frequently', 35 selected 'Slightly Frequently', and 22 selected 'Never'. Only 4 people indicated that they talked about their career plans at the Newton over 5 times per week. Obviously, the number of those who chose 'Never' and 'Slightly Frequently' were more than those choosing 'More Frequently' and 'Most Frequently'. The pie charts in Figure 5-8 contains the calculated percentage for each set of responses to the five options in the questionnaire. 23% of the respondents indicated they 'Never' talking about career plans at the Newton, while 36% believed that they 'Slightly Frequently' talked about career plans. The remaining percentage of the

respondents selecting ‘Frequently’, ‘More Frequently’, and ‘Most Frequently’ were respectively at 25%, 12%, and 4%. Accordingly, 59% of the respondents talked about career plans at the Newton less than 3 times per week; That is, an average 41% of the respondents believed that the activity of ‘talking about career plans’ was occurred ‘Frequently’ or much more than Frequently.

Table 5-10: Student frequencies of Intermittent Exchange activities of the Newton per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Intermittent Exchange</b>	5. <i>Talked about career plans</i>	22	35	24	12	4	97
	6. <i>Study alone, but with occasional interaction with others</i>	13	28	24	25	6	97
	7. <i>Worked with others on activities other than coursework</i>	20	30	23	21	3	97
	8. <i>Received prompt feedback from the faculty on your academic performance</i>	33	26	21	13	4	97
	9. <i>Tutored or taught other students</i>	58	23	7	6	3	97
	10. <i>Had serious conversations with students of a different program or department than your own</i>	51	29	8	6	3	97

13 respondents selected ‘Never’ regarding ‘Study alone, but with occasional interaction with others’ at the Newton. Furthermore, 28 selected ‘Slightly Frequently’, 24 selected ‘Frequently’, 25 respondents selected ‘More Frequently’, and 6 selected ‘Most Frequently’. As the pie chart shows in Figure 5-8, it can be clearly seen that 57% of the respondents believed they were

‘Frequently’, ‘More Frequently’ and ‘Most Frequently’ at ‘talking about career plans’. That is to say, only 43% of the respondents gave an indication that they talked about career plans at the Newton less than 3 times per week.

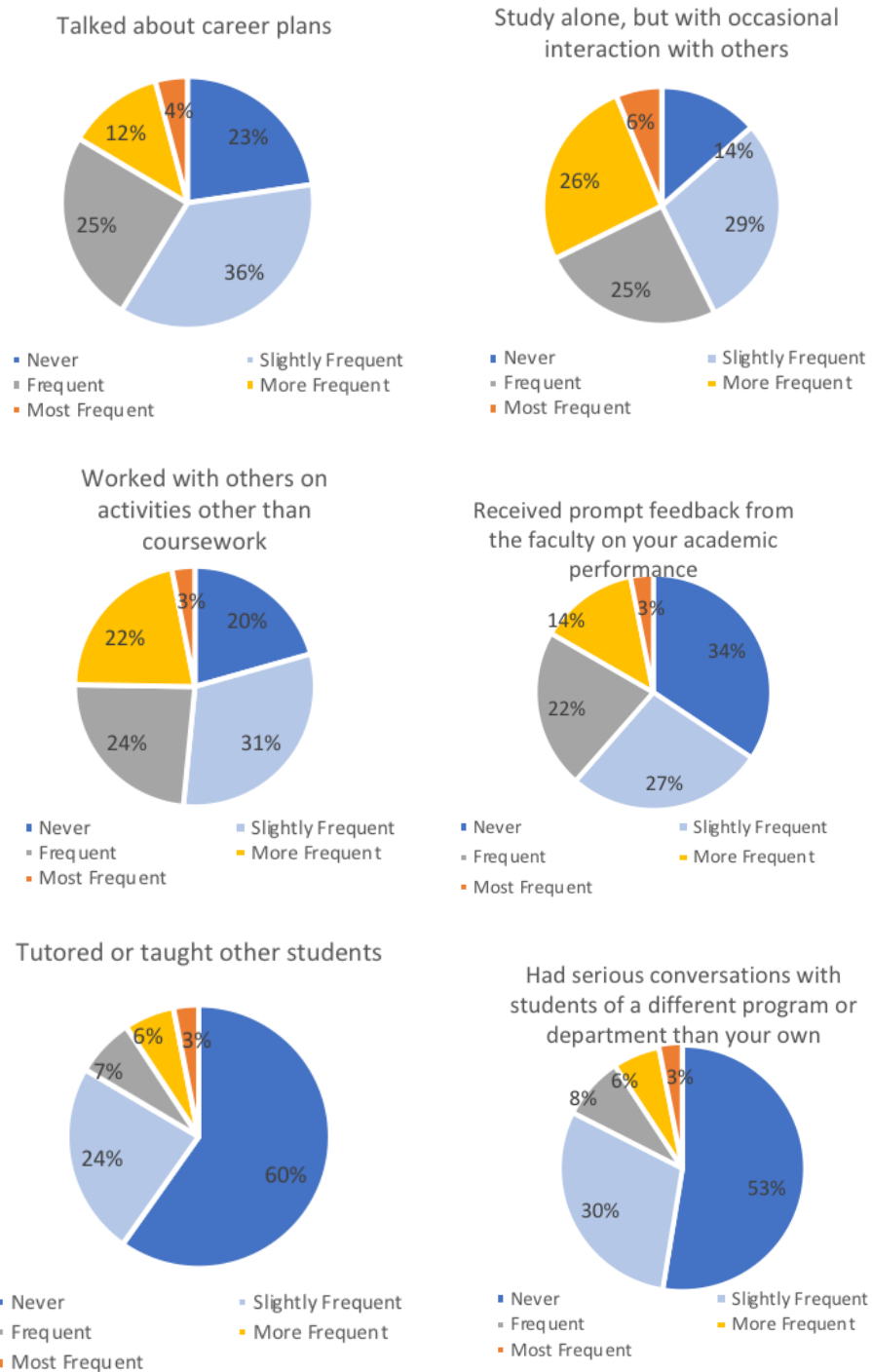


Figure 5-8: The percentage of the frequencies of Intermittent Exchange activities of the Newton per week based on the questionnaires.

In terms of 'working with others on activities other than coursework' at the Newton, 30 selected 'Slightly Frequently'. Furthermore, 23 selected 'Frequently', 21 selected 'More Frequently', 3 selected 'Most Frequently', and 20 selected 'Never'. The pie chart represents the calculated percentage for each set of the responses to the five options in the questionnaire. 20% indicated a negative view by selecting 'Never', while 31% believed that they 'Slightly Frequently' worked with others on activities other than coursework. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently' were 24%, and 22%, respectively. In addition, the option 'Most Frequently' was selected by only 3% of the respondents. Accordingly, 25% of the respondents indicated that they worked with others on activities other than coursework 3 or more than 3 times per week; that is to say, an over 51% of the respondents believed that 'working with others on activities other than coursework' 'Never' was or was a 'Slightly Frequently' occurrence.

In terms of 'receiving prompt feedback from the faculty on their academic performance' at the Newton, only 4 people selected 'Most Frequently', 13 selected 'More Frequently', and 21 selected 'Frequently'. Furthermore, 26 selected 'Slightly Frequently', and 33 selected 'Never'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 34% of the respondents 'Never' 'receiving prompt feedback from the faculty on their academic performance' at the Newton, while 27% believed that they 'Slightly Frequently' received prompt feedback from the faculty on their academic performance. The percentage of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were at 22%, 14% and 3%, respectively. Accordingly, 39% of the respondents indicated



that they received prompt feedback from the faculty on their academic performance at the Newton 3 or more than 3 times per week; that is to say, an average of 61% of the respondents believed that the activity of ‘receiving prompt feedback from the faculty on their academic performance’ was occurred less than 3 times per week.

In terms of ‘tutoring or teaching other students’ in the informal learning spaces of the Newton, only 3 people selected ‘Most Frequently’, 6 selected ‘More Frequently’, and 7 selected ‘Frequently’. Furthermore, 23 selected ‘Slightly Frequently’ and 58 selected ‘Never’. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 60% of the respondents indicated that they ‘Never’ do tutoring or teaching other students in the informal learning spaces of the Newton, while 24% believed that there were ‘Slightly Frequently’ regarding ‘tutoring or teaching other students’ at the Newton. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ were at 7%, 6% and 3%, respectively. Accordingly, 16% of the respondents gave an indication that they did tutoring or teaching other students in the informal learning spaces of the Newton 3 or more than 3 times per week; that is to say, an average of 84% of the respondents believed that ‘tutoring or teaching other students’ never occurred or that this occurred ‘Slightly Frequently’.

Similar with the ‘tutoring or teaching of other students’ in the informal learning spaces of the Newton, only 3 people selected ‘Most Frequently’ at ‘having serious conversations with students from a different program or department than their own’. Moreover, 6 selected ‘More Frequently’, 8 selected ‘Frequently’, 29

selected 'Slightly Frequently', and 51 selected 'Never'. The pie chart indicated that in total 83% of the respondents having serious conversations with students of a different program or department than their own less than 3 times per week. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were respectively at 8%, 6% and 3%. Accordingly, 17% of the respondents have serious conversations with students of a different program or department than their own 3 or more than 3 times per week; that is to say, an average of 83% of the respondents believed that the activity of 'having serious conversations with students from a different program or department than their own' never occurred and that if it did, it happened 'Slightly Frequently'.

### ***5.5.3 The Frequency of Focused Socialising Activities.***

The data of Focused Socialising activities were collected from four specific activities: 'taking a call', 'using of tablet, laptop or phone', 'casual chatting', and 'taking a break from studies with friends'. The data of Focused Socialising activities collected from the respondents of the Diamond is summarised in Table 5-11. In order to better show the percentage of selection, the data was translated into pie charts, which was shown in Figure 5-9. Similarly, the selection at the Newton is summarised in Table 5-12 while the data was translated into pie charts, which was shown in Figure 5-10.

More specifically, in terms of 'taking a call' at the Diamond, 67 selected 'Slightly Frequently' and 25 selected 'Never'. Furthermore, 23 selected 'Frequently', 10 selected 'More Frequently', and 12 selected 'Most Frequently'. The pie chart recorded the calculated percentage for each set of responses to the

five options in the questionnaire. 17% of the respondents indicated that they ‘Never’ take a call at the Diamond, while 34% believed that they ‘Slightly Frequently’ got into the habit of taking a call. The percentages of the remaining respondents selecting ‘Frequently’, ‘More Frequently’, and ‘Most Frequently’ were respectively at 23%, 7%, and 8%. Accordingly, 38% of the respondents took a call at the Diamond 3 or more than 3 times per week; that is to say, an over 62% of the respondents believed that the activity ‘taking a call’ was ‘Never’ or ‘Slightly Frequently’ occurred.

Table 5-11: Student frequencies of Focused Socialising activities of the Diamond per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Focused Socialising</b>	11. Taken a call	25	67	34	10	12	148
	12. Use of tablet, laptop or phone	1	10	23	34	80	148
	13. Casual chatting	5	21	52	36	34	148
	14. Taken a break from studies with friends	12	32	45	27	32	148

In terms of the ‘using of tablet, laptop or phone’ at the Diamond, only 1 person selected ‘Never’, and 10 selected ‘Slightly Frequently’. Furthermore, 23 selected ‘Frequently’, 34 selected ‘More Frequently’, and 80 selected ‘Most Frequently’. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. Only 1% of the respondents indicated that they ‘Never’ use of tablet, laptop or phone at the Diamond, while 7% believed that they were ‘Slightly Frequently’ practiced the ‘using of tablet, laptop or phone’. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ were respectively at 15%, 23% and 54%. Accordingly, 92% of the respondents used of tablet,

laptop or phone at the Diamond 3 or more than 3 times per week; that is to say, an average of 92% of the respondents believed that the activity of the ‘using of tablet, laptop or phone’ was occurred ‘Frequently’ or much more than ‘Frequently’.

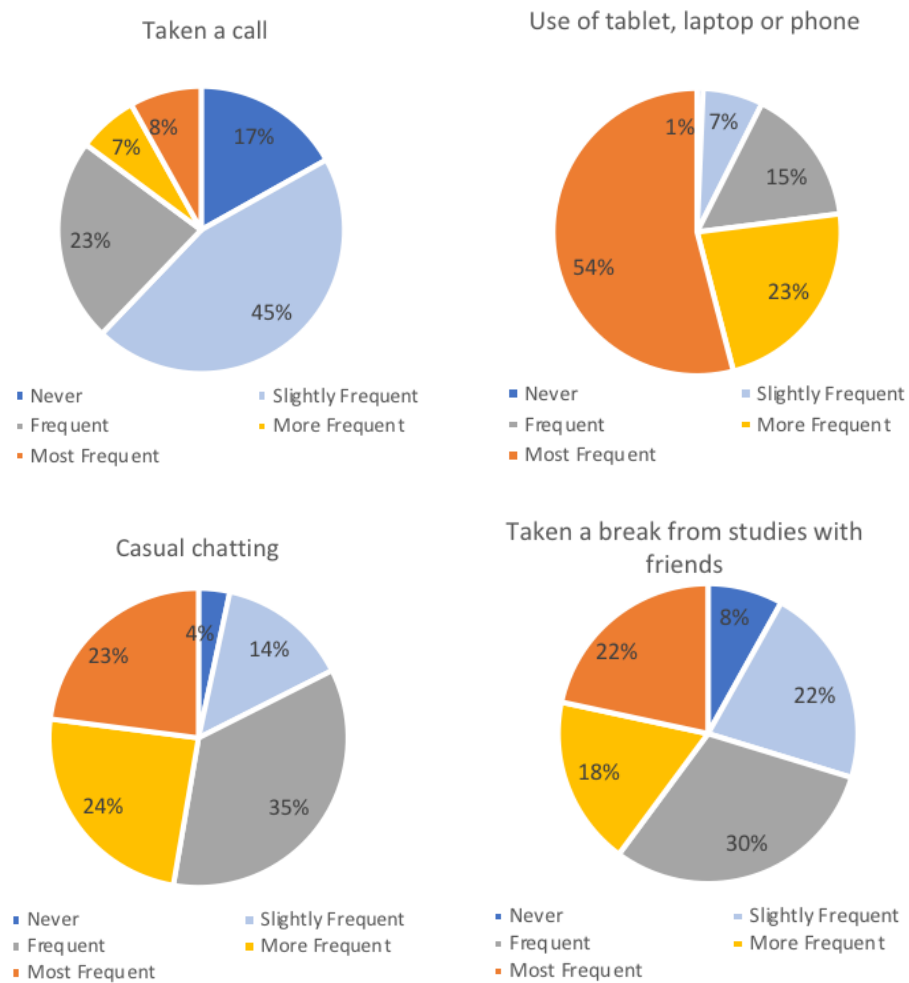


Figure 5-9: The percentage of the frequencies of Focused Socialising activities of the Diamond per week based on questionnaires.

In terms of ‘casual chatting’ at the Diamond, only 5 people selected ‘Never’, and 21 selected ‘Slightly Frequently’. Furthermore, 52 selected ‘Frequently’, 36 selected ‘More Frequently’, and 34 selected ‘Most Frequently’. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 4% of the respondents ‘Never’ do casual chatting at the

Diamond, while 14% believed that they ‘Slightly Frequently’ took part in ‘casual chatting’ at the Diamond. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ were at 35%, 24% and 23%, respectively. Accordingly, 82% of the respondents did casual chatting at the Diamond 3 or more than 3 times per week.

In terms of ‘taking a break from studies with friends’ at the Diamond, only 12 people selected ‘Never’. Moreover, 32 selected ‘Slightly Frequently’, 45 selected ‘Frequently’, 27 selected ‘More Frequently’, and 32 selected ‘Most Frequently’. The pie chart indicated that in total 30% of the respondents selected ‘Never’ and ‘Slightly Frequently’ at ‘taking a break from studies with friends’. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ were at 30%, 18% and 22%, respectively. Accordingly, 70% of the respondents believes that ‘taking a break from studies with friends’ is occurred 3 or more than 3 times per week.

Table 5-12: Student frequencies of Focused Socialising activities of the Newton per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Focused Socialising</b>	11. Taken a call	8	33	29	16	11	97
	12. Use of tablet, laptop or phone	1	10	25	19	42	97
	13. Casual chatting	0	17	25	22	33	97
	14. Taken a break from studies with friends	4	13	28	24	28	97

More specifically, in terms of ‘taking a call’ at the Newton, only 8 selected ‘Never’ and 33 selected ‘Slightly Frequently’. Furthermore, 29 selected ‘Frequently’, 16 selected ‘More Frequently’, and 11 selected ‘Most Frequently’. The pie chart recorded the calculated percentage for each set of responses to the

five options in the questionnaire. 8% of the respondents indicated that they ‘Never’ take a call at the Newton, while 34% believed that they ‘Slightly Frequently’ participated in ‘taking a call’. The percentages of the remaining respondents selecting ‘Frequently’, ‘More Frequently’, and ‘Most Frequently’ were at 30%, 17%, and 11%, respectively. Accordingly, 58% of the respondents gave an indication that they took a call at the Newton 3 or more than 3 times per week; that is to say, an over 42% of the respondents believed that the activity of ‘taking a call’ was ‘Never’ or ‘Slightly Frequently’ occurred.

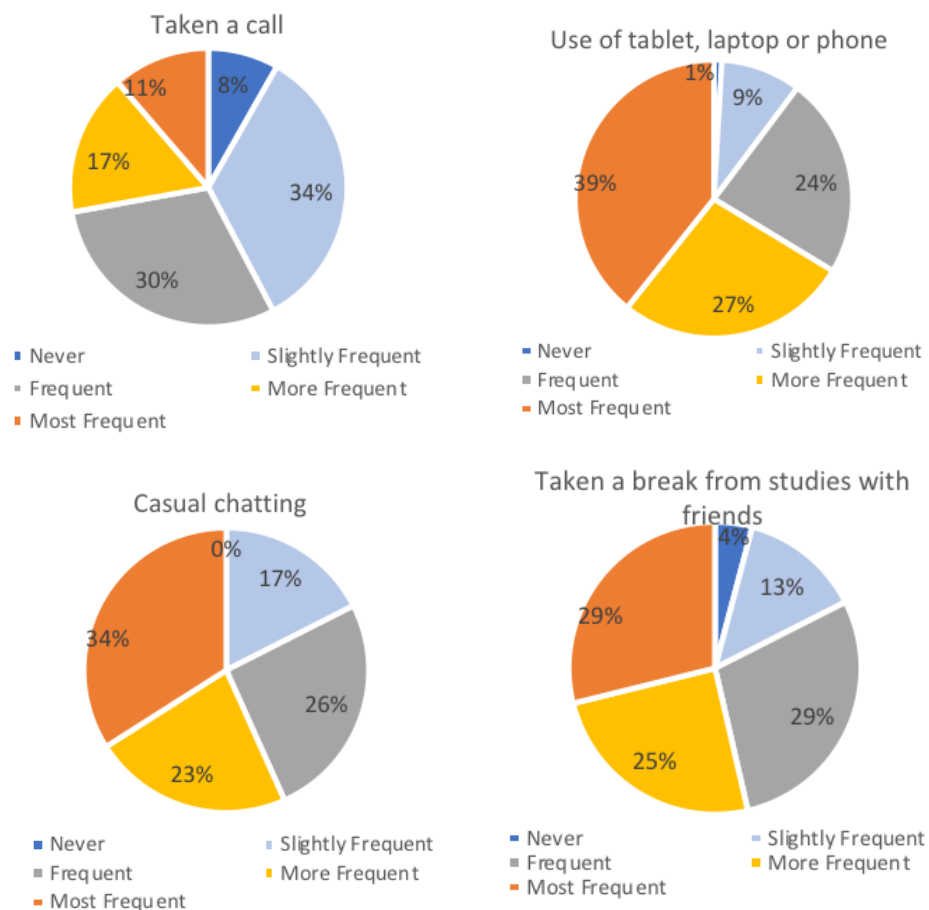


Figure 5-10: The percentage of the frequencies of Focused Socialising activities of the Newton per week based on the questionnaires.

In terms of ‘using of tablet, laptop or phone’ at the Newton, only 1 person that selected ‘Never’, and 10 selected ‘Slightly Frequently’. Furthermore, 25 selected ‘Frequently’, 19 selected ‘More Frequently’, and 42 selected ‘Most

Frequently'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. Only 1% of the respondents 'Never' use of tablet, laptop or phone, while 9% believed that they 'Slightly Frequently' practiced the 'using of tablet, laptop or phone' at the Newton. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were at 24%, 27% and 39%, respectively. Accordingly, 90% of the respondents had experiences of using tablet, laptop or phone at the Newton 3 or more than 3 times per week; that is to say, an average of 90% of the respondents believed that the activity of 'using of tablet, laptop or phone' was occurred 'Frequently' or much more than 'Frequently'.

In terms of 'casual chatting' at the Newton, nobody selected 'Never', and 17 selected 'Slightly Frequently'. Furthermore, 25 selected 'Frequently', 22 selected 'More Frequently', and 33 selected 'Most Frequently'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 0% of the respondents selected 'Never', while 17% believed that they 'Slightly Frequently' indulged in 'casual chatting' at the Newton. The percentages of the remaining respondents selecting the positive options of 'Frequently', and 'More Frequently', and 'Most Frequently' at 26%, 23% and 34%, respectively. Accordingly, 83% of the respondents did casual chatting 3 or more than 3 times per week; that is to say, an average of 83% of the respondents believed that the activity of 'casual chatting' in the informal learning spaces of the Newton was occurred 'Frequently' or much more than 'Frequently'.

In terms of ‘taking a break from studies with friends’ at the Newton, only 4 people selected ‘Never’ and 13 selected ‘Slightly Frequently’. Moreover, 28 selected ‘Frequently’, 24 selected ‘More Frequently’, and 28 selected ‘Most Frequently’. The pie chart indicated that in total 17% of the respondents selected ‘Never’ (4%) and ‘Slightly Frequently’ (13%) at ‘taking a break from studies with friends’. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ at 29%, 25% and 29%, respectively. Accordingly, an average of 83% of the respondents believed that the activity of ‘taking a break from studies with friends’ was occurred ‘Frequently’ or much more than ‘Frequently’.

#### **5.5.4 The Frequency of Dietary Related Activities.**

The data of Dietary Related Activities were collected from two specific activities: ‘having a meal’, and ‘having a snack’. The data of Dietary Related Activities collecting from the respondents of the Diamond is summarised in Table 5-13. In order to better present the percentage of selection, the data was translated into pie charts, which was shown in Figure 5-11. Similarly, the selection at the Newton is summarised in Table 5-14 while the data was transferred into pie charts, as shown in Figure 5-12.

Table 5-13: Student frequencies of Dietary Related Activities of the Diamond per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Dietary Related Activities</b>	15. Had a meal	25	38	32	27	26	148
	16. Had a snack	6	28	44	30	40	148



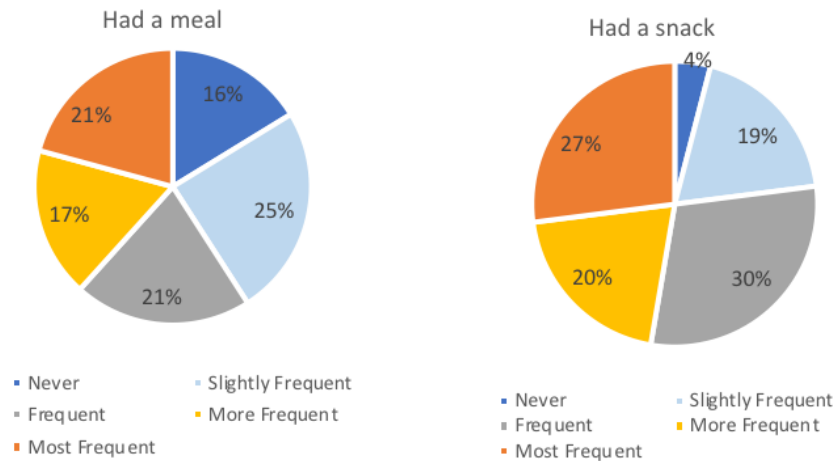


Figure 5-11: The percentage of the frequencies of Dietary Related Activities of the Diamond per week based on the questionnaires.

In terms of ‘having a meal’ in the informal learning spaces of the Diamond, 25 people selected ‘Never’, and 38 selected ‘Slightly Frequently’. Furthermore, 32 selected ‘Frequently’, 27 selected ‘More Frequently’, and 26 selected ‘Most Frequently’. The pie chart reflects the calculated percentage for each set of responses to the five options in the questionnaire. 16% of the respondents selected ‘Never’, while 25% believed that they ‘Slightly Frequently’ of ‘Having a meal’ at the Diamond. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’, at 21%, 17% and 21%, respectively. Accordingly, an average of 59% of the respondents believed that the activity of ‘having a meal’ in the informal learning spaces of the Diamond was occurred ‘Frequently’ or much more than ‘Frequently’.

In terms of ‘having a snack’ in the informal learning spaces of the Diamond, only 6 people selected ‘Never’ and 28 selected ‘Slightly Frequently’. Moreover, 44 selected ‘Frequently’, 30 selected ‘More Frequently’, and 40 selected ‘Most Frequently’. The pie chart indicated that in total 23% of the respondents selected ‘Never’ (4%) and ‘Slightly Frequently’ (19%) at ‘having a snack’ at the Diamond. The percentages of the remaining respondents selecting ‘Frequently’,

and ‘More Frequently’, and ‘Most Frequently’ at 30%, 20% and 27%, respectively. Accordingly, an average of 77% of the respondents believed that the activity of ‘having a snack’ was occurred ‘Frequently’ or much more than ‘Frequently’.

Table 5-14: Student frequencies of Dietary Related Activities of the Newton per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Dietary Related Activities</b>	15. Had a meal	6	26	23	22	20	97
	16. Had a snack	5	19	15	37	21	97

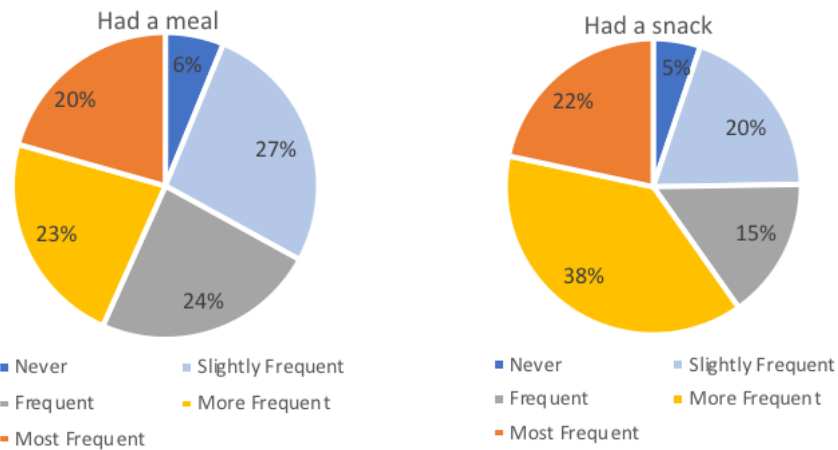


Figure 5-12: The percentage of the frequencies of Dietary Related Activities of the Newton per week based on the questionnaires.

In terms of ‘having a meal’ in the informal learning spaces of the Newton, 6 people selected ‘Never’, and 26 selected ‘Slightly Frequently’. Furthermore, 23 selected ‘Frequently’, 22 selected ‘More Frequently’, and 30 selected ‘Most Frequently’. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 6% of the respondents selected ‘Never’, while 27% believed that they ‘Slightly Frequently’ of ‘Having a meal’ at the Newton. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ at 24%, 23% and 20%, respectively. Accordingly, an average of 67% of the respondents believed

that ‘having a meal’ at the Newton was occurred ‘Frequently’ or much more than ‘Frequently’.

In terms of ‘having a snack’ at the Newton, only 5 people selected ‘Never’ and 19 selected ‘Slightly Frequently’. Moreover, 15 selected ‘Frequently’, 37 selected ‘More Frequently’, and 21 selected ‘Most Frequently’. The pie chart indicated that in total 25% of the respondents selected ‘Never’ (5%) and ‘Slightly Frequently’ (20%) at ‘having a snack’. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ at 15%, 38% and 22%, respectively. Accordingly, an average of 75% of the respondents believed that the activity of ‘having a snack’ was occurred ‘Frequently’ or much more than ‘Frequently’.

#### ***5.5.5 The Frequency of Serendipitous Encounter Activities.***

Table 5-15: Student frequencies of Serendipitous Encounter activities of the Diamond per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Serendipitous Encounter</b>	17. When you meet a friend of someone you know, but neither of planned to	11	29	56	33	19	148

Table 5-16: Student frequencies of Serendipitous Encounter of the Newton per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Serendipitous Encounter</b>	17. When you meet a friend of someone you know, but neither of planned to	9	27	35	22	3	97

The data of Serendipitous Encounter activities were collected from one specific activity: ‘when you meet a friend of someone you know, but neither planned to’. The data of Serendipitous Encounter activities collecting from the respondents of the Diamond is summarised in Table 5-15 while the data of Serendipitous Encounter activities collected from the respondents of the Newton is summarised in Table 5-16. In order to better present the percentage of selection, the data of the frequency of Serendipitous Encounter activities at the Diamond and the Newton were translated into pie charts, as shown in Figure 5-13.

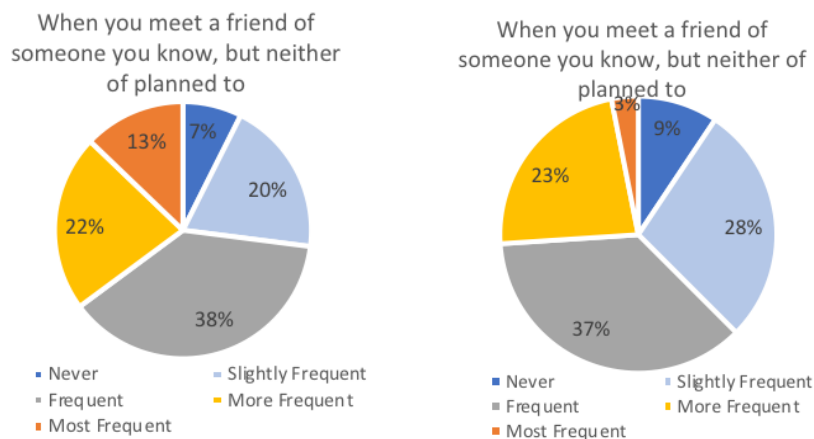


Figure 5-13: The percentage of the frequencies of Serendipitous Encounter activities of the Diamond (Left) and the Newton (Right) per week based on the questionnaires.

More specifically, there are 11 people that selected ‘Never’ and 29 selected ‘Slightly Frequently’ to the option ‘when you meet a friend of someone you know, but neither of planned to’ in the informal learning spaces of the Diamond. Moreover, 56 selected ‘Frequently’, 33 selected ‘More Frequently’, and 19 selected ‘Most Frequently’. The pie chart indicated that in total 27% of the respondents selected ‘Never’ (7%) and ‘Slightly Frequently’ (20%) at ‘when you meet a friend of someone you know, but neither of planned to’. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More

Frequently', and 'Most Frequently' were at 38%, 22% and 13%, respectively. Accordingly, an average of 73% of the respondents believed that the activity of 'having a snack' was occurred 'Frequently' or much more than 'Frequently'.

There are only 9 people that selected 'Never' and only 3 selected 'Most Frequently' at 'when you meet a friend of someone you know, but neither of planned to' in the informal learning spaces of the Newton. Moreover, there are 27 that selected 'Slightly Frequently', 35 selected 'Frequently', and 22 selected 'More Frequently'. The pie chart indicated that in total 37% of the respondents selected 'Never' (9%) and 'Slightly Frequently' (27%) at 'when you meet a friend of someone you know, but neither of planned to'. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were at 37%, 23% and 3%, respectively. Accordingly, an average of 63% of the respondents believed that the activity of 'having a snack' occurred 'Frequently' or much more than 'Frequently'.

#### ***5.5.6 The Frequency of Ambient Sociality Activities.***

The Data of Ambient Sociality activities were collected from five specific activities: 'Attended events such as Exhibition, open days or coursework shows', 'Found the space as a way to a lecture room or gathering for going to another place together', 'Used as a meeting point before or after lectures', 'People watching', and 'Having a rest'. The data of Ambient Sociality activities collected from the respondents of the Diamond was summarised in Table 5-17. The data was translated into pie charts as well, as shown in Figure 5-14. Similarly, the selection at the Newton is summarised in Table 5-18 while the data is translated into pie charts, as shown in Figure 5-15.

More specifically, in terms of ‘attending events such as exhibition, open days or coursework shows’ in the informal learning spaces of the Diamond, 54 selected ‘Slightly Frequently’ and 58 selected ‘Never’. Furthermore, 26 selected ‘Frequently’, 6 selected ‘More Frequently’, and only 4 selected ‘Most Frequently’. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 39% of the respondents indicated that they ‘Never’ attend events such as exhibition, open days or coursework shows at the Diamond, while 36% believed that they ‘Slightly Frequently’ of ‘attending events such as exhibition, open days or coursework shows’. The percentages of the remaining respondents selecting ‘Frequently’, ‘More Frequently’, and ‘Most Frequently’ were at 18%, 4%, and 3%, respectively. Accordingly, an over 75% of the respondents believed that the activity of ‘attending events such as Exhibition, open days or coursework shows’ was ‘Never’ or ‘Slightly Frequently’ occurred.

Table 5-17: Student frequencies of Ambient Sociality activities of the Diamond per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Ambient Sociality</b>	18. Attended events such as exhibition, open days or coursework shows	58	54	26	6	4	148
	19. Found the space as a way to a lecture room or gathering for going to another place together	36	55	38	14	5	148
	20. Used as a meeting point before or after lectures	25	46	44	24	9	148
	21. People watching	47	53	31	8	9	148
	22. Had a rest	40	58	38	3	9	148

In terms of 'finding the space as a way to a lecture room or gathering for going to another place together' in the informal learning spaces of the Diamond, 36 people selected 'Never', and 55 selected 'Slightly Frequently'. Furthermore, 38 selected 'Frequently', 14 selected 'More Frequently', and 5 selected 'Most Frequently'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 24% of the respondents indicated that they 'Never' use the space as a passageway to a lecture room or gathering for going to another place together', while 37% believed that they 'Slightly Frequently' to 'finding the space as a passageway to a lecture room or gathering for going to another place together'. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were at 26%, 10% and 3%, respectively. Accordingly, an average of 39% of the respondents believed that the activity of 'using of tablet, laptop or phone' was occurred 'Frequently' or much more than 'Frequently'.

In terms of 'using as a meeting point before or after lectures' at the Diamond, 25 people selected 'Never', and 46 selected 'Slightly Frequently'. Furthermore, 44 selected 'Frequently', 24 selected 'More Frequently', and only 9 selected 'Most Frequently'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 17% of the respondents indicated that they 'Never' used the space as a meeting point before or after lectures in the informal learning spaces of the Diamond, while 31% believed that they did 'Slightly Frequently'. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were at 30%, 16% and 6%, respectively. Accordingly, the average of 52% of the respondents believed that the activity of 'using the space as a

meeting point before or after lectures’ in the informal learning spaces of the Diamond was occurred ‘Frequently’ or much more than ‘Frequently’.

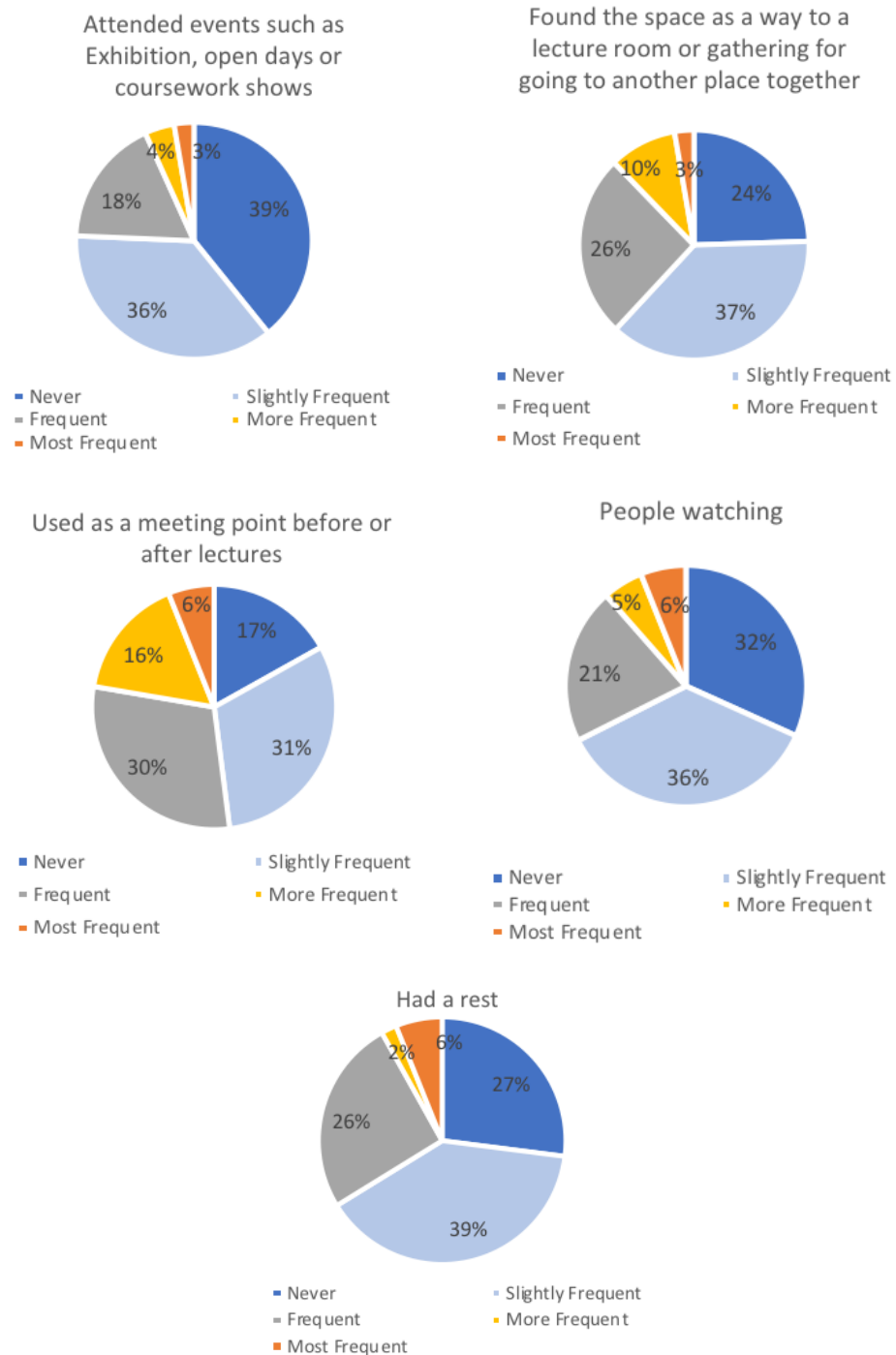


Figure 5-14: The percentage of the frequencies of Ambient Sociality activities of the Diamond per week based on the questionnaires.



In terms of ‘people watching’ at the Diamond, 47 people selected ‘Never’. Moreover, 53 selected ‘Slightly Frequently’, 31 selected ‘Frequently’, 8 selected ‘More Frequently’, and 9 selected ‘Most Frequently’. The pie chart indicated that in total 66% of the respondents gave an indication of selecting ‘Never’ (32%) and ‘Slightly Frequently’ (36%) at ‘people watching’. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ were at 21%, 5% and 6%, respectively. Accordingly, an average of 32% of the respondents believed that ‘people watching’ was occurred ‘Frequently’ or much more than ‘Frequently’.

Table 5-18: Student frequencies of Ambient Sociality activities of the Newton per week based on the questionnaires.

Type of activities	How often have you done these activities in this social space per week?	Never	Slightly Frequently	Frequently	More Frequently	Most Frequently	Total
<b>Ambient Sociality</b>	18. <i>Attended events such as Exhibition, open days or coursework shows</i>	11	30	41	10	4	97
	19. <i>Found the space as a way to a lecture room or gathering for going to another place together</i>	8	28	33	16	12	97
	20. <i>Used as a meeting point before or after lectures</i>	9	23	32	19	14	97
	21. <i>Peopewatching</i>	29	22	31	11	4	97
	22. <i>Had a rest</i>	16	27	31	12	11	97

In terms of ‘having a rest’ at the Diamond, 40 people selected ‘Never’. Moreover, 58 selected ‘Slightly Frequently’, and 38 selected ‘Frequently’. There are only 3 selected ‘More Frequently’, and 9 selected ‘Most Frequently’. The pie chart indicates that in total 66% of the respondents indicated that they ‘Never’ (27%) and ‘Slightly Frequently’ (39%) at ‘having a rest’. The percentages of the remaining respondents selecting ‘Frequently’, and ‘More

Frequently', and 'Most Frequently' were at 26%, 2% and 6%, respectively. Accordingly, an average of 34% of the respondents believed that the activity of 'having a rest' was occurred 'Frequently' or much more than 'Frequently'.

In terms of 'attending events such as exhibitions, open days or coursework shows' in the informal learning spaces of the Newton, 30 selected 'Slightly Frequently' and 11 selected 'Never'. Furthermore, 41 selected 'Frequently', 10 selected 'More Frequently', and only 4 selected 'Most Frequently'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 4% of the respondents indicated that they 'Never' attend events such as exhibitions, open days or coursework shows, while 31% of the respondents believed that they 'Slightly Frequently' of 'attending events such as exhibitions, open days or coursework shows'. The percentages of the remaining respondents selecting 'Frequently', 'More Frequently', and 'Most Frequently' were at 43%, 10%, and 12%, respectively. Accordingly, an over 65% of the respondents believed that the activity of 'attending events such as exhibitions, open days or coursework shows' was occurred 3 or more than 3 times per week.

In terms of 'finding the space as a way to a lecture room or gathering for going to another place together' in the informal learning spaces of the Newton, 8 people selected 'Never', and 28 selected 'Slightly Frequently'. Furthermore, 33 selected 'Frequently', 16 selected 'More Frequently', and 12 selected 'Most Frequently'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 8% of the respondents 'Never' use the space as a way to a lecture room or gathering for going to another place

together, while 29% believed that they did 1-2 times per week. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were at 34%, 17% and 12%, respectively. Accordingly, an average of 63% of the respondents believed that the activity of the use of a tablet, laptop or phone' was occurred 3 or more than 3 times per week.

In terms of using the space as a meeting point before or after lectures, in the informal learning spaces of the Newton, 9 people selected 'Never', and 23 selected 'Slightly Frequently'. Furthermore, 32 selected 'Frequently', 19 selected 'More Frequently', and 14 selected 'Most Frequently'. The pie chart recorded the calculated percentage for each set of responses to the five options in the questionnaire. 9% of the respondents indicated that they 'Never' use the space as a meeting point before or after lectures in the informal learning spaces of the Newton, while 24% believed that they did 'Slightly Frequently'. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were at 33%, 20% and 14%, respectively. Accordingly, an average of 67% of the respondents believed that the activity of using the space as a meeting point before or after lectures in the informal learning spaces of the Newton was occurred 3 or more than 3 times per week.

In terms of 'people watching' in the informal learning spaces of the Newton, 29 people selected 'Never'. Moreover, 22 selected 'Slightly Frequently', 31 selected 'Frequently', 11 selected 'More Frequently', and only 4 selected 'Most Frequently'. The pie chart indicated that in total 50% of the respondents gave an indication of selecting 'Never' (28%) and 'Slightly Frequently' (22%) at 'people watching'. The percentages of the remaining respondents selecting

‘Frequently’, and ‘More Frequently’, and ‘Most Frequently’ were at 30%, 11% and 9%, respectively. Accordingly, an average of 50% of the respondents believed that the activity of ‘people watching’ was occurred ‘Frequently’ or much more than ‘Frequently’.

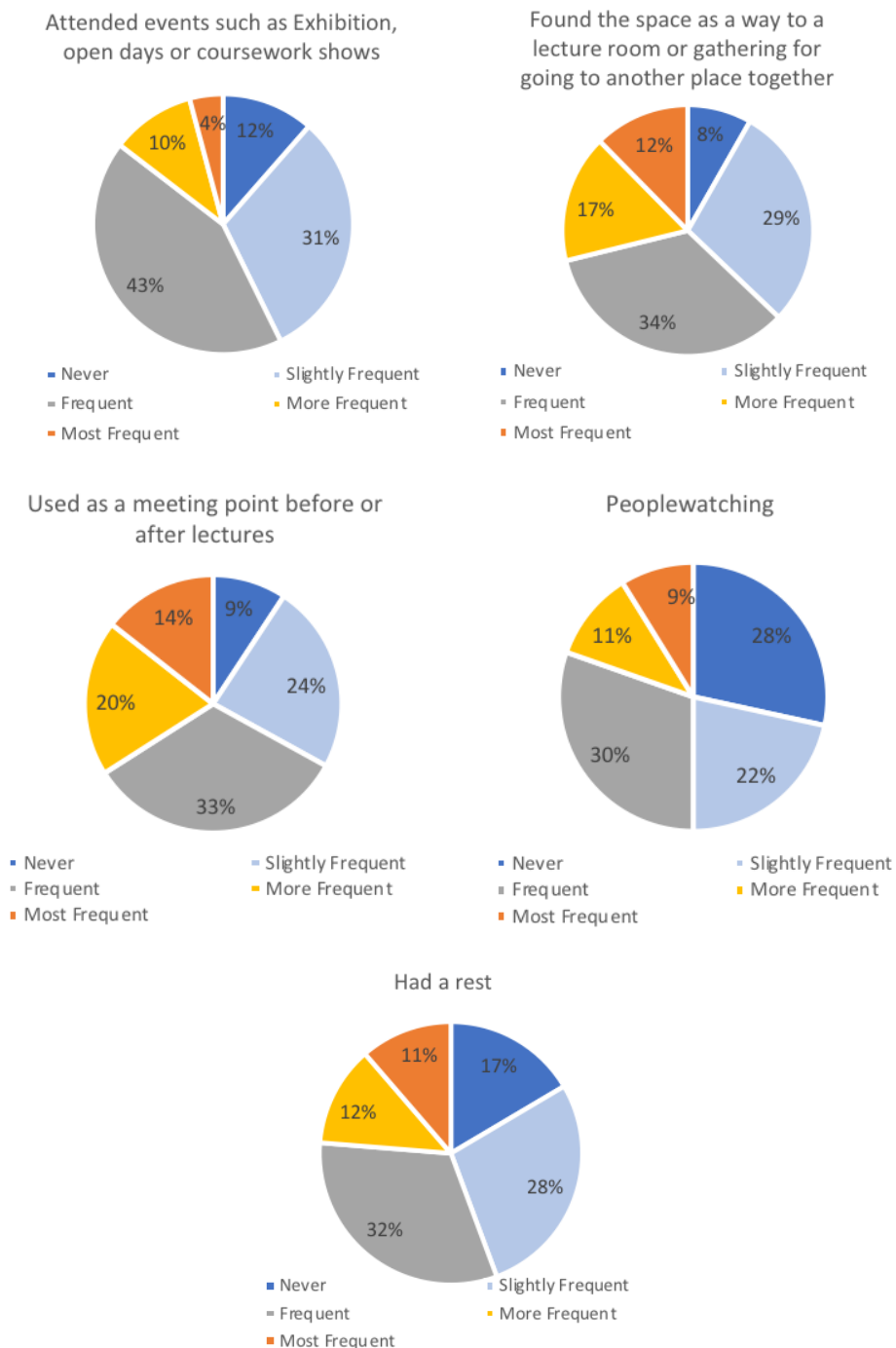


Figure 5-15: The percentage of the frequencies of Ambient Sociality activities of the Newton per week based on the questionnaires.

In terms of 'having a rest' in the informal learning spaces of the Newton, 16 people selected 'Never'. Moreover, 27 selected 'Slightly Frequently', and 31 selected 'Frequently'. There are 12 selected 'More Frequently', and 11 selected 'Most Frequently'. The pie chart indicates that in total 45% of the respondents selected 'Never' (17%) and 'Slightly Frequently' (28%) at 'having a rest'. The percentages of the remaining respondents selecting 'Frequently', and 'More Frequently', and 'Most Frequently' were at 32%, 12% and 11%, respectively. Accordingly, an average of 55% of the respondents believed that the activity of 'having a rest' was occurred 3 or much more than 3 times per week.

## **5.6 SUMMARY.**

This chapter interprets the student experiences in the informal learning spaces at the Diamond at the University of Sheffield and the Newton at Nottingham Trent University. The students' subjective preferences reflect the daily usage of the informal learning space. The key findings are presented in detail and concluded below.

As an informal learning space, students could decide what they want to do, where the students prefer to remain or to leave and to use the informal learning spaces, which time period they want to get involved, and the reasons why they select and use the informal learning spaces. This is based on their own reasons. The questionnaire and observation methods, employed in this chapter, investigate the student experiences and student satisfactions with the design qualities of the informal learning spaces in two contexts, the Diamond at the University of Sheffield and the Newton at Nottingham Trent University. The

investigation presents a solid evidence on student experiences and determine the levels of student socialising and informal learning activities in relation to where, when, what and why they behave in the informal learning spaces. The six types of student activities occurring in the four different functional zones of the informal learning spaces in four time periods reflect the students' daily usage of the informal learning spaces. The student behaviours reflect the efficiency of the informal learning spaces. More specifically, observation and questionnaires were used to obtain the data of student experiences. The data of student experiences are collected to intensify the understanding on how students use the informal learning spaces. The student experiences are collected in one aspect by observation: the usage of different functional zones in the informal learning spaces; and are collected in three aspects by questionnaires: the frequency of student activities in the informal learning spaces, the time period, and the reason for selecting and using the informal learning spaces. The findings are summarised in the following three dimensions.

Firstly, six of the students' types of socialising and informal learning activities are different in four different functional zones. But on the whole, the results from observation reflect a diversity of usage of the informal learning spaces. More specifically, the number of Focused Informal Learning activities maintain a relatively low level at the Entrance Space and Café Area of the Diamond while quite a high number of the students are involved in the Corridor Space and Open Space at the Diamond. However, the number of Focused Informal Learning activities maintain a low percentage of all the activities at the Newton. Moreover, the number of the Focused Informal Learning activities in the Corridor space at the Newton is higher than the sum total number of this activity

in the other three functional zones. This can be explained based on the allocation of the supporting facilities. More specifically, more tables and chairs are arranged in the Corridor Space of the Newton. As an Open Space, the Central Court of the Newton is organised as a central hub of the pedestrian paths and a hall for student events. The number of the Intermittent Exchange activities present a good level in the Open Space and the Corridor Space of both cases. On the contrary, the Focused Socialising activities mainly occur at the Entrance Space and the Café Area of both cases. A majority of Dietary Related Activities occur in the Café area in both cases. The Serendipitous Encounter activities maintain quite a low number in both cases while Ambient Sociality are emerged in all four functional zones.

Secondly, through the observation and questionnaire, we could find out a trend on when students get involved into the informal learning spaces. The response of the time period indicates that the busiest time period of the informal learning spaces of the Diamond is between 2 – 5 pm while the busiest time period at the Newton is between 12 – 2 pm. Furthermore, there are quite a few participants who would like to use the informal learning spaces at the Newton between 5 – 10 pm while over a half of the total number of the participants (N=87) use the informal learning spaces of the Diamond from 5 – 10 pm. According to the previous explanations, we could conclude that the students came into the informal learning spaces during the morning section (8 – 10 am). And then, the number of students in the informal learning spaces reach to the peak during the midday and afternoon section (12 – 5 pm). After that, the number of students in the informal learning spaces decrease gradually. Slightly different from the Newton, the number of students using the informal learning spaces of the

Diamond still remain a quite high amount during the evening section at 8 – 10 pm.

Thirdly, the results stress the importance of the brightly lit environment and the service support for student selecting and using the informal learning space of the Diamond. The percentage of students choosing the brightly lit environment and service support, as their reasons for selecting and using the informal learning spaces at the Diamond, are 81.8% and 80.4%, respectively (see Table 5-5). The informal learning spaces providing sufficient light and adequate service support are also pivotal at the Newton. The percentage of students choosing them are 73.2% and 67%, respectively (see Table 5-6). However, beyond the bright environment and the service support, the spatial accessibility is much more important than at the Newton. It is the first reason for selecting and using the informal learning space at the Newton. The percentage of students choosing the accessibility, as their reasons for selecting and using the informal learning spaces at the Newton, reach to 80.4% (see Table 5-6).

Fourthly, subjectively collected by questionnaires, the frequencies of six types of the student activities are presented and compared within two cases. In terms of the socialising activities, especially the Focused Socialising and the Dietary Related Activities, are the two main activities occurring at the Diamond and the Newton. However, as types of socialising activities, more Ambient Sociality activities occur at the Newton than doing at the Diamond. In terms of the informal learning activities, the respondents tend to do more Focused Informal Learning and the Serendipitous Encounter activities at the Diamond than doing at the Newton. This result presents the same results of the observation.



However, the investigation of the frequencies of the Intermittent Exchange activities by questionnaire and observation presents a conflict consequence. Based on the questionnaires, students don't believe they do a lot of Intermittent Exchange activities at the Diamond and the Newton. However, the data collecting by observation presents a quite number of Intermittent Exchange activities in two case studies.

## **6. CHAPTER 6: THE IMPACT OF STUDENT SATISFACTION WITH THE DESIGN QUALITIES IN RELATION TO STUDENT ACTIVITIES IN THE TWO CASE STUDIES.**

### **6.1 INTRODUCTION.**

*‘Good quality higher education requires good quality environments’ – CABE,*

*2011: 9*

Related literature emphasises the impact of the design qualities, of the learning spaces, on student achievement (Earthman, 2002; Higgins et al., 2008; Scott-Webber et al., 2013). It is believed that student achievement generally correlates with the efficiency and efficacy of available learning spaces. However, the student achievement in the informal learning spaces cannot be measured. Moreover, the socialising and informal learning activities, as defined in Chapter 3 section 2 (see Table 3-7), can be seen as different degrees of student experiences in the informal learning spaces. Therefore, instead of focusing on student achievement, this thesis stresses on the importance of the student experiences in the informal learning spaces. The review of the literature by Griffin (1990), which investigated the impact of a variety of physical attributes upon people’s behaviour, found that the spatial arrangements and physical designs were of significance in terms of their effects upon human behaviour. That is to say, the students’ activities can be impacted by physical spatial design

qualities in the learning environment context. In terms of exploring how the design qualities shape student experiences in the informal learning spaces, this chapter analyses the impact of student satisfaction with the design qualities as relating to student experiences.

More specifically, the data on student satisfaction with the design qualities of the informal learning spaces are collected by using questionnaires. Based on the literature review and a pilot study, in total 28 items of the design qualities, are investigated by using questionnaires at the Diamond at the University of Sheffield and the Newton at Nottingham Trent University. This was for collecting information relating to seven key design qualities of the informal learning spaces. The seven design qualities of the informal learning spaces, Physical Comfort, the Flexibility, the Ambience, the Functionality, the Situation, the Spatial Hierarchy, and the Other Support (see Table 3-15), are discussed to explore their impacts upon student experiences. Firstly, by investigating the degree of student satisfactions with the design qualities of the informal learning spaces, the statement: *I feel that I am satisfied with...in this space* (see appendix - questionnaire), was prominent. The respondents indicated their degree of agreement with the description by ticking one from five options: Strongly Disagree, Disagree, Neither Disagree nor Agree, Agree, and Strongly Agree, developed by Likert (1931). He designed and then developed this technique for the assessment of attitudes (See Methodology Chapter – section 7). Based on this technique, the levels of student satisfaction regarding the design qualities of the informal learning spaces are captured based on the students' subjective evaluation. Student satisfaction with the design qualities of the informal learning spaces was statistically collected through questionnaires,

analysed by using SPSS BIM 23 software and presented in the form of tables and bar charts. After that, the quantitative evidences of the differences of the two cases is compared in order to articulate the findings. Secondly, the qualitative data, generated from the interview and focus group methods, enhances the analysis of the impact the student preferences of the design qualities has on student experiences.

## 6.2 PHYSICAL COMFORT.

### 6.2.1 *Student Satisfaction with the Physical Comfort.*

The data on student satisfaction regarding the Physical Comfort within the informal learning spaces is collected from five specific aspects: Light, Acoustic, Temperature, Ventilation, and Colour/Material of furniture. The data regarding student satisfaction with the Physical Comfort collected from the respondents at the Diamond is summarised in Table 6-1. In order to better present the percentage of the selection, the data is translated into bar charts, as shown in Figure 6-1.

Table 6-1: The degree of student satisfaction with the Physical Comfort of the informal learning spaces at the Diamond based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
Physical Comfort	1. Light	1	3	13	68	63	148
	2. Acoustics	2	12	34	66	34	148
	3. Temperature	4	16	29	66	33	148
	4. Ventilation	1	15	27	73	32	148
	5. Furniture (Colour/Material)	2	11	29	57	49	148

More specifically, there is only 1 person that selected ‘Strongly Disagree’ and 3 selected ‘Disagree’ regarding their satisfaction with the lighting. Moreover, 13 selected ‘Neither Agree nor Disagree’, 68 selected ‘Agree’, and 63 selected ‘Strongly Agree’. The bar chart in Figure 6-1 indicates that in total less than 5%

presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ regarding the satisfaction with the lighting’. There are around 10% that selected ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback is over 80%; that is to say, an average of over 80% of the respondents selecting ‘Agree’ or much more than ‘Agree’ on the description relating to their satisfaction with the lighting.

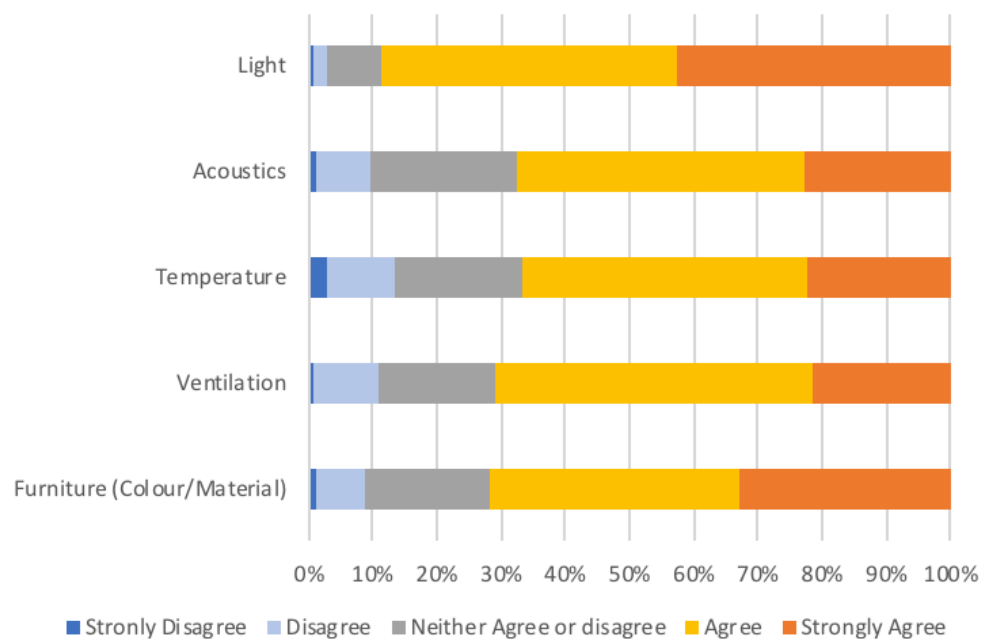


Figure 6-1: The percentage of the selections on student satisfaction with the Physical Comfort of the informal learning spaces at the Diamond based on the questionnaires.

In terms of the design quality of the ‘acoustics’ and ‘temperature’ at the Diamond, the respondents’ satisfaction with them remained at the same percentage. More specifically, there were around 10% of the respondents that selected ‘Strongly Disagree’ and ‘Disagree’. Meanwhile, there were around 20% that selected ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback is over 65%; that is to say, an average of

over 65% of the respondents selected ‘Agree’ or much more than ‘Agree’ when describing their satisfaction with the acoustics and temperature.

In terms of ‘ventilation’ and ‘the colour/material of furniture’ in the informal learning spaces of the Diamond, the student satisfaction with them remained the same percentage. More specifically, there are around 10% of the respondents that selected ‘Strongly Disagree’ and ‘Disagree’. Meanwhile, there are around 20% that selected ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback is over 70%; that is to say, an average of over 70% of the respondents selected ‘Agree’ or much more than ‘Agree’ on describing their satisfaction with the ventilation and temperature.

Table 6-2: The degree of student satisfaction with the Physical Comfort of the informal learning spaces at the Newton based on the questionnaires

Design Quality	I feel that I am satisfied with...in this space	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>Physical Comfort</b>	1. <i>Light</i>	0	6	14	49	28	97
	2. <i>Acoustics</i>	2	8	40	35	12	97
	3. <i>Temperature</i>	0	6	29	46	16	97
	4. <i>Ventilation</i>	0	7	33	44	13	97
	5. <i>Furniture (Colour/Material)</i>	0	7	19	53	18	97

Compared with their satisfaction with the physical comfort of the informal learning spaces at the Diamond, the following paragraphs explained student satisfaction with the physical comfort of the informal learning spaces at the Newton. The data of the student satisfaction with Physical Comfort collected from the respondents of the Newton is summarised in Table 6-2. In order to better show the percentage of the selection, the data is translated into bar charts, as shown in Figure 6-2.

More specifically, there is no one that selected ‘Strongly Disagree’. 6 selected ‘Disagree’ regarding their satisfaction with the lighting. Moreover, 14 selected

‘Neither Agree nor Disagree’, 49 selected ‘Agree’, and 28 selected ‘Strongly Agree’. The bar chart in Figure 6-2 indicates that in total over 5% presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ with the option regarding ‘the satisfaction with the light’. There were around 15% that selected ‘Neither Agree nor Disagree’. The bar chart in Figure 6-2 indicates that in total around 10% presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ at their satisfaction with the acoustics while there were over 40% that selected ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback is over 45%; that is to say, an average of over 45% of the respondents selected ‘Agree’ or much more than ‘Agree’ on the description of their satisfaction with the acoustics.

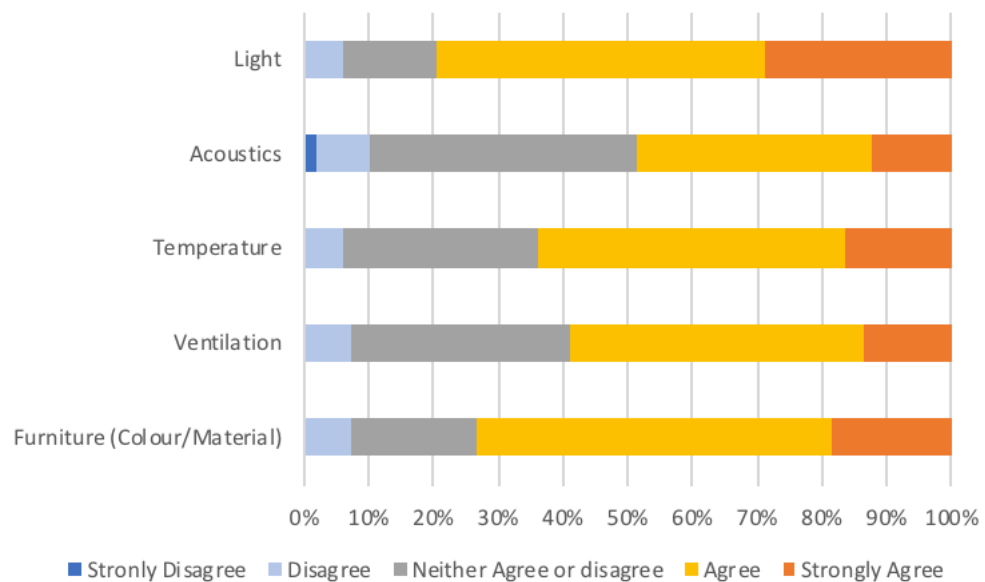


Figure 6-2: The percentage of the selection of student satisfaction with the Physical Comfort of the informal learning spaces at the Newton based on the questionnaires.

In terms of the satisfaction with the temperature and ventilation in the informal learning spaces of the Newton, the responses presented a similar percentage in the bar chart Figure 6-2. More specifically, in total over 5% presented a negative

view by selecting 'Strongly Disagree' and 'Disagree'. Meanwhile, there were around 30% that selected 'Neither Agree nor Disagree'. The remaining respondents selected the positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of positive feedback was around 60%; that is to say, an average of around 60% of the respondents selected 'Agree' or much more than 'Agree' regarding their satisfaction with the temperature and ventilation at the Newton.

In terms of the satisfaction with the colour/material of the furniture in the informal learning space of the Newton, there is no one that selected 'Strongly Disagree' and 7 selected 'Disagree'. Moreover, 19 selected 'Neither Agree nor Disagree', 53 selected 'Agree', and 18 selected 'Strongly Agree'. The bar chart in Figure 6-2 indicated that in total less than 10% presented a negative view by selecting 'Strongly Disagree' and 'Disagree' regarding their satisfaction with the colour/material of furniture at the Newton. Furthermore, there are over 20% that selected 'Neither Agree nor Disagree'. The remaining respondents selected the positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of positive feedback was over 70%; that is to say, an average of over 70% of the respondents selected 'Agree' or much more than 'Agree' when describing their satisfaction with the colour/material of furniture in the informal learning spaces of the Newton.

Overall, both the percentage of the students who were satisfactory with the Physical Comfort of the informal learning spaces of the Diamond and the Newton accounted for over a half. The percentage of student satisfaction with the Physical Comfort of the informal learning spaces of the Diamond, on



average, reached over 70% while the percentage of student satisfaction on the Physical Comfort of the Newton also accounted for over 60%. However, it could be clearly seen from Figure 6-2 that the acoustic level of the Newton could not have been satisfactory to over half of the students. Different students had different perception of the acoustic levels and the same students could also have had different requirements when they were doing different activities. There were quite a lot of students that preferred to study within a learning environment with a low noise background. To those students doing socialising and discussing, they would not mind if the flow of noise was not aloud.

### ***6.2.2 The Impact of the Physical Comfort in Relation to Student Experiences.***

In this section, the design quality relating to the physical comfort of the informal learning spaces is discussed to examine its impact upon student socialising and informal learning activities. More specifically, the design qualities of the physical comfort refer to the ergonomics of learning spaces and, in this context, strengthens a wider range of physical attributes of the informal learning spaces including lighting, acoustics, temperature, ventilation, and furniture (colour/material), etc. (see Appendix – questionnaire). In this research, the level of the physical comfort is collected based on the student perceptions of the comfort provided. This indicator of subjectively is collected through the use of quantitative research.

In terms of the students' preferences of the informal learning spaces, when asked the question, '*what are the three most important things about this space that you would not want to change*' (see Appendix – Interview form), the

research found that the respondents paid strong attention to the lit environment, noise levels, and temperature. These three aspects are also discussed during in the focus groups sessions. The following sections explain the impact of the design qualities of the physical comfort of the informal learning spaces in three ways.

#### *6.2.2.1 Lighting.*

The quantitative data presents a high percentage of student satisfaction with the lit environment of the informal learning spaces of the Diamond and the Newton, which is 88% (see Figure 6-1) and 79% (Figure 6-2), respectively. The data from interviews and focus groups indicates that the lighting conditions in the learning environment were frequently described by learners as important, which is also proved by academic sources (Harrop & Turpin, 2013; Zhang et al., 2015), and in general, the respondents proved to be satisfied with the lit environment of the informal learning spaces. The overarching goal of lighting in a learning space is to provide a visual environment that supports the learning process. This can be achieved only if the users of a space can see their visual task accurately, quickly, and comfortably and having already been reviewed by Earthman (2002). As suggested, adequate lighting contributes to a good learning environment. Sufficient lighting, providing a good learning environment, is essential for student success (USDOE, 2000). In terms of student success in this context, the informal learning spaces with sufficient lighting could stimulate more student activities that promote academic success.

The lit environment of the informal learning spaces focuses on both the physiological and the emotional needs of students. The quantitative analysis

found that the lit environment in general was perceived as satisfactory by students in the Diamond and the Newton. They felt that the lit environment was very sufficient and comfortable to support their socialising and informal learning activities. The data of the design quality of the informal learning spaces are investigated based on questionnaires. More specifically, the percentage number satisfied with the natural lighting, of the Diamond and the Newton, accounted for 73.6% and 72.2% respectively, which means that the natural lighting of the two cases is very satisfactory to the participants. Burruss (2001) also produced similar findings in his paper. Especially, as summarised by Friesen and Jardine (2009), the 21<sup>st</sup> century learners require the design of the learning spaces to be dominated by more natural light.

For the Diamond, Figure 6-3 demonstrates the image of the natural lighting strategy of the informal learning space of the Diamond at the University of Sheffield. More specifically, even though the small glazed apertures on the rooftop allow daylight to flood into the open-plan study spaces below and even if this was not noticed by participants, it indeed provides the proper skylight for the four-floor height atrium of the Diamond. Meanwhile, with larger openings to the north façade and smaller panels on the south side, the ‘diamond’ style exterior façade, which is where the name of the building coming from, controls the solar gain within the setting, and most importantly, provides adequate daylight into the informal learning spaces.

Students also mentioned the effect of natural light in the Diamond. Provided by glass curtain wall or rooftop of the atrium, the natural light could be perceived

by students. As PD5 describes, students prefer the learning spaces with good lighting as shown in the following statement:

*‘...I prefer studying in the Diamond because of its lighting, as the building facade is covered with glass and the interior space is illuminated by white light, which is more comfortable than yellow light in other spaces.’*



Figure 6-3: Natural lighting strategy of the informal learning space of the Diamond at the University of Sheffield.

In terms of the natural light of the Newton (see Figure 6-4), the main entrance for the daylight is from the glass rooftop with round wooden columns. The large size of the glass rooftop pours daylight and even sunshine into the two-floor height atrium, which provides an ideal and active place for students to relax and share ideas. The participants of the Focus Group in the Newton (PN5) provided similar descriptions regarding the lighting conditions of the informal learning spaces:

*.....I like this space because I guess it is the sufficient natural light there (Central Court). One of the criteria of the study learning environment is*

*the sufficient lighting system. You will feel listless if there is not enough light...*

However, one of the participants stressed that she rarely used the Central Court of the Newton as a place for reading books because too much sunshine can make her eyes hurt.



Figure 6-4: Natural lighting strategy of the informal learning spaces of the Newton at Nottingham Trent University.

Artificial light is also important to stimulate the learning phenomenon within the learning space. As literature reviews state, a properly lit environment could help to improve the student performances (Earthman, 2002; Cairns et al., 2015). The adequate artificial light could help to enhance the lighting conditions in the learning spaces. However, there are huge differences between the percentage of the respondents that were satisfied with the artificial lighting at the Diamond and the Newton. This accounted for 81.1% and 53.6%, respectively.

In the informal learning spaces of the Diamond, the artificial lighting strategy is projected from multiple directions (see Figure 6-5). On the rooftop of the Diamond, the reflectors are cautiously arranged to simulate daylight flooding from the artificial light from the top to the bottom of the atrium. In the centre of the atrium where the daylight cannot reach, sufficient LED light bulbs are suspended on the ceiling. On the tables, the table lamps are provided with self-controlled switches, which provides a maximum amount of personalised lighting for students in the Diamond. The innovative design of the lighting system in the Diamond is the 'moonscape'. Linking the atrium and the levels below, the moonscape panels are created to improve the lighting conditions of the Diamond, to enhance the connection between spaces on different levels, and to generate the image of the future learning spaces.



Figure 6-5: The artificial lighting strategy of the informal learning spaces of the Diamond at the University of Sheffield.

Even though, overall 81.1% students are satisfied with the lighting conditions in the Diamond, based on the quantitative analysis, the qualitative data also presents some negative voices regarding the lit environment in the Diamond.

The inappropriate lighting settings tend to make students impatient. This can be seen in the statements below:

*.....There is a place [Moonscape] for standing on the 1<sup>st</sup> floor, which is dazzling... Yeah, I tried to study there and I felt it is difficult to see computer because of dazzling... Yeah, I agree. I also saw two of students hang their cloths on there to avoid strong artificial light. But literally, it is efficient when you use the computer just for a while. That is a good design concept, I think... Indeed. (PD3 and PD8)*

The participants also expressed disappointment towards the natural light from the rooftop of the atrium. One of participants (PD7) commented:

*‘... Even though the skylight of the atrium in the centre has been adopted in the diamond, the central part is still dark all day, which cannot fulfil the requirement for study. Your eyes will feel tired if you study here for a long time.’*

Furthermore, the white artificial light was also praised by participants. Simulating natural light, white artificial light could make students more comfortable while the yellow light tended to make people ‘listless’. One of the respondents (PD5) stated that,

*‘... I prefer studying in the diamond because of its lighting, as the building façade is covered with glass and the interior space is illuminated by white light, which is more comfortable than yellow light in other spaces.’*

As an innovative design, the Moonscape (see Figure 6-5) is recognised as a good design concept and some students preferred stopping there and using the



computer for just a while. However, some participants expressed that the artificial light of the Moonscape was annoying. The strong lighting tended to make the atrium hot and uncomfortable.

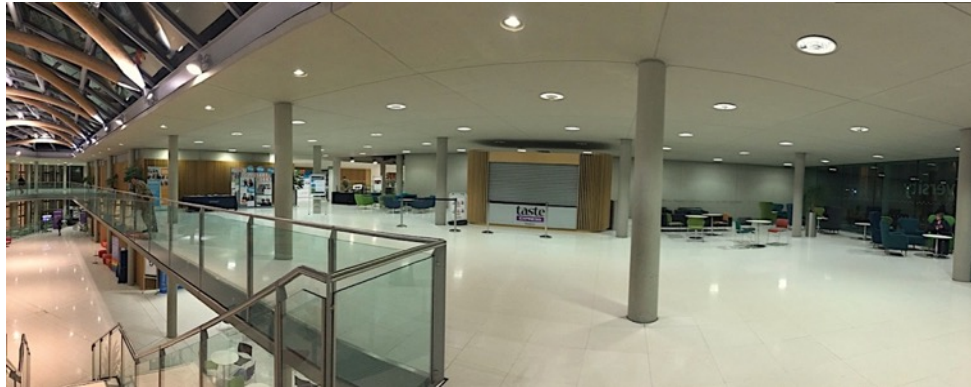


Figure 6-6: The artificial lighting strategy of the informal learning spaces of the Newton at Nottingham Trent University.

Compared with the lighting strategy of the Diamond, the layout of the lighting system in the Newton is much easier to understand (see Figure 6-6). Based on the scale of the building, even though the sufficient LED spotlights are arranged in the ceiling of the Newton and that some decorated spotlights are allocated on the round wooden rooftop column, there were still only 53.6% participants satisfied with the artificial light in the Newton. Based on this observation, there are fewer people doing activities in the Newton at night. Hence, it can be inferred that the bright lit environment inspires student learning activities. Just like what Earthman (2002) concluded, the natural and artificial lighting conditions are one of the most crucial aspects of evaluating the design of the informal learning spaces.

#### *6.2.2.2 Acoustics.*

Another design attribute that students identified was the noise level. The percentage number of respondents satisfied with the acoustics of the Diamond



represents over 65% while the percentage number satisfied with the acoustics of the Newton accounted for less than 50% based on the quantitative analysis. Based on the observation, it can be clearly seen that the informal learning space of the Diamond is mainly used for learning while of the Newton is mainly used for socialising and walking through. With this background, it can be inferred that the impact of the noise level towards students determines their activities. In the Diamond, the students chose to study and talk about their coursework occasionally. The students would try to lower their voices to avoid disturbing the other students' learning. That is to say, the noise of discussing is normally tolerated by students studying alone. Technically, the installations for acoustic separation are set up on the rooftop of the atrium. Consequently, there are students that argued that literally a certain level of noise would not distract their attentions. PD3 states that,

*'... Well, besides loud noises made on purpose, sounds from the surroundings have little effect on me. It really doesn't matter if the discussion occurred in the booked private room or simply in the open study place. In fact, I prefer working with some background sounds.'*

However, the role of noise in facilitating study in a learning space seemed contradictory to some students. The noise levels resulted in 'distraction' in terms of focused study. Some students acknowledged that some people prefer to study with noise and that they thrive on distraction. P6 mentioned that: *'I will not be distracted by noises if I study around the open area.'* ID3 shared the same opinion:

*'In silent study, I find it's harder to concentrate, whether there's people talking or a bit of background noise it helps me focus in on my work more.'*

The tolerance capacity of the noise level was varied based on different students' characteristics and preferences. Felder and Silverman (1988) suggest that students should be given the freedom to develop their own learning styles to solve problems. This idea highlights the characteristics of the informal learning space. In here, there is no necessity to set the specific noise levels to fit student activities. Instead, students using the informal learning spaces shape their socialising and informal learning activities according to their own learning styles and control the physical learning environment in a reasonable situation. Consequently, the situation of the Newton can be discussed from two ways depending on the different activities. In terms of the informal learning activities, the respondents presented negative feedback regarding their satisfaction with the noise level of the informal learning spaces at the Newton. Less than half of all the students were satisfied with the noise level. However, many students are keen to do socialising activities in the informal learning space of the Newton because, *'it is a space where you can feel relaxed and do whatever you want to do and you can create an element of noise here'* (PN2). This makes the informal learning spaces of the Newton uniquely different from the other learning spaces on the city campus, particularly the libraries where the space was especially used for the silent study. A number of the students shape the informal learning spaces at the Newton as their places for socialising and they freely talk with their friends during meals or between lectures. Instead of informal learning activities, socialising activities generally tend to be less of a 'learning process'

happening in the informal learning spaces (see explanation in Chapter 3 section 2). This is partly why around 40% of the respondents do not mind the noise level at the Newton (see Figure 6-2).

#### *6.2.2.3 Temperature.*

In terms of the temperatures at the informal learning space of the Newton at Nottingham Trent University and the Diamond at the University of Sheffield, the quantitative data presents similar results: over 65% of the respondents in both cases were satisfied with the design quality of the temperature (see Figure 6-1 and Figure 6-2). However, the qualitative data in relation to the Newton indicates that its temperatures was changed dynamically. During a clear day, the huge glass curtain rooftop enables a lot of sunshine to flood into the atrium, which makes the temperature to increase dramatically. Meanwhile, the temperature of the informal learning spaces at the Newton changed by seasonally. According to the interviews and focus groups, the temperatures at the Newton, in winter, are colder than in summer. Compared to the complain about temperature at the Newton, the temperatures at the Diamond are more stable. However, respondents (PD6) claimed that the ventilation was still sending cold wind during the lectures in winter in the Diamond, which is frustrating.

Consequently, this section discusses how students evaluate the physical comfort of the informal learning spaces to impact their socialising and informal learning activities in the informal learning spaces at the Newton and the Diamond, based on the correlation between the qualitative and quantitative analysis. More specifically, the three key characteristics of the physical comfort of the informal

learning spaces: Lighting, Acoustics, and temperature are interpreted. The physical comfort is an important element for retaining students in the spaces. With a comfortable physical environment, the space can be recognised as a place for supporting student socialising and informal learning activities. With the high percentage of student satisfaction with the physical comfort of the informal learning spaces, the students did not realise how these aspects could impact their decisions regarding using the informal learning spaces in the chosen cases. Through an in-depth analysis, this section explicitly interprets the impact of the physical comfort upon student activities. The next section analyses and discusses the impact of the flexibility of the informal learning spaces upon student socialising and their informal learning activities.

## 6.3 FLEXIBILITY.

### 6.3.1 *Student Satisfaction of the Flexibility.*

The data of student satisfaction regarding the Flexibility of the informal learning spaces are collected from four specific aspects: Movement Flows, Adaptability, Diversity, and Flexibility. The data of student satisfaction with Flexibility collected from the respondents of the Diamond is summarised in Table 6-3. In order to better show the percentage of the selection, the data is translated into a bar chart, as shown in Figure 6-7.

Table 6-3: The degree of student satisfaction with the Flexibility in the informal learning spaces at the Diamond based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
Flexibility	6. Movement Flows	3	9	36	66	34	148
	7. Adaptability	1	6	35	63	43	148
	8. Diversity	0	6	42	67	33	148
	9. Flexibility	0	5	34	70	39	148

More specifically, there are only 3 people that selected ‘Strongly Disagree’ and 9 that selected ‘Disagree’ in relation to the satisfaction with the movement flows. Moreover, 36 selected ‘Neither Agree nor Disagree’, 66 selected ‘Agree’, and 34 selected ‘Strongly Agree’. The bar chart in Figure 6-7 indicated that in total less than 10% presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ at ‘the satisfaction with the movement flows’. There were over 20% that selected ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback was over 65%; that is to say, an average of over 65% of the respondents selected ‘Agree’ or much more than ‘Agree’ on the description of the movement flows.

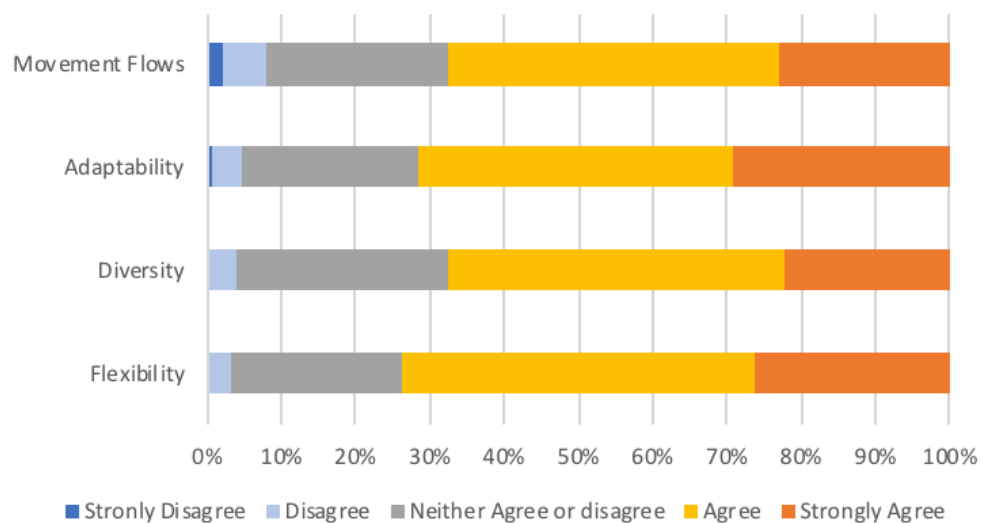


Figure 6-7: The percentage of the selection on student satisfaction with the flexibility of the informal learning spaces at the Diamond based on questionnaires.

In terms of ‘Adaptability’, ‘Diversity’, and ‘Flexibility’ at the Diamond, the student satisfaction remains similar. More specifically, there are less than 5% of the respondents that selected ‘Strongly Disagree’ and ‘Disagree’. Meanwhile, there are around 20% that selected ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’.

Accordingly, the total percentage of positive feedback was around 70%; that is to say, an average of around 70% of the respondents selecting ‘Agree’ or much more than ‘Agree’ when describing their satisfaction with adaptability, diversity and flexibility.

Compared with their satisfaction with the flexibility of the informal learning spaces at the Diamond, the following paragraphs explained the student satisfaction with the flexibility of the informal learning spaces at the Newton. The data of student satisfaction with Flexibility collected from the respondents of the Newton, is summarised in Table 6-4. In order to better show the percentage of the selection, the data is translated into bar charts, as shown in Figure 6-8.

Table 6-4: The degree of student satisfaction with the Flexibility of the informal learning spaces at the Newton based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
Flexibility	6. Movement Flows	0	6	30	47	14	97
	7. Adaptability	0	2	31	52	12	97
	8. Diversity	0	7	33	46	11	97
	9. Flexibility	0	7	25	51	14	97

More specifically, nobody selected ‘Strongly Disagree’ and 6 selected ‘Disagree’ in relation to their satisfaction with the movement flows at the Newton. Moreover, 30 selected ‘Neither Agree nor Disagree’, 47 selected ‘Agree’, and 14 selected ‘Strongly Agree’. The bar chart in Figure 6-8 indicates that in total less than 10% presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ at ‘the satisfaction with the movement flows’. There are around 30% that selected ‘Neither Agree nor Disagree’. The remaining respondents selected positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback was over 60%; that is to

say, an average of over 60% of the respondents selected ‘Agree’ or much more than ‘Agree’ on the description of the movement flows.

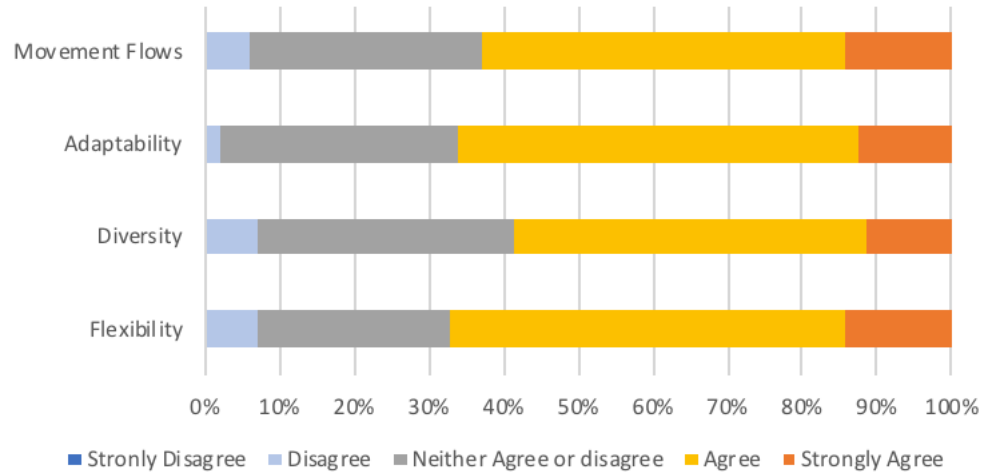


Figure 6-8: The percentage of the selection on student satisfaction with the Flexibility of the informal learning spaces at the Newton based on the questionnaires.

In terms of ‘Adaptability’, ‘Diversity’, and ‘Flexibility’ at the Newton, the satisfaction with them remains the same. More specifically, there are around 5% of the respondents that selected ‘Strongly Disagree’ and ‘Disagree’. Meanwhile, there are around 30% that selecting ‘Neither Agree nor Disagree’. The remaining respondents selected positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback was around 60%; that is to say, an average of around 60% of the respondents selected ‘Agree’ or much more than ‘Agree’ when describing their satisfaction with the spaces’ adaptability, diversity and flexibility.

All in all, the Flexibility of the informal learning spaces in both cases were very satisfactory to students. They realised that the flexible design provided a self-guided learning environment, where students could shape their own learning atmosphere by reorganising tables and chairs based on their different learning activities. The space itself, can be used by different department and for different

events, where students can feel that the informal learning spaces are dynamic and diverse.

### ***6.3.2 The Impact of the Flexibility upon Student Experiences.***

In this section, the design quality of the flexibility of the informal learning spaces is discussed to examine its impact upon student socialising and informal learning activities.

The design quality of the spaces' flexibility refers to a wider range of physical attributes including, movement flows, the adaptability, and the diversity (see appendix – questionnaire). The flexibility of the informal learning spaces, in this thesis, refers not only to the furniture's flexibility but also to the ability to arrange tables and chairs to shape student learning environments, as necessary for them to socialise with others, use technology, and access the space at different hours of the day. However, furniture plays a significant role in enabling a learning environment to be more flexible. This is an important element to attract student retention and for using the informal learning spaces. With a flexible physical learning environment, the spaces could be recognised as places that support diverse student socialising and informal learning activities.

More specifically, the respondents refer to the importance of flexibility as satisfactory regards to the informal learning environments through a quantitative analysis (see Figure 6-7 and Figure 6-8). As the data shows, the number of respondents selecting 'agree' or 'strongly agree', in relation to the description of their satisfaction with the movement flow, the adaptability, the



diversity and the flexibility of the informal learning spaces at the Diamond, accounts for 67%, 72%, 68% and 74%, respectively, while the number of respondents selecting 'agree' or 'strongly agree', in relation to their satisfaction with the movement flow, the adaptability, the diversity and the flexibility of the informal learning spaces at the Newton account for 62%, 65%, 59% and 66%, respectively. As a whole, the flexibility of the informal learning spaces in both cases seems to be satisfactory to the students. The flexibility level at the Diamond is better than that of the Newton. The following sections interpret the data in detail.

#### *6.3.2.1 Movement Flow.*

The flexible movement flow in this section refers to the convenience and multiple choices of the movement. In the Diamond, it can be clearly seen from Figure 6-9 that the central atrium is used to provide orientation for students to their destination. Meanwhile, four vertical transportation cores, with service and fire staircases and lifts, fulfil the student daily requirements. In the middle of the atrium, a spiral staircase is arranged especially for students to find the location of their preference. The choices of student movement provide them with a convenient learning space. Meanwhile, staircases, lifts and the spiral staircase enables adequate evacuation requirements even during the rush hour. If students are not in a hurry, they can wait for the lifts. If students are in a hurry to leave the building, they can choose the staircases. If they want to find a place to study, they can climb up or down from the spiral staircase as well as looking for preferred places.



Figure 6-9: The ‘corridor’ and vertical transportation in the C – floor plan at the Diamond at the University of Sheffield.

The spatial organisation of the Newton is more horizontal (see Figure 6-10). More specifically, as a central hub of Nottingham Trent University city campus, the informal learning spaces of the Newton link different schools of the university. Students mainly go across the informal learning spaces of the Newton from the south part of the main entrance, the west part of the entrance through the School of Architecture, Design and Built Environment, and the east part of the entrance through Nottingham Business School and Nottingham Conference Centre. The students stated that they would like to stay in the informal learning spaces of the Newton when they are free between lectures. In here, students could hang out, relax and eat, and directly continue their movement flow to their destinations after that. The convenient movement flow of the informal learning spaces of the Newton retains students in the space and encourages student communication and activities.

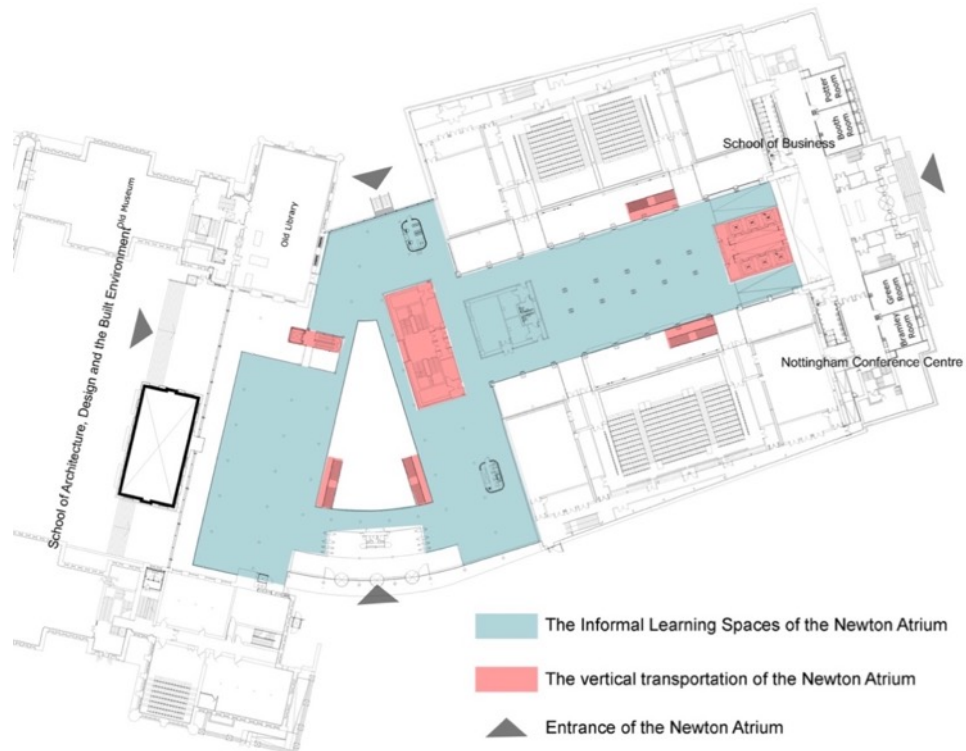


Figure 6-10: The ‘corridor’ and vertical transportation in the first floor plan at the Newton at Nottingham Trent University.

#### 6.3.2.2 *Adaptability.*

In terms of the adaptability, this emphasises if the space can be easily reconfigured in a short period time for group or individual study and if the space is usable 24/7 and maximises the usage over time. Based on a quantitative analysis, the questionnaires measured the proportion of participants satisfied with the spatial conditions and how this can be easily reconfigured in a short period time for group or individual study in the Diamond and the Newton. The results indicate that there were only a few of respondents who believed that this could still be improved at the Diamond and the Newton. This accounted for 11.5% and 7.2%, respectively. That is to say, the quantitative data demonstrates that the informal learning spaces can be easily reconfigured for group or individual study. The observation presents the same result. As the Figure 6-11 shows, the arrangement of most of the furniture in the centre of the informal learning spaces

at the Diamond can easily be reconfigured to match the size and purpose of the group. Like the trigonal desks in the Open Space at the Diamond at the University of Sheffield and the oblong tables and colourful chairs in the Open Space of the Newton at Nottingham Trent University, these are custom-made items that are designed to support both individual and group study.

The qualitative data also proves this statement. More specifically, respondent (PN3) expressed the significance of the adaptable and removable furniture towards the informal learning activities in the informal learning space of the Newton:

*... It is quite a flexible area. For example, the furniture settings can be changed according to the different activities. ... The functional partition can also be changed by the arrangement of the movable walls. From the functional perspective, this area is very practical.*



Figure 6-11: The reconfigurable tables and removable chairs allow students to shape their learning forms individually or by group in the open space at the Diamond (left) and the corridor space at the Newton.

That is to say, the evaluation of the informal learning space would be higher if the ‘flexible tables and chairs’ (PD1) in the informal learning spaces were removable. In other words, the students’ ability to rearrange the space for supporting individual or group study would be suitable and improve student activities in the informal learning environment.

However, the respondents also stated that there's a balance in reshaping the spaces. The frequent changes of the layout of the learning spaces is also not good for retain learning activities (see Figure 6-12). Even though the informal learning spaces were designed with '*flexible furniture*' and '*movable walls*', and the furniture settings can be changed to accommodate student different activities (PN3), the respondent (PN5) stressed that '*it is kind of an open area (the Open space of the Newton) but nobody would like to use the space unless some school fair and only something like that were organised here*'.



Figure 6-12: The different usages of the Open Space at the Newton.

For students doing learning activities, they prefer to have a fixed area for them. Learners could be reluctant to change an inherited configuration, even when the self-management of the space is encouraged. So, they are likely to adopt a certain mode of learning within an existing layout and type of furniture. For those students, who were using the informal learning spaces daily, they disliked finding out that the spatial layout had been changed frequently. The informal learning spaces, where it is too flexible, meant that the space would be frequently organised and occupied for different kinds of activities. It was also partly the reason why less students used the Open Space in the Newton for informal learning activities.

Another aspect on the adaptability of the informal learning space related to the opening time and length of stay in the informal learning spaces (if the space is usable 24/7 and maximises the usage over time). The length of stay depends on the spatial availability, their personal timetables and how they are supported to stay in the informal learning spaces. As a 7-24 access area and close to their formal learning spaces such as lectures, the informal learning space of the Diamond provides an open public area for students, including those who are even staying up late there. Based on the quantitative analysis, there are 63.9% of the respondents were satisfied with the 24/7 arrangement of the informal learning spaces of the Diamond. However, 39.2% of the students in the informal learning spaces of the Newton were dissatisfied with the time arrangement. In fact, the informal learning spaces of the Newton were open to students 24/7 as well. However, based on observation, there are almost no student using the informal learning spaces of the Newton after 7 pm (see Table 5-4).

Meanwhile, the results of observations indicate that the average length of stay for both socialising and informal learnings activities in the Newton were around 30 minutes and the average length of stay in the Diamond was far longer than in the Newton. That is to say, they saw the informal learning spaces in the Newton as a transitory point, where they stayed between lectures, and saw the informal learning spaces in the Diamond as a learning space, where they kept doing learning activities. The length of stay presents the preferences of students and their retention in the informal learning spaces. Whether the space provides enough supports facilities for them to stay was important for further student activities.

In terms of the adaptability, it is also really important that students need to learn how to use the 21<sup>st</sup> century learning space. A well-designed space might not be efficiently used until students get used to it. The informal learning space itself could tell students how to use it to its maximum usage yet still need more time. For example, some students were dislike to study in the Open Space of the Diamond because they realised that it was too noisy, and students discussed amongst each other while studying alone. The tables they sat at were connected together and they felt distracted. However, they gradually realised that they could use the Open Space as a space for group discussion and individual study with some background music playing. As the respondent (PD3) stated:

*‘After I adapted to that, I think the Diamond is like a “Learning Place” compared with a “library”. Now, I like this atmosphere after I get used to studying in this environment. In this place, I can find both silent areas and space for group discussion if needed.’*

That is to say, students also were requested to adapt to the usage of the informal learning spaces. In order to let students better getting used to the use of the informal learning spaces, it is good to think over the design strategy on the spatial organisation of the adaptability. For example, the widened Open Spaces and Corridor Spaces are designed spaciouly with reconfigurable and removable tables and chairs. This can provide more adaptable spaces and varied distances between tables to decrease the impacts of varied students’ different activities and for prompting student informal learning activities.

#### **6.3.2.3 Diversity.**

A flexible environment is the one that could be tailored by themselves to support their diverse physical as well as academic preferences and needs. The diversity involves several aspects. The spatial diversity in this section firstly involves the diverse learning setting elements of the informal learning space supports and a diversity of student activity models, including both socialising and informal learning activities. For supporting both socialising and informal learning activities, the informal learning spaces are designed as multipurpose places for exploring student experiences in the educational complexes. Different learning setting elements (see Table 6-5) are arranged in the informal learning spaces of the Diamond and the Newton to prompt varied student different activities. Interestingly, in general, even though there are similar learning setting elements at the Diamond and the Newton, the operation model is totally different. More specifically, the learning setting elements at the Newton can be used but are organised by managers and scheduled based on different events or allocations. However, all these learning setting elements at the Diamond are totally self-organised by students themselves. From this point, the diversity of the informal learning spaces should be reconsidered to enhance student experiences. At the Newton, clearly, the operation model is against the indication of the flexibility of the informal learning spaces – tailored by students. This can be partly reason why students tend to spend more time staying in the informal learning spaces at the Diamond. As McDaniel (2014) states, students typically spend more time in these spaces when they have the ability to change the layout of the space to accommodate a variety of needs.



Table 6-5: Learning setting elements in the informal learning spaces of the Newton and the Diamond.

Learning setting element	The Newton				The Diamond			
	Entrance Space	Café Area	Corridor Space	Open Space	Entrance Space	Café Area	Corridor Space	Open Space
Desk		✓	✓	✓	✓	✓	✓	✓
Chair	✓	✓	✓	✓	✓	✓	✓	✓
Bench			✓	✓	✓			
Plugs and Sockets			✓	✓		✓	✓	✓
Movable Wall			✓	✓				✓
Computer								✓
Network Connection	✓	✓	✓	✓	✓	✓	✓	✓
White Board			✓	✓				
Projector & Monitor								✓
Printer							✓	✓
Plants	✓		✓	✓				
Food and Beverage	✓	✓	✓	✓		✓	✓	

The qualitative data from questionnaires indicates that the proportion of the participants satisfied with the combination of space in the Diamond is higher than that of the Newton, which accounted for 70.9% and 50.5%, respectively. Take the C floor of the Diamond as an example (see Figure 6-13), it can be seen that the informal learning space of the Diamond is a place providing multiple learning setting elements to support students' socialising and informal learning activities. More specifically, the Moonscape (see Figure 6-14 left), providing high tables with table lamps on and without chairs, enables students, who need a table to use computers briefly, or to stand by for checking their phones. Next to the spiral staircase, a circle of soft sofas is provided for people to relax or wait. The left of the spiral staircase has an allocation of several oblong tables and chairs for Intermittent Exchange activities. Some round tables and removable chairs are located under the Silent Study space and the three Moonscape round tables (see Figure 6-14 right) provide enough light and the

surrounding swivel chairs enable student communications as well as the silent study. The diversity of removable tables and chairs are allocated in different area of the space and students could control the size of group furniture based on their numbers. The diverse learning setting elements provide a place to support diverse student activities.



Figure 6-13: The diversity of learning styles supported by the diverse informal learning space design in the diamond.



Figure 6-14: The design of the moonscape (left) and the diverse learning settings (right) in the Diamond.

Source from: [https://www.youtube.com/watch?v=RnS\\_R-gKHKM](https://www.youtube.com/watch?v=RnS_R-gKHKM)

Another form of spatial diversity indicates if the informal learning spaces prompts the Dietary Related activities. With the support of beverage and food service, students trend to be retain in the informal learning space for a long time. During the Dietary Related activities, students could talk with their friends and feel relaxed. Students require a relaxed phenomenon environment in the campus after the lecture. The design quality of the flexibility of the informal learning spaces provides the opportunities for the informal learning spaces to cater for socialising and relaxing. Like what Wilson and Randall (2010) conclude,

students echoed this sentiment (that flexibility) in their praises of the learning environment are a space where it was easier to relax and learn.

## 6.4 AMBIENCE.

### 6.4.1 Student satisfaction of the Ambience.

The Data of student satisfaction with the Ambience of the informal learning spaces were collected from seven specific aspects: Socialising, Sense of Community, Informative, Attractiveness, Openness, Enclosure, and Safety. The data of student satisfaction with the Ambience as collected from the respondents of the Diamond is summarised in Table 6-6. In order to better show the percentage of selection, the data is translated into bar charts, as shown in Figure 6-15.

Table 6-6: The degree of student satisfaction with the Ambience of the informal learning spaces at the Diamond based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Stronly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
Ambience	10. Socialising	1	5	39	61	42	148
	11. Sense of Community	0	13	42	56	37	148
	12. Informative	1	10	47	60	30	148
	13. Attractiveness	1	6	31	71	39	148
	14. Openness	0	0	18	72	58	148
	15. Enclosure	1	15	48	59	25	148
	16. Safety	0	3	21	57	67	148

More specifically, there was only 1 person who selected ‘Strongly Disagree’ and 5 selected ‘Disagree’ regarding their satisfaction with conditions for socialising. Moreover, 39 selected ‘Neither Agree nor Disagree’, 61 selected ‘Agree’, and 42 selected ‘Strongly Agree’. The bar chart in Figure 6-7 indicates that in total less than 5% presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ with ‘the satisfaction with the socialising’. There were over 25% selecting ‘Neither Agree nor Disagree’. The remaining respondents

selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback was around 70 %; that is to say, an average of around 70 % of the respondents selected ‘Agree’ or much more than ‘Agree’ on their description with their satisfaction with the socialising.

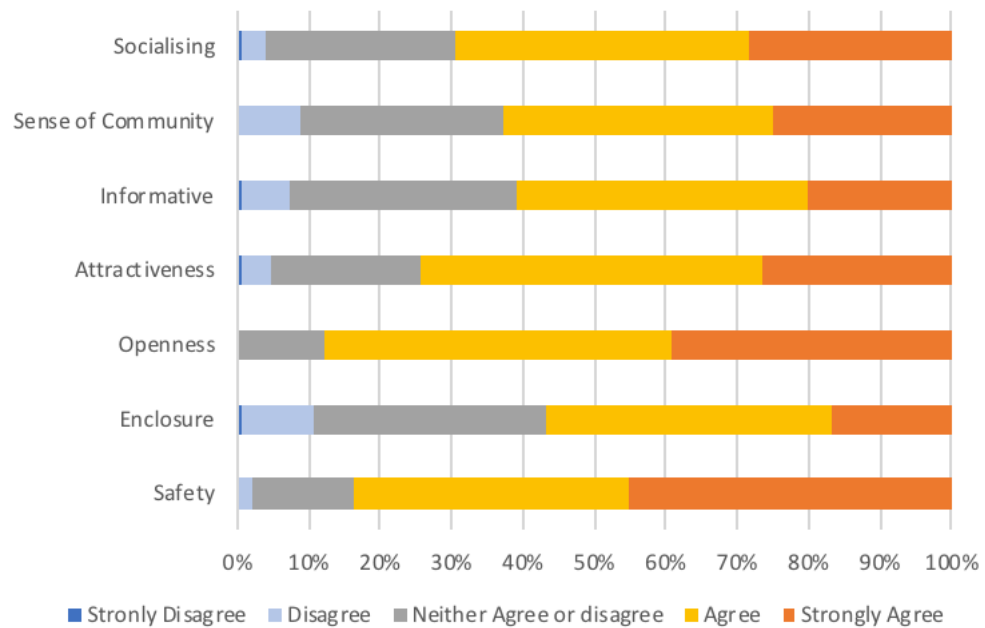


Figure 6-15: The percentage of the selection on student satisfaction with the Ambience of the informal learning spaces at the Diamond based on the questionnaires.

In terms of the satisfaction with the sense of community, nobody selected ‘Strongly Disagree’ and 13 selected ‘Disagree’ at satisfying the sense of community at the Diamond. Moreover, 42 selected ‘Neither Agree nor Disagree’, 56 selected ‘Agree’, and 37 selected ‘Strongly Agree’. The bar chart in Figure 6-15 indicates that in total less than 10% presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ at being satisfied with the sense of community at the Diamond. There were around 30% selecting ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of the positive feedback was over 60%; that is to say, an average of over 60% of the

respondents selected 'Agree' or much more than 'Agree' with satisfying the sense of community at the Diamond.

In terms of the satisfaction with the informative and attractive the informal learning spaces at the Diamond, the percentage of selecting 'Strongly Disagree' and 'Disagree' were both less than 10%. However, over 60% respondents selected the positive options of 'Agree', and 'Strongly Agree' with their satisfaction with the informative function of the informal learning spaces while over 70% of the respondents selected the positive options of 'Agree', and 'Strongly Agree' with their satisfaction with the attractiveness.

In terms of the satisfaction with the openness of the informal learning spaces at the Diamond, there is no one that selected 'Strongly Disagree' and 'Disagree'. Moreover, 18 selected 'Neither Agree nor Disagree', 72 selected 'Agree', and 58 selected 'Strongly Agree'. Accordingly, the total percentage of positive feedback regarding satisfaction with the openness of the informal learning spaces is over 85%; that is to say, an average of over 85% of the respondents selecting 'Agree' or much more than 'Agree' with their satisfaction with the openness of the informal learning spaces at the Diamond.

Inquiry into the enclosure of the informal learning spaces at the Diamond, there are only 1 person that selected 'Strongly Disagree' and 15 selected 'Disagree'. Moreover, 48 selected 'Neither Agree nor Disagree', 59 selected 'Agree', and 25 selected 'Strongly Agree'. The bar chart in Figure 6-15 indicates that in total over 10% of the respondents presented a negative view by selecting 'Strongly Disagree' and 'Disagree' at the satisfaction with the enclosure of the informal learning spaces at the Diamond. There were around 30% selected 'Neither

Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback was over 55%; that is to say, an average of over 55% of the respondents selected ‘Agree’ or much more than ‘Agree’ with the satisfaction of the enclosure of the informal learning spaces at the Diamond.

In terms of their satisfaction with the safety of the informal learning spaces at the Diamond, there was nobody that selected ‘Strongly Disagree’ and only 3 selected ‘Disagree’. Moreover, 21 selected ‘Neither Agree nor Disagree’, 57 selected ‘Agree’, and 67 selected ‘Strongly Agree’. The bar chart in Figure 6-15 indicates that in total less than 5% presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’. There were around 15% selecting ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback was over 85%; that is to say, an average of over 85% of the respondents selected ‘Agree’ or much more than ‘Agree’ regarding their satisfaction with the safety of the informal learning spaces at the Diamond.

Table 6-7: The degree of student satisfaction with Ambience of the informal learning spaces at the Newton based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
Ambience	10. Socialising	0	5	20	47	25	97
	11. Sense of Community	0	6	21	50	20	97
	12. Informative	0	8	36	38	15	97
	13. Attractiveness	0	6	20	51	20	97
	14. Openness	0	6	15	44	32	97
	15. Enclosure	0	11	48	27	11	97
	16. Safety	0	4	25	40	28	97

Compared with their satisfaction with the Ambience of the informal learning spaces at the Diamond, the following paragraphs explained student satisfaction with the flexibility of the informal learning spaces at the Newton. The data of student satisfaction with the Ambience was collected from the respondents of

the Newton. It is summarised in Table 6-7. In order to better show the percentage of selection, the data is translated into bar charts as shown in Figure 6-16.

More specifically, there was nobody that selected 'Strongly Disagree' and 5 selected 'Disagree' about the satisfaction with the socialising. Moreover, 20 selected 'Neither Agree nor Disagree', 47 selected 'Agree', and 25 selected 'Strongly Agree'. The bar chart in Figure 6-16 indicated that in total less than 5% presented a negative view by selecting 'Strongly Disagree' and 'Disagree' with 'the satisfaction with the socialising'. There are over 20% that selected 'Neither Agree nor Disagree'. The remaining respondents selected the positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of positive feedback is over 70 %; that is to say, an average of over 70 % of the respondents selected 'Agree' or much more than 'Agree' with the description of their satisfaction with the socialising.

In terms of the satisfaction with the sense of community, nobody selected 'Strongly Disagree' and 6 selected 'Disagree' with satisfaction with the sense of community at the Newton. Moreover, 21 selected 'Neither Agree nor Disagree', 50 selected 'Agree', and 20 selected 'Strongly Agree'. The bar chart in Figure 6-16 indicates that in total less than 10% presents a negative view by selecting 'Strongly Disagree' and 'Disagree' at being satisfied with a sense of community at the Newton. There are over 20% that selected 'Neither Agree nor Disagree'. The remaining respondents selected the positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of the positive feedback is over 70%; that is to say, an average of over 70% of the respondents selected

‘Agree’ or much more than ‘Agree’ with the description of the sense of community at the Newton.

In terms of the satisfaction with the informative description of the informal learning spaces at the Newton, there is no-one that selected ‘Strongly Disagree’ and 8 respondents selected ‘Disagree’. Moreover, 36 selected ‘Neither Agree nor Disagree’, 38 selected ‘Agree’, and 15 selected ‘Strongly Agree’. Accordingly, the total percentage of the positive feedback of the satisfaction with the informative description of the informal learning spaces was around 55%; that is to say, an average of around 55% of the respondents selected ‘Agree’ or much more than ‘Agree’ with their satisfaction with the information regarding the informal learning spaces at the Newton.

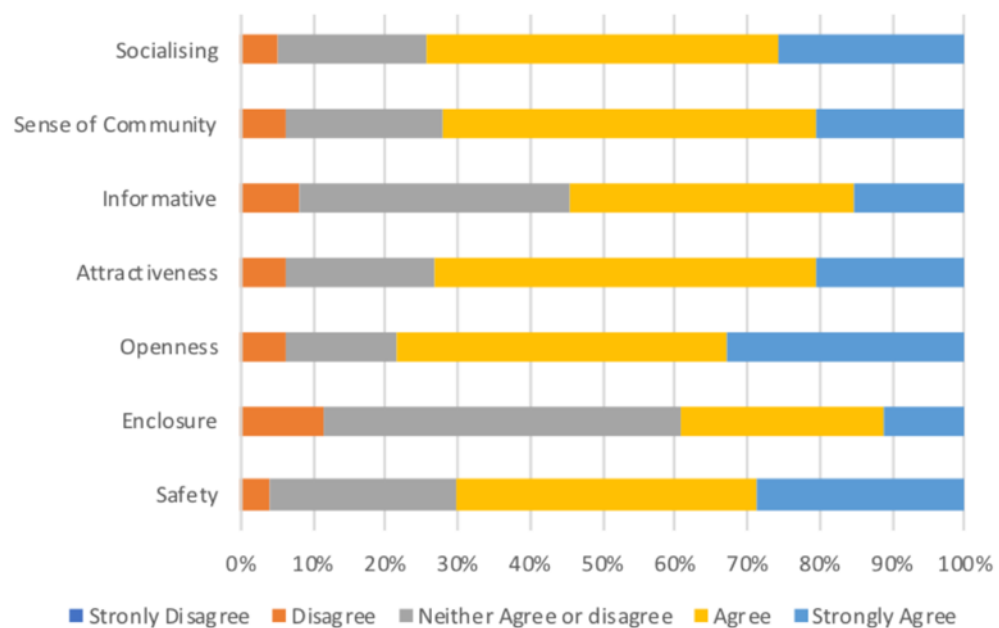


Figure 6-16: The percentage of the selection on student satisfaction with the Ambience of the informal learning spaces at the Newton based on the questionnaires.

In terms of the satisfaction with the attractiveness and openness of the informal learning spaces at the Newton, the percentage that selected ‘Strongly Disagree’ and ‘Disagree’ were both less than 10%. Furthermore, over 70% of the



respondents selected the positive options of 'Agree', and 'Strongly Agree' with their satisfaction with the attractiveness and openness the informal learning spaces at the Newton.

Regarding the inquiries into the enclosure of the informal learning spaces at the Newton, no respondent selected 'Strongly Disagree' and 11 selected 'Disagree'. Moreover, 48 selected 'Neither Agree nor Disagree', 27 selected 'Agree', and 11 selected 'Strongly Agree'. The bar chart in Figure 6-16 indicates that in total over 10% of the respondents presented a negative view by selecting 'Strongly Disagree' and 'Disagree' at their satisfaction with the enclosure of the informal learning spaces at the Newton. There were over 50% selected 'Neither Agree nor Disagree'. The remaining respondents selected the positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of positive feedback is less than 40%; that is to say, an average of less than 40% of the respondents selected 'Agree' or much more than 'Agree' on the satisfaction with the enclosure of the informal learning spaces at the Newton.

In terms of the satisfaction with the safety of the informal learning spaces at the Newton, there was nobody that selected 'Strongly Disagree' and only 4 selected 'Disagree'. Moreover, 25 selected 'Neither Agree nor Disagree', 40 selected 'Agree', and 28 selected 'Strongly Agree'. The bar chart in Figure 6-16 indicates that in total less than 5% of the respondents presented a negative view by selecting 'Strongly Disagree' and 'Disagree'. There are over 25% of the respondents that selected 'Neither Agree nor Disagree'. The remaining respondents selected positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of positive feedback is around 70%; that is to

say, an average of around 70% of the respondents selected 'Agree' or much more than 'Agree' on their satisfaction with the safety of the informal learning spaces at the Newton.

Overall, the students were satisfied with the Ambience of the informal learning spaces of the Diamond and the Newton. However, there are distinct differences in four characteristics of the design qualities: Sense of Community, Openness, Enclosure and Safety. The satisfaction with the Sense of Community of the informal learning spaces of the Diamond was less 10% than of the Newton. However, the students felt that the Openness and the Enclosure of the informal learning spaces of the Diamond was more satisfactory than that of the Newton. The atrium, as an architectural language to organise informal learning spaces, provided an openness for students to socialise and informal learning activities. The majority of the students studied in the informal learning spaces at the Diamond. They focused on their works and sometimes were not aware of their learning environment. Therefore, generally, they felt that the Openness and the Enclosure of the informal learning spaces of the Diamond was satisfied. However, the majority of the students socialised and relaxed in the informal learning spaces of the Newton. They focused on the design of the spatial organisation more and they had more requirements on the design of the informal learning spaces. As a linking space where a lot of students passed through, it was difficult to create more enclosure spaces. Instead, the informal learning spaces of the Newton provided a more socialising ambience than that of the Diamond.

Furthermore, even though both of the informal learning spaces were designed for students who can only access it if they swiped their student cards, the satisfaction with the safety of the informal learning spaces varied based on the different forms of usages in the informal learning spaces. At the Diamond, a lot of students chose to stay in the informal learning spaces. People around students are relatively stable and they felt that they studied in a stable learning environment. However, the students felt they did activities in a very dynamic learning environment, where students around were passing through. Even the informal learning spaces were used for different activities. Therefore, they did not feel that it was a stable surrounding. Consequently, the percentage of the student satisfaction rates with the Safety of the informal learning spaces at the Diamond accounted for around 83%, which is 13% higher than that of the Newton.

#### ***6.4.2 The impact of the Ambience upon student experiences.***

In this section, the design quality – the ambience of the informal learning spaces was debated to examine its impact upon student socialising and informal learning activities. The design quality of the ambience refers to a wider range of learning atmospheres including, Socialising, Sense of Community, Informative, Attractiveness, Openness, and Enclosure. The qualitative research stressed the significance of the design quality of ambience on the informal learning spaces and student experiences.

#### *6.4.2.1 Socialising.*

Based on the observation, the students did a lot of socialising activities in the informal learning spaces at the Diamond and the Newton (see Figure 5-2 and Figure 5-3). Based on the questionnaire, the proportion of respondents satisfied with the socialising ambience of the informal learning spaces at the Diamond and the Newton present a similar percentage, both around 70% (see Figure 6-15 and Figure 6-16). Based on the qualitative analysis, respondent (PD3) describes this learning style at the Diamond in his own words:

*...we are in group discussions and, whatever you want to say and to do, you can do it in here. It is very convenient.*

Compared with student experiences at the Diamond, more respondents claimed that the socialising ambience made them really '*rejuvenated*' in the Newton (PN4). PN2 stated that the informal learning spaces at the Newton are '*designed as a place where students do whatever they want to do.*' With this phenomenon, the collaborations and peer-to-peer learning should be stimulated. These activities, essentially, face-to-face social interactions, remain important to a student's experience (Weaver, 2006). The socialising ambience provides more opportunities for students to do face to face social interactions. However, the data of the observations indicates that there is a significant difference between the Diamond and the Newton (see Figure 5-2 and Figure 5-3).

In the Diamond, it can be seen that more students tend to discuss the coursework with their friends and they feel that the socialising ambience at the Diamond supports their communication. That is to say, the socialising ambience should

enhance students' Intermittent Exchange activities at the Diamond and the socialising ambience at the Newton prompts more social interaction. The informal learning spaces at the Newton provide students with a more relaxing learning environment, where students could talk with friends at their own convenience. The socialising ambience provides a relaxed spatial configuration where students feel at ease in the learning environment.

#### *6.4.2.2 Community.*

Based on the questionnaire, the proportion of respondents satisfied with the ambience of the community of the informal learning spaces at the Diamond and the Newton were 63% and 72%, respectively (see Figure 6-15 and Figure 6-16). The quantitative analysis shows that the ambience of the community was more satisfactory to students at the Newton than at the Diamond. It can be understood, based on the definition of the sense of community that the respondents have a feeling that they stay with their friends and talk with each other and (McMillan & Chavis, 1986). The sense of community ambience can make students have the same response to be retained in the informal learning spaces. Firstly, student satisfactions with the sense of community in both cases was high. Community refers to socialising and ambient support which can be found in the learning environment. In order to think over the community impact of the ambience of the informal learning space on student activities, it is necessary to debate how students talk and learn with each other. Collaboration and interpersonal communication are good for transferring from socialising into informal learning activities. The students described this importance at the Newton regarding their communication, where they could talk, share and debate without worrying about

disturbing others. Communication refers to contexts where significant learning can occur (Kolb & Kolb, 2005). It is therefore paramount for the informal learning spaces to support interpersonal communications from an informal learning perspective as well as a social one. Hunley and Schaller (2009) also observed the importance of interpersonal communication in their study of the characteristics that encouraged engagement with library spaces. They assert that communication should be facilitated in all spaces. According to the observations, more communication occurred in the informal learning space at the Newton. That is to say, the informal learning spaces of the Newton create a sense of community to better support student learning experiences. This is also the result of the spatial design. The architects aim to provide a new unified identity within students and the community at large. The communication, especially the Intermittent Exchange activities and Focused Informal Learning activities, require a talkative and relaxing environment where students could meet, gather and discuss their coursework. Students generated a sense of community by being together.

#### *6.4.2.3 Informative.*

The informative nature of the informal learning spaces indicates the guide for the usage of the informal learning space. The students noticed the value of using the space and if the information from the informal learning spaces on supporting their learning styles, including individual learning and group study, successfully delivered to students. As respondent (PD3) mentioned, the students can learn how to use the informal learning space at the Diamond and after that, control and manage their learning spaces. However, the dynamic informal learning

spaces of the Newton provides more activities organised in the Open Space, where students can rarely be noticed if they can learn in there. These results are the same as the quantitative analysis. Accordingly, the proportion of satisfaction with the informative nature of the Diamond was higher than at the Newton, which were respectively, at 61% and 55%, respectively (see Figure 6-15 and Figure 6-16).

Furthermore, observations, in the Diamond, found that there were many students talking with their friends or simply doing their own coursework without talking and being next to peers who were known to them (usually 2-3 people, occupied 75% in total). This behaviour is also reported by O'Connor (2005) terming it 'studying alone'. That is partly why respondents stated that they preferred to stay in the Open Space where they could sit together with their friends but study individually. If they needed to discuss a little bit, they did not necessarily go to a special room or corridor. They could directly discuss with their friends sitting next to them. Furthermore, there were a lot of students staying at the Newton, in groups. Based on the observations, the Open Space could be used as a place for coming together and the Corridor Spaces were selected as a study room for group study and a lounge for relaxing between lectures. The informal learning spaces at the Newton provided an informative place where students explored the usage of the informal learning spaces. This improved the student experiences. More specifically, except supporting student activities, the atrium at the Newton is also used for events, such as school events and job fairs during the term weeks (see Figure 6-17). These events provide sufficient information to enhance student experiences at the Newton and even the whole campus.



Figure 6-17: School of Art & Design undergraduate open day 2017, at the Central Court at Nottingham Trent University.

Source from: <https://www.ntu.ac.uk/university-life-and-nottingham/open-days/find-your-open-day/art-design/school-of-art-and-design-open-day-interview-courses-saturday-25-march-2017>

#### 6.4.2.4 *Attractiveness.*

The attractiveness of the informal learning spaces indicates the overall architectural aesthetic effect. In terms of where students want to study, attractiveness is also one of the keys to impact their choices. Based on the questionnaire, the proportion of respondents satisfied with the ambience of the attractiveness of the informal learning spaces at the Diamond and the Newton were 74% and 73%, respectively (see Figure 6-15 and Figure 6-16). The quantitative data presents an indication of satisfaction with the informal learning spaces at the Diamond and the Newton.

As a multi-layered informal learning space, it can be seen from the Figure 6-18 that there is communication between the different levels of the Diamond. Students walking on the corridor can also visually feel the learning atmosphere downstairs. As respondent (PD8) described: ‘... *(the atrium of) the Diamond provides a good sight*’. Different arrangements of the tables and chairs enhance



the students learning experiences. This attracts students to engage with the learning environment. Respondent (PD2) stated that *'the Diamond looks more impressive and really cool. You can feel a spirit of modernity when you are in it. And it makes me enjoy studying in the Diamond'*. Supported by the sufficient natural and artificial light, the round shape Moonscape and the slant columns' painting with orange colours, the design of the informal learning space of the Diamond, provides a state-of-the-art and innovative learning environment.

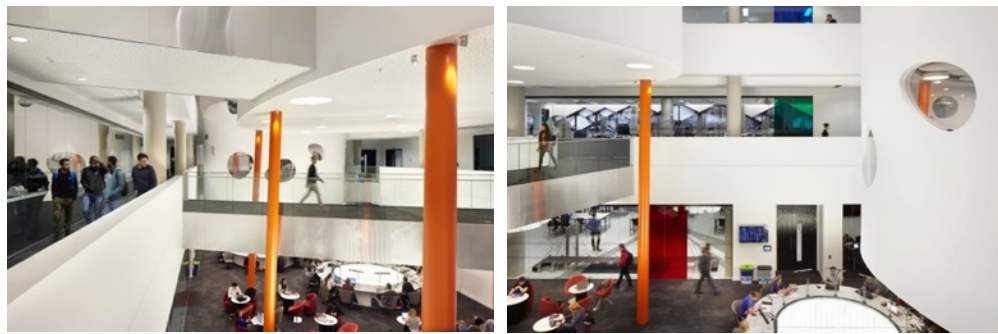


Figure 6-18: The in-between space in the Diamond.



Figure 6-19: The aesthetic echo of the Diamond.

Source from: <http://www.twelvearchitects.com/portfolio/item/the-university-of-sheffield/>

The Diamond is stunning, not only in its design of the informal learning space inside. The façade design and the environment surrounding it are also amazing (see Figure 6-19). As the architects explained:

*'... the Diamond is named after its distinctive anodised aluminium and glass facade, which draws inspiration from the detailing of the surrounding historic buildings and in particular the stone tracery that frames the windows of the adjacent church.'*

In terms of the spatial attractiveness of the informal learning spaces of the Newton, the atrium has already been recognised as a ‘landmark’ of the campus (PN1). The spatial height of the atrium provides a different feeling compared with the lecture space. The atrium consists of glass and steel materials, which makes the design state-of-the-art. Meanwhile, the Nottingham Business School tower building can be seen from the big rooftop, creating an impressive modern learning environment.



Figure 6-20: The Central Court at Nottingham Trent University.  
Source from: <http://www.hopkins.co.uk/projects/16/113/>



Figure 6-21: The historically extensive renovation and modernisation of the informal learning space design at the Newton by Hopkins.  
Source from: <http://www.hopkins.co.uk/projects/16/113/>

Furthermore, the Newton, as the vibrant new social heart for the city-centre campus, connects the historical buildings, providing extensive renovation and modernisation to their dated, inefficient and incoherent spaces. The informal learning space have become a communal lung for the university, where students can enjoy their socialising and informal learning activities.

#### *6.4.2.5 Openness.*

The openness of the informal learning space is very important. Based on the investigation, the atriums in the informal learning spaces of the Diamond and the Newton provided a spatial transformation from *'the oppressive interiors'* to a *'visual antidote'* (Douvlu, 2004: 22). Different from the formal learning spaces, such as lectures and seminar spaces, the openness provides a feeling more like staying outside of the building and like staying on the city square. The openness provides good views and a relaxing feeling, where students can be *rejuvenated* (PN4).

As Hillier and Leaman (1972) suggest, there are four reasons for a space to exist. These have been called the four functions of architecture: the cultural, economic, shelter provision and accommodation. The informal learning spaces with the design quality of the Openness reflect these four functions best:

*'Atria appeal to the mind and the senses. They put people at the centre of things in a way lost in recent architecture. They encourage play: people-watching and promenading, movement through space, enjoyment of nature and social life. They provide a visual antidote to the oppressive interiors and the formless external spaces of today.'* – Douvlu (2004: 22)

In the Newton, students felt the openness of the informal learning spaces because they could observe people and movement through the space and enjoy the social life. The openness of the informal learning spaces provides a visual impact towards the students who would have come out of the lecture halls. Spatially, the openness provides a socialising phenomenon to enrich student experiences in the campuses and *'increased the impression of the university'* (PN1). Furthermore, these spatial experiences support mixed learning experiences and socialising in one place. The movement flows both vertically and horizontally with comfortable physical and spatial designs, which provides a good atmosphere for learning. The openness of the informal learning spaces at the Newton provides an opportunity for students to pay attention to this order. As PN 3 mentioned:

*'...I think the atrium space is the most important space for students. No matter if you have experiences in studying here or never come here before, it is the first place where people are paying attention to. So, on the premise of the function, the space should also be enjoyable. It should not be designed with a messy place. Instead, it should be a well-managed space with good usage rate. ... It is also a place of students' show room. The space presents what and how students use this space. I think it is the first impression of the space (Central Court). ...'*

The vast openness is one of the most astonishing design qualities of the atria in the educational complexes (see Figure 6-22). The participants believed that staying in the atrium for a while before or after lecture would make them relax. The spatial volume of the atrium was always open and multi-layered. Researchers have started to evaluate the openness of the 3D space based on the



space ecology model (Morais et al., 2017). Meanwhile, the method of 3D Isovist, a method of using mathematical way to quantify the spatial openness of the atrium, were explored by academics (Wang et al., 2007; Suleiman et al., 2013). In terms of the openness, the atrium was selected as a particularly informal learning space to identify the importance of the atrium in the educational complexes' systems. These spaces tended to be very open ended and undefined by their nature, creating a lot of freedom in their design, yet challenging in defining meaningful social spaces for people.



Figure 6-22: The astonishing openness of the atrium in the educational complexes of the Diamond (left) and the Newton (right).

The spatial configuration of the at the Diamond and the Newton brings people into a space, gives them reasons to linger, converse, share ideas or enjoy waiting in the different areas of the learning environment. Furthermore, as a highly functional role in a building, circulation, the atrium provides movement flows that connect different departments. This role provides the dual function of keeping the informal learning spaces at the Newton active and giving students

a reminder of the larger communal connections in the building. It gives students orientation in the complex learning environments. Consequently, the socialising and informal learning activities tend to occupy the peripheral than the central learning space (Oblinger & Lippincott, 2006). This, was observed within the atrium at the Newton. However, as a learning space, the atrium at the Diamond did not cater for a similar situation.

The atrium of the Diamond provides vertical circulation throughout the building. It works more like a hallway of the modern technology exhibition museum at the edge of the building, drawing people from the inside to the edge, bringing light and views. At its heart, this was all about creating the social spaces students want to occupy and remind them and open them up to larger communal interactions. We could not force spontaneous interactions and collaborations occurring here but through the skilful layering and reconfiguring of the space and scale, the design of the informal learning spaces could encourage and expose people to do those activities and contributes to the attachment in the learning environment.

*In my opinion, the Diamond has become a landmark of Sheffield. And it is reported that the Diamond is the best library in the Britain, which we are proud of. With lots of experiences in this library as I first came to the University of Sheffield, I have deep feelings for the Diamond. (PD4)*

The atrium is not only used as a learning space to support student daily life and enrich student experiences. It is also not only a place for gathering, and providing for multiple activities, it is also a place for memory. Participants are proud of having the fantastic learning environment in the university. The

university also enrolls students by presenting these modern astonishing atria as physical attractions.

#### *6.4.2.6 Enclosure.*

In terms of the enclosure of the informal learning spaces, the students stated the percentage of their satisfactions through questionnaires in the Diamond (see Figure 6-15) and in the Newton (see Figure 6-16), which were over 55% and less than 40%, respectively. The enclosure of the informal learning spaces of the Diamond was better than that of the Newton's Respondents. They claimed their preferences for enclosure when they used informal learning spaces. A series of physical supports were designed for supporting the ambience of the enclosure. The physical supports, such as high-back sofa chair, movable walls and even monitors, can function as movable walls to divide a large open space into smaller group meetings areas and/ or creative visual privacy" (O'Neill, 2013). The support at the informal learning spaces of the Diamond can be seen from Figure 6-23. The high sofa area was '*difficult to reserve*' (PD9) in the Diamond and students used the high sofa area a lot.

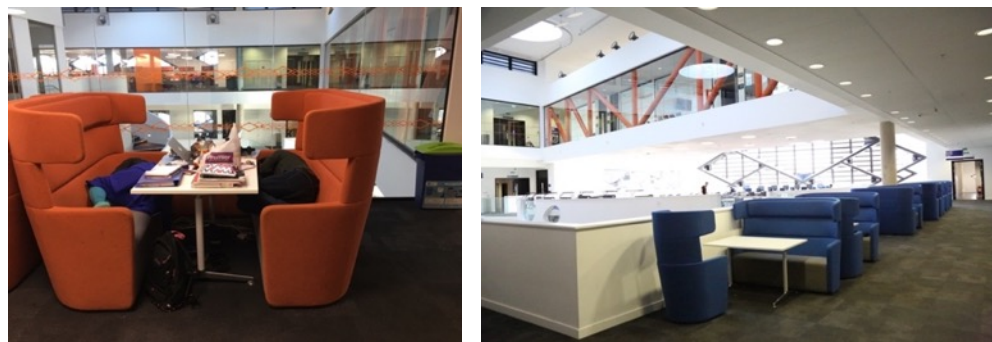


Figure 6-23: High-back sofa chairs forms a small community in the Diamond.

Respondent (PN3) also described the preferences of the enclosure in the Newton:

*... The sofa there is a semi-height furniture. If four or five students discuss around the table with this kind of sofa, they will get some privacy.*

However, based on the observation, the design of the furniture appeals more to openness and the public use (see Figure 6-24). The arrangement decreases the control of noise levels and student concentration levels. Therefore, reduced satisfaction with the feelings of the enclosure of the Newton were obtained based on the questionnaires.



Figure 6-24: The semi-height furniture provides the enclosure of the Newton.

## **6.5 FUNCTIONALITY.**

### ***6.5.1 Student satisfaction of the Functionality.***

The data reflecting student satisfaction with the functionality of the informal learning spaces were collected from two specific aspects: Supporting group work or collaboration and supporting individual learning. The data reflecting student satisfaction with functionality was collected from the respondents at the Diamond and is summarised in Table 6-8. In order to better show the percentage of the selection, the data is translated into bar charts, as shown in Figure 6-25.



Table 6-8: The degree of student satisfaction with the functionality of the informal learning spaces at the Diamond based on questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Stronly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>Functionality</b>	17. Supporting group work or collaboration	1	6	27	62	52	148
	18. Supporting individual learning	2	3	25	56	62	148

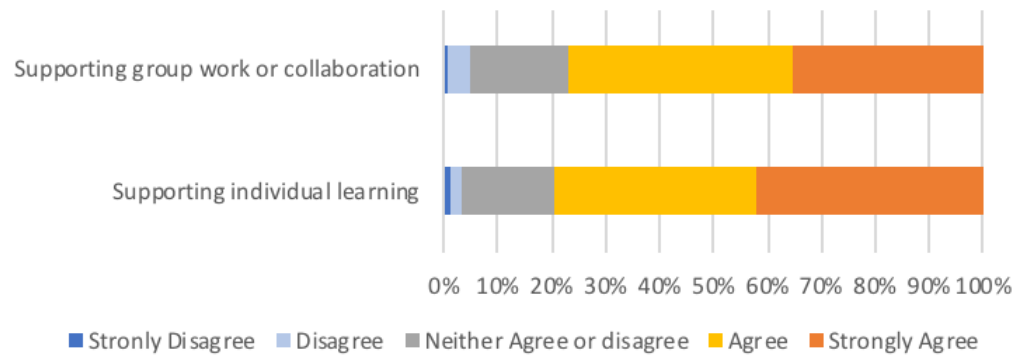


Figure 6-25: The percentage of the selection on student satisfaction with the functionality of the informal learning spaces at the Diamond based on the questionnaires.

More specifically, there was only 1 person that selected ‘Stronly Disagree’ and 6 selected ‘Disagree’ regarding their satisfaction with supporting group work or collaboration at the Diamond. Moreover, 27 selected ‘Neither Agree nor Disagree’, 62 selected ‘Agree’, and 52 selected ‘Strongly Agree’. The bar chart in Figure 6-25 indicates that in total less than 5% of the respondents presented a negative view by selecting ‘Stronly Disagree’ and ‘Disagree’ at ‘the satisfaction with supporting group work or collaboration. There were over 15% of the respondents that selected ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of positive feedback was over 75 %; that is to say, an average of over 75% of the respondents selecting ‘Agree’ or much more than ‘Agree’ with the description of the satisfaction with supporting group work or collaboration at the Diamond. The rate of satisfaction with supporting individual learning at the Diamond was quite similar with the rate of satisfaction with supporting group work or collaboration at the Diamond. Less than 5% of the respondents presented a negative view by selecting ‘Stronly Disagree’ and

‘Disagree’ and over 15% of the respondents selected the option of ‘Neither Agree nor Disagree’. The total percentage of positive feedback was around 80 %; that is to say, an average of around 80 % of the respondents selected ‘Agree’ or much more than ‘Agree’ regarding the description of the satisfaction with supporting individual learning at the Diamond.

The following paragraphs explained the student satisfaction rates regarding the functionality of the informal learning spaces at the Newton. The data of student satisfaction regarding the functionality as collected from the respondents of the Diamond is summarised in Table 6-9. In order to better show the percentage of the selection, the data was translated into bar charts, as shown in Figure 6-26.

Table 6-9: The degree of student satisfaction with the functionality of the informal learning spaces at the Newton based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Stronly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>Functionality</b>	17. Supporting group work or collaboration	0	3	24	48	22	97
	18. Supporting individual learning	1	11	22	42	21	97

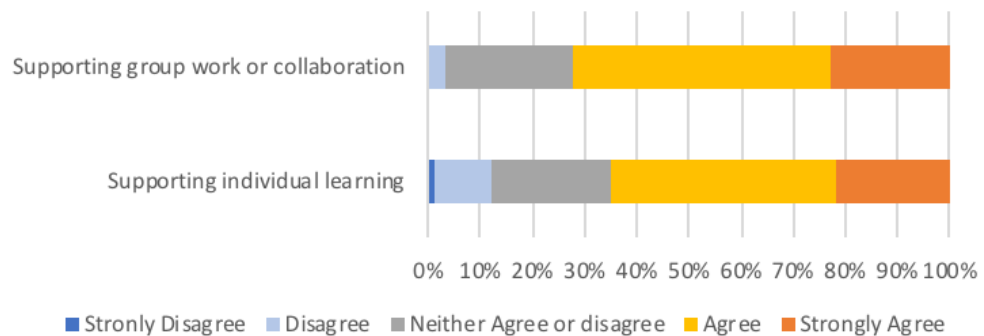


Figure 6-26: The percentage of the selection on student satisfaction with the functionality of the informal learning spaces at the Newton based on the questionnaires.

More specifically, there was nobody that selected ‘Strongly Disagree’ and 3 selected ‘Disagree’ regarding the satisfaction with having supporting group work or collaboration at the Newton. Moreover, 24 selected ‘Neither Agree nor Disagree’, 48 selected ‘Agree’, and 22 selected ‘Strongly Agree’. The bar chart in Figure 6-26 indicates that in total less than 5% presented a negative view by

selecting 'Strongly Disagree' and 'Disagree' with the satisfaction with supporting group work or collaboration. There were over 20% of the respondents selected 'Neither Agree nor Disagree'. The remaining respondents selected the positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of the positive feedback is over 70%; that is to say, an average of over 70% of the respondents selected 'Agree' or much more than 'Agree' regarding the description of the satisfaction with supporting group work or collaboration at the Newton.

The choice of supporting individual learning at the Newton is quite similar to the satisfaction with supporting group work or collaboration at the Newton. However, there were more than 10% of the respondents that presented a negative view by selecting 'Strongly Disagree' and 'Disagree' and over 20% of the respondents selected the option of 'Neither Agree nor Disagree'. The total percentage of the positive feedback was around 65%; that is to say, an average of around 65% of the respondents selected 'Agree' or much more than 'Agree' regarding the description of the satisfaction with supporting individual learning at the Newton.

Overall, it can be clearly seen that the functionality of the informal learning spaces of the Diamond and the Newton were both satisfactory to the students. There were more support strategies for improving the students' individual learning and group study activities at the Diamond. Therefore, the percentage of the student satisfaction accounted for almost 80%, which was higher by over 10% than that of the Newton.

### **6.5.2 The impact of the Functionality upon student experiences.**

In this section, the design quality, the functionality of the informal learning spaces is discussed to examine its impact upon student socialising and informal learning activities. The functionality of the informal learning space relates to the definition of the space and how it is feels it should be used. Analysed through quantitative methods, the data of student satisfaction with the functionality of the informal learning spaces was collected through questionnaires from two aspects: supporting group work or collaboration, and supporting individual learning. The quantitative analysis presents that the proportion of satisfaction with the supporting group work or collaboration within the informal learning spaces at the Diamond and the Newton were both reached around 70% (see Figure 6-25 and Figure 6-26). Based on observation, even though there are more socialising activities occurring in the Open Space at the Newton, there are still quite a lot of students studying in group or even individually in the Corridor Space at the Newton.

The qualitative data stressed the significant impacts of the design quality of the function of the informal learning spaces upon student experiences. To evaluate the functionality of an informal learning space, it is important to see if the informal learning spaces supported student individual learning and group work. As an informal learning space, rather than a social space, except the function of socialising, there were also a significant sign: if the informal learning spaces supported the informal learning activities. Literature reviews show that the design of the informal learning space was becoming increasingly blurred, where the students could manage their own learning models as they wanted (Radcliffe

et al., 2008; Harrison & Hutton, 2013). It is really important to stimulate students acting their socialising and informal learning activities automatically. Observation also found out the diverse of student activities in the informal learning spaces. Instead of only socialising activities occurring in the informal learning spaces, more blended student activities happened in the informal learning spaces. The informal learning spaces were designed with basic spatial arrangements, where students could allocate and arrange the layout of the spaces to '*fulfil different requirements*' (PN3). Hence, the functionality of the informal learning spaces, how a space was laid out, influenced the usage and there were many positive examples observed with spaces enabling the activities expected.

Furthermore, the necessary supports of the informal learning spaces upon student experiences are important to enhance their functionality. Based on the quantitative data, it can be seen that the satisfaction with the functionality of the informal learning spaces of the Diamond is better than that of the Newton. The observation revealed evidence of sufficient computers and IT facilities in the Diamond. As the architects described the design of the Diamond, the central atrium of the Diamond enables students to view the showcase engineering activities being undertaken and promotes collaboration and cross-disciplinary working in an environment fit for the 21<sup>st</sup> century research and practice. However, the necessary setting supports in the Newton, such as '*big monitors*' (PN5), were needed. The learning setting elements, such as tables and chairs, which could be organised by students, big monitors, which could simulate the real environment of presentation, etc., provided the functionalities of the informal learning spaces and supported student experiences in the informal

learning spaces. This could also be examined in the Other Support facilities of the informal learning spaces in the latter section.

## 6.6 SITUATION.

### 6.6.1 Student Satisfaction of the Situation.

The data regarding student satisfaction with the Situation of the informal learning spaces were collected from two specific aspects: Continuing classroom discussions immediately following class time; and Outside views. The data regarding student satisfaction with Situation collected from the respondents at the Diamond is summarised in Table 6-10. In order to better show the percentage of the selection, the data is translated into bar charts, as shown in Figure 6-27.

Table 6-10: The degree of student satisfaction with the Situation of the informal learning spaces at the Diamond based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>Situation</b>	19. Continue classroom discussions immediately following class time	6	14	48	51	29	148
	20. Outside views	8	26	35	46	33	148

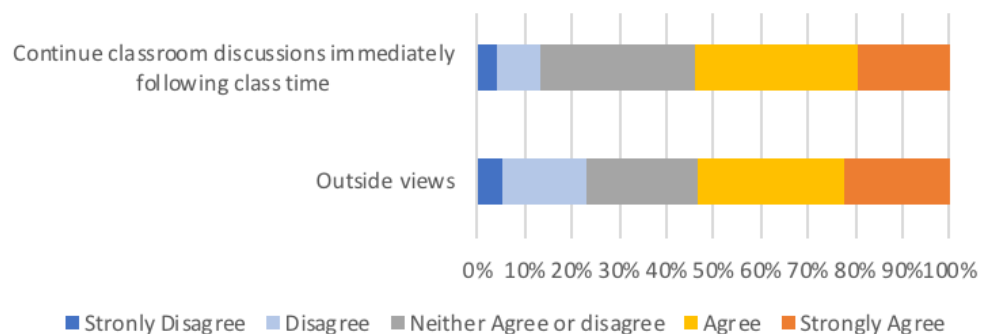


Figure 6-27: The percentage of the selection on student satisfaction with the Situation of the informal learning spaces at the Diamond based on the questionnaires.

Even though the percentage of respondents selecting ‘Strongly Agree’ and ‘Agree’ are both over 50%, the satisfaction with the Situation between two

aspects is slightly different. More specifically, the number of the respondents selecting ‘Neither Disagree nor Agree’ at satisfaction with continuing classroom discussions immediately following class time is over 30%, which is 10% higher than the number of the respondents selecting ‘Neither Disagree nor Agree’ with outside views. Furthermore, there were over 10% of the respondents that selected ‘Strongly Disagree’ and ‘Disagree’ regarding the satisfaction with continuing classroom discussions immediately following class time while there were over 20% of the respondents selected ‘Strongly Disagree’ and ‘Disagree’ with the satisfaction with outside views at the Diamond.

Table 6-11: The degree of student satisfaction with the Situation of the informal learning spaces at the Newton based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Stronly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>Situation</b>	19. Continue classroom discussions immediately following class time	3	7	36	30	21	97
	20. Outside views	9	24	30	19	15	97

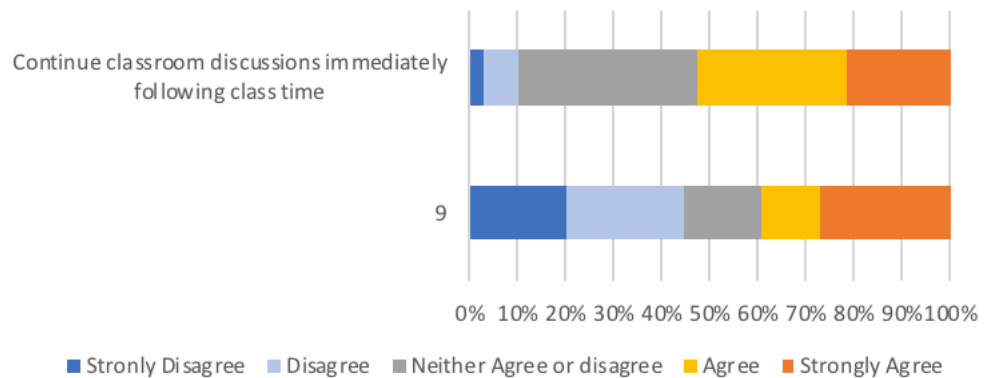


Figure 6-28: The percentage of the selection on student satisfaction with the Situation of the informal learning spaces at the Newton based on the questionnaires.

The following paragraphs explained student satisfaction with the Situation of the informal learning spaces at the Newton. The data for student satisfaction with the Situation collecting from the respondents at the Newton is summarised in Table 6-11. In order to better show the percentage of the selection, the data was translated into bar charts, as shown in Figure 6-28.

There is quite different between the two aspects of the satisfaction with the situation of informal learning spaces at the Newton. More specifically, the number of the respondents selecting 'Neither Disagree nor Agree' with the satisfaction with continuing classroom discussions immediately following class time was almost 40% while the number of the respondents selecting 'Neither Disagree nor Agree' with outside viewing is around 15%. Furthermore, there were around 10% of the respondents that selected 'Strongly Disagree' and 'Disagree' with the satisfaction of continuing classroom discussions immediately following class time while there were around 45% of the respondents that selected 'Strongly Disagree' and 'Disagree' regarding the satisfaction with outside viewing at the Newton.

To some extent, the Situation of the informal learning spaces impacted the usage of the informal learning spaces. It could be clearly seen from Figure 6-27 and Figure 6-28 that over a half of the students felt that they were satisfied with the Situation of the informal learning spaces. The design of the informal learning spaces was planned to be used for continuing classroom discussions immediately following class time. Based on the survey, it could be seen that over 30% of the respondents still did not realise the value of the design quality of the informal learning spaces. At this point, it could be reflected that the students required to subjectively realise the functions and the usages of the informal learning spaces. A good Situation of the informal learning spaces provided students opportunities for continuing classroom discussions immediately following class time, which was one of the key design qualities of the informal learning spaces. Furthermore, the outside views were different between two cases. As mentioned earlier, there were lots of outside views in the



informal learning spaces of the Diamond. This provided not only natural light but also a clear legibility of the building. Students could feel at ease and find it easy to mark where they were. On the contrary, there were no landmarks outside of the Newton. Instead, the architects created an ultra-modern Central Court to link the two Grade II listed buildings, the Newton and the Arkwright, at the heart of the City Campus.

#### ***6.6.2 The Impact of the Situation upon Student Experiences.***

In this section, the design quality of the situation of the informal learning spaces is discussed to examine its impact upon student socialising and informal learning activities. The design quality of the situation refers to two ways: if the design quality of the situation support student who can continue classroom discussions immediately following class time and if the informal learning space provided sufficient outside views. The quantitative data on the student satisfaction with the supporting facilities of students who can continue with classroom discussions immediately following class time in the Diamond and the Newton, accounted for both around 52% while the proportion of the satisfaction on outside views of the Diamond is higher than that of the Newton, are 52% and 40%, respectively (see Table 6-10 and Table 6-11).

##### ***6.6.2.1 Location.***

The qualitative research stressed the significant impacts of the design quality of the situation of the informal learning spaces on student experiences. More specifically, the design quality of the situation firstly refers to whether the informal learning space supports students who can continue classroom

discussions immediately following class time. Located in the heart of the campus, the informal learning spaces of the Diamond at the University of Sheffield and at the Newton at Nottingham Trent University provided a fitting location for linking with students' formal learning spaces. The 'hub' engaged people into the space and made a substitute space extending the formal learning spaces into social spaces, where students could continue discussions immediately following class time. The location was next to the formal learning space and important to help stimulate communications in the informal learning spaces. According to the qualitative analysis, location places an important role in two cases.

The informal learning space of the Diamond, the heart of the Sheffield campus, had students preferring to choose a learning space, where it was next to their lecture settings or accommodations, to learn individually or in groups. Qualitative research in the Diamond also stressed the significance of the location. One participant (P3) argued that:

*.....Compared with the other two libraries [the Information Commons and the Western Bank Library], the Diamond is quite close to our department [Financial Economics] and our accommodation. Hence, in generally, students in our courses are all love to study in the Diamond because of the location.*

The location of the informal learning space is more important for attracting students in selecting and using the informal learning spaces. Based on the questionnaire, there are over 80% of respondents, at the Newton, who believed that the location is the main reason for their selecting and using the informal

learning spaces (see Table 5-6). One of the participants (PN5) at the Newton commented:

*... After the lecture, we will have small reviews with correction. After that, we immediately get into the group discussion and rush over details after it.*

The location could stimulate students to discuss issues immediately after the review and the lectures. This can also be observed before or after the lecture. There are more communication opportunities between lectures. A good location of the informal learning spaces usually promotes more interaction in the informal learning spaces.

#### 6.6.2.2 *Outside views.*



Figure 6-29: Outside view of the Newton from the north façade (left) and from the rooftop of the Central Court (right).

Furthermore, the outside views were stressed to enhance student experiences. There are some attracting outside views from the north and the south façade of the Newton. The Arkwright building, a Grade II listed building, where the department of Architecture, Design and the Built Environment is located, is recognised as a landmark of the Nottingham Trent Campus and provides a good

view for students in the informal learning spaces of the Newton. There is also a view of the Newton Building from the rooftop of the Central Court (see Figure 6-29). However, the informal learning spaces of the Newton were organised more horizontally. The spatial configuration of the Newton limits access to views outside. With a four-floor height atrium in the centre of the Diamond, the informal learning spaces of the Diamond provided better outside views than that of the Newton. The satisfaction with the outside views of the Diamond provide 12% more than that of the Newton. The respondents gave the positive feedback. As PD5 stated that,

*... I think the view in that place [the space next to the window] is excellent as it is fabricated by French windows. There, you can see the church facing towards the library.*

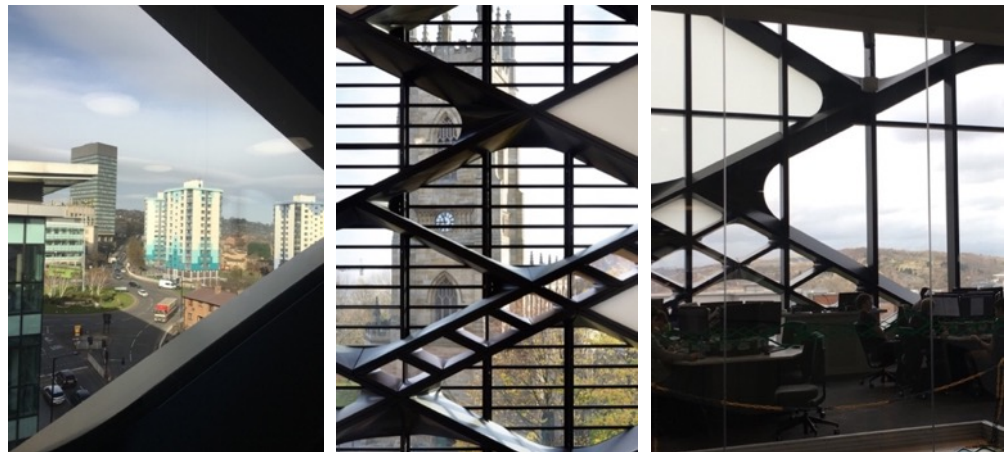


Figure 6-30: View of Arts Tower through the the aluminium diamond shaped West façade (left); View of St Georges Church through the aluminium diamond shaped east (middle); View of Parkwood Springs through the aluminium diamond shaped north façade (right).

Source from: <http://www.jackhobhouse.com/>

In the Diamond, the conflict between the old-style St Georges Church and an aluminium diamond shaped facade exterior, with galvanised steel sheets and glass, could even be one of their reasons for choosing where to sit. Students preferred to study in some areas with a different atmosphere from lecture halls

and seminar rooms. Remarkable outside views could be an attraction to inspire the desire for choosing places for discussion and study alone (see Figure 6-30).



Figure 6-31: The view of Computer Lab (left), EEE and Control Lab (right).

The outside view is not limited into the view outside of the building. The respondents also argued that the view of the formal learning spaces, such as the EEE and Control Lab and Pilot Plant in the Diamond (see Figure 6-31). The students were not allowed to have access to these specific rooms without permission cards. However, the transparent glass curtain wall provided them with a view inside of the specific rooms, which also visually enriched the students' experiences in the learning environment.

## **6.7 THE SPATIAL HIERARCHY.**

### ***6.7.1 Student Satisfaction of the Spatial Hierarchy.***

The data on student satisfaction with the Spatial Hierarchy of the informal learning spaces were collected from four specific aspects: Circulation, Legibility, Privacy, and Spacious. The data on student satisfaction with the Spatial Hierarchy collected from the respondents of the Diamond is summarised in Table 6-12. In order to better show the percentage of the selection, the data was translated into bar charts, as shown in Figure 6-32.

Table 6-12: The degree of student satisfaction with the Spatial Hierarchy of the informal learning spaces at the Diamond based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Stronly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>The Spatial Hierarchy</b>	21. <i>Circulation</i>	0	7	49	69	23	148
	22. <i>Legibility</i>	0	10	54	61	23	148
	23. <i>Privacy</i>	7	28	43	47	23	148
	24. <i>Spacious</i>	1	7	18	76	46	148

The satisfaction with circulation and legibility are almost the same. More specifically, there was both nobody selecting ‘Strongly Disagree’ while 23 respondents selecting ‘Strongly Agree’. Accordingly, the bar chart in Figure 6-32 indicates that in total around 5% of the respondents presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ in terms of the satisfaction with the circulation and legibility of the informal learning spaces at the Diamond. There were around 60% selecting the positive options of ‘Agree’, and ‘Strongly Agree’.

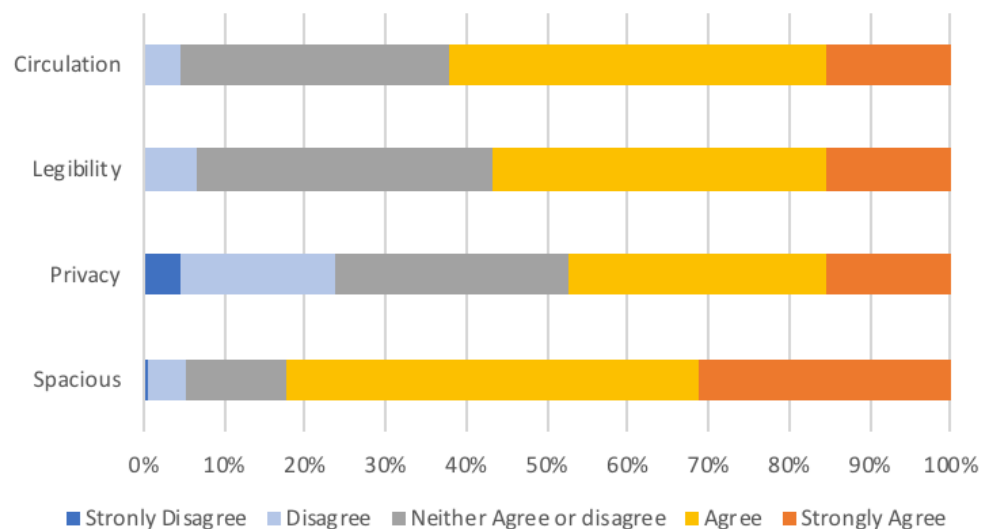


Figure 6-32: The percentage of the selection on student satisfaction with the the Spatial Hierarchy of the informal learning spaces at the Diamond based on the questionnaires.

In terms of the satisfaction with the privacy of the informal learning spaces at the Diamond, there were 7 people that selected ‘Strongly Disagree’ and 29 selected ‘Disagree’ regarding the satisfaction with the description of privacy. Moreover, 43 selected ‘Neither Agree nor Disagree’, 47 selected ‘Agree’, and

23 selected 'Strongly Agree'. The bar chart in Figure 6-32 indicates that in total over 20% of the respondents presented a negative view by selecting 'Strongly Disagree' and 'Disagree' with the satisfaction of the privacy. There were over 25% of the respondents that selected 'Neither Agree nor Disagree'. The remaining respondents selected the positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of positive feedback was over 45%; that means, an average of over 45% of the respondents selected 'Agree' or much more than 'Agree' regarding the satisfaction with the privacy of the informal learning spaces at the Diamond.

The satisfaction with the spaciousness is quite different from the other three aspects. More specifically, there were around 5% of the respondents that selected 'Strongly Disagree' and 'Disagree'. Meanwhile, there were around 15% selecting 'Neither Agree nor Disagree'. The remaining respondents selected the positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of positive feedback was around 80%; that is to say, an average of around 80% of the respondents that selected 'Agree' or much more than 'Agree' when describing their satisfaction with the spaciousness of the informal learning spaces at the Diamond.

The following paragraphs explain student satisfaction with the Spatial Hierarchy of the informal learning spaces of the Newton. The data on student satisfaction with the Spatial Hierarchy rate was collected from the respondents at the Newton. It is summarised in Table 6-13. In order to better show the percentage of the selection, the data was translated into bar charts, as shown in Figure 6-33.

Table 6-13: The degree of student satisfaction with the Spatial Hierarchy of the informal learning spaces at the Newton based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>The Spatial Hierarchy</b>	21. <i>Circulation</i>	1	7	38	40	11	97
	22. <i>Legibility</i>	1	11	46	28	11	97
	23. <i>Privacy</i>	7	28	40	16	6	97
	24. <i>Spacious</i>	0	4	17	47	29	97

The satisfaction with circulation and legibility is almost the same. More specifically, there was 1 respondent selected ‘Strongly Disagree’ while around 10 respondents selected ‘Strongly Agree’. The bar chart in Figure 6-33 indicates that in total around 10% of the respondents presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ in terms of the satisfaction with the circulation and the legibility of the informal learning spaces at the Newton. There were over 50% of the respondents that selected the positive options of ‘Agree’, and ‘Strongly Agree’ regarding the satisfaction with the circulation while there were over 40% of the respondents that selected the positive options of ‘Agree’, and ‘Strongly Agree’ on the satisfaction with the legibility.

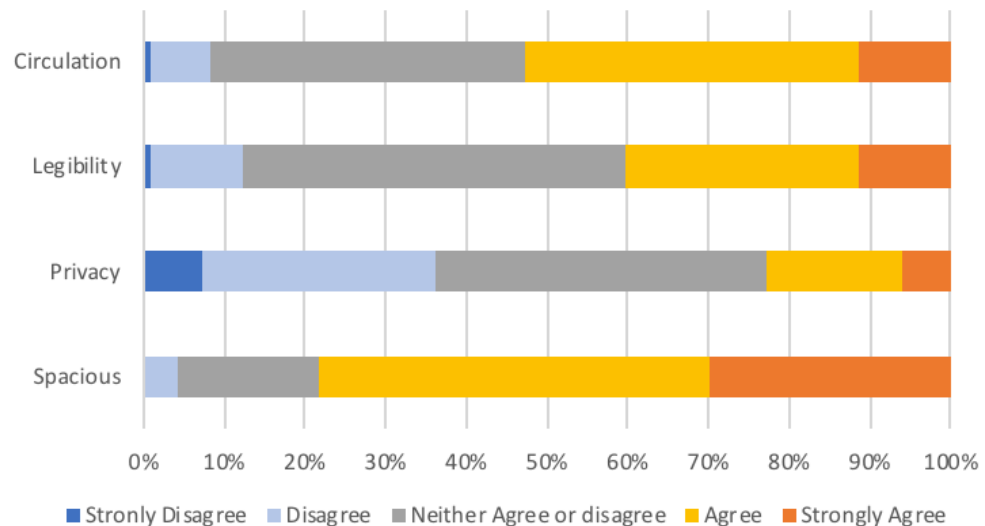


Figure 6-33: The percentage of the selection on student satisfaction with the Spatial Hierarchy of the informal learning spaces at the Newton based on the questionnaires.

In terms of the satisfaction with the privacy of the informal learning spaces at the Newton there were 7 people that selected ‘Strongly Disagree’ and 28



selected 'Disagree' regarding the satisfaction with the privacy. Moreover, 40 selected 'Neither Agree nor Disagree', 16 selected 'Agree', and 6 selected 'Strongly Agree'. The bar chart in Figure 6-33 indicates that in total over 35% of the respondents presented a negative view by selecting 'Strongly Disagree' and 'Disagree' regarding the satisfaction with the privacy. There were over 40% of the respondents that selected 'Neither Agree nor Disagree'. The remaining respondents selected positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of the positive feedback was over 20%; that is to say, an average of over 20% of the respondents that selected 'Agree' or much more than 'Agree' regarding their satisfaction with the privacy of the informal learning spaces at the Newton.

Quite different with the results of the satisfaction with privacy, the satisfaction with the spaciousness of the space is quite positive. More specifically, there are less than 5% of the respondents that selected 'Strongly Disagree' and 'Disagree'. Meanwhile, there were over 15% of the respondents that selected 'Neither Agree nor Disagree'. The remaining respondents selected positive options of 'Agree', and 'Strongly Agree'. Accordingly, the total percentage of positive feedback is almost 80%; that is to say, an average of almost 80% of the respondents that selected 'Agree' or much more than 'Agree' in describing their satisfaction with the spaciousness of the informal learning spaces at the Newton.

Based on the analysis, the students were satisfied with the circulation and the spaciousness of the informal learning spaces in both cases. In terms of legibility, the students believed that the informal learning spaces were more understandable at the Diamond. Over six thousand square metre of the informal

learning spaces at the Newton were located in two floors. The students who came there for the first time found that it was difficult to find where they wanted to go. However, with a four-floor high atrium and a spiral stair in the middle of the atrium, the informal learning spaces were much easier to read. In terms of the privacy, students believed that there was less privacy in the informal learning spaces of the Newton.

#### ***6.7.2 The Impact of the Spatial Hierarchy upon Student Experiences.***

In order to think over the possibilities of the impact of the Spatial Hierarchy of the informal learning spaces upon student activities, it is necessary to identify the definition of the communication. As mentioned in the Ambience section of this chapter, communication between students should be encouraged. However, communication is not only based on students communicating with each other, it also refers to entertainment as based on the performance of the spatial configuration. Designed with a clear spatial configuration, the circulation of the informal learning space could be simple and the legibility of the space, clear. In the informal learning spaces of the Diamond and the Newton, the atrium played a pivotal in determining the circulation of the settings and making the spatial organisation simpler and clearer. The atrium, investigated as an Open Space, provided a spatial ‘antinode’, where students could easily identify where they were and where their destination was. Therefore, the atrium of the Diamond and the Newton provided a place, where students could more easily gather for socialising or discussion.

In this section, the design quality – the Spatial Hierarchy of the informal learning spaces has been debated to examine its impact upon student socialising

and informal learning activities. Analysed through quantitative methods, the data of student satisfaction with the Spatial Hierarchy of the informal learning spaces was collected by questionnaires from four specific aspects: Circulation, Legibility, Privacy, and Spaciousness (see Figure 6-22 and Figure 6-23). This section interprets the design quality of the Spatial Hierarchy of the informal learning spaces by comparing the quantitative and qualitative data in the Diamond at the University of Sheffield and the Newton at Nottingham Trent University.

#### *6.7.2.1 Circulation.*

In terms of the circulation of the informal learning spaces, it refers that if the circulation of the informal learning spaces is helpful in increasing opportunities for socialising and using informal learning activities because of convenience, sufficient and efficient staircases and lifts. Based on the observation, it can be seen that five vertical transportation cores, which are arranged next to the informal learning spaces of the Diamond, provide a convenient, sufficient and efficient circulation system vertically. Meanwhile, sky bridges and corridors are created to enhance the connection horizontally. In terms of the circulation of the Newton, even though multiple entrances to the informal learning spaces are applicable and these passageways enhance the stability of the functional flow, the proportion of the respondents' satisfaction on the circulation of the informal learning spaces of the Diamond was higher than that of the Newton, at 62% and 52%, respectively. The large number of the students passing through the informal learning space of the Newton indicates their satisfaction.

Furthermore, the quantitative data from questionnaires indicates that there were both around 54% of the respondents agreeing that the circulation of the Diamond and the Newton helped to increase opportunities for socialising. However, the proportion of the respondents, who believed that the circulation at the Diamond and the Newton helped to increase opportunities for informal learning activities were varied at 50% and 66%, respectively. That is to say, students did not realise or believe that the circulation helped to increase the informal learning activities, which is also highlighted by Marsick et al. (2000). However, more respondents realised this situation. The qualitative data presented the same result. The respondents of the Diamond believed that the advantage of the circulation helps to find study spaces but is not helpful for improving informal learning activities. However, the respondents at the Newton saw the space as a social space. The closer the social space is next to their lecture space, the more possibilities they would use the space for learning.

#### *6.7.2.2 Legibility.*

The typology of the atrium enhances the legibility of the informal learning spaces of the Diamond and the Newton. Legibility refers to the spatial context's capability to be understood. Spatial configuration affects spatial behaviour and movement patterns (Hillier et al., 1993). The spaces derived much of their value from the physical context and connectedness with other spaces.

The informal learning space of the Newton was mainly identified as a corridor for students to pass through. Based on the observation, we can clearly see the position of the atrium in the educational complex system. The atrium between the Newton and the Arkwright Building linked the educational complex as a

whole (see Figure 6-34). In the atrium, students firstly used it as a passageway where they could go through and find where they wanted to go. Based on the observation, the population passing through in the informal learning space of the Newton is even over 16 times than the population socialising and doing informal learning activities. The huge population passing through has created the busiest place in the campus.

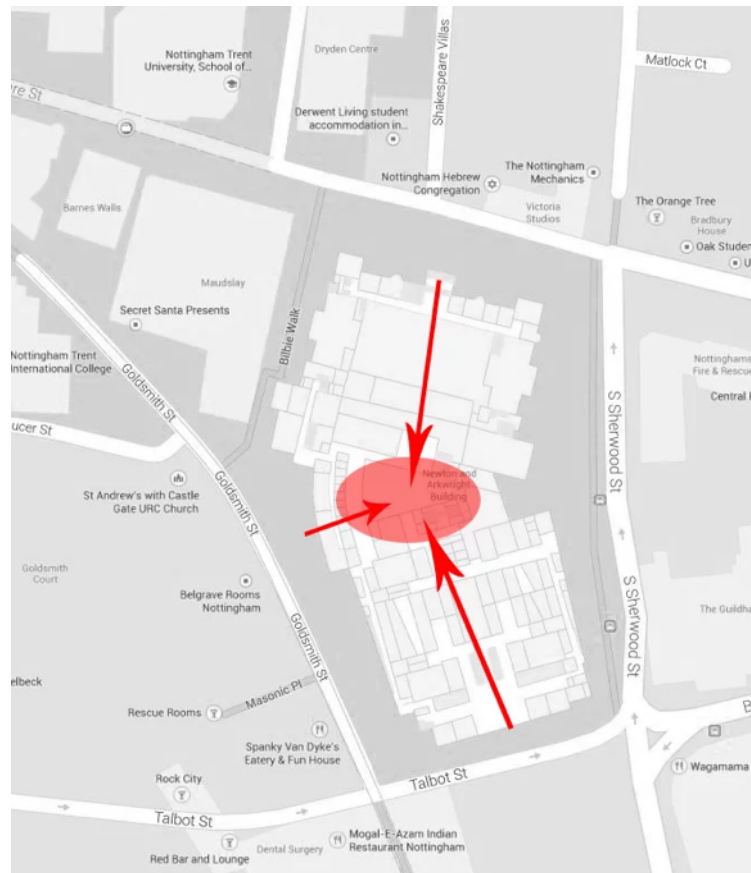


Figure 6-34: The atrium as a central hub of the educational complex at Nottingham Trent University.

As the heart of the Diamond, the axis of the atrium echoes the surrounding building environment (see Figure 6-35). The atrium of the Diamond provides students with both horizontal and vertical way to gather and then find the best route. The staircase for vertical use increased the accessibility of the atrium, making students easily get access to the atrium space

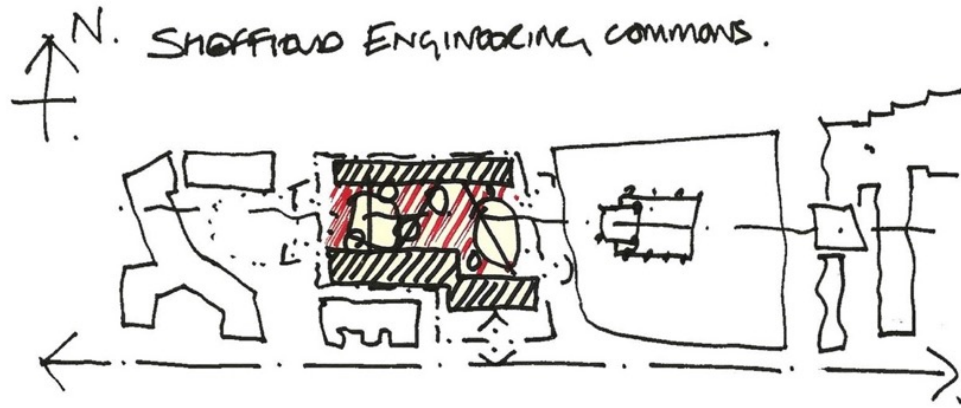


Figure 6-35: Sketch the relationship between the Diamond and surroundings.

Source from: <http://www.archdaily.com/779201/the-diamond-twelve-architects>

#### 6.7.2.3 Privacy.

The simpler and clearer the space is, the less privacy the space could provide. Based on the questionnaire, the satisfaction with the privacy of the informal learning spaces in the Diamond and the Newton were only around 48% (see Figure 5-26) and 22% (see Figure 5-27), respectively. Privacy is always a part of the comfort preference identified in the research by O'Connor (2005) into what makes a place more attractive as a space for learning activities. In the Diamond, a series of learning setting elements (see Table 6-5) achieve the requirement of the privacy. Even the Open Space of the Diamond, where it is seen as a public space, can also provide relatively privacy place for students. A group of students can sit face to face and communicate while individuals can sit facing to the provided computers where they are relatively separated from the others. The high back sofas were arranged along with the expanded corridor space, where this also provided a private place for a group of students. However, in the Newton, as a vibrant environment, the informal learning spaces are rarely seen as a private learning environment. Even the learning setting elements were created to be open to all. In there, students can share, talk and relax but are not encouraged to do activities in privacy.

## 6.8 OTHER SUPPORT.

### 6.8.1 Student Satisfaction of the Other Support.

The Data on student satisfaction with other support facilities in the informal learning spaces were collected from four specific aspects: It-rich environment, Wi – Fi coverage, Plugs and sockets, and Food and beverage. The data on student satisfaction with other support facilities collected from the respondents of the Diamond is summarised in Table 6-14. In order to better show the percentage of the selection, the data was translated into bar charts, as shown in Figure 6-36.

Table 6-14: The degree of student satisfaction with the other support facilities of the informal learning spaces at the Diamond based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Stronly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>Other Support</b>	25. It-rich environment	2	9	37	50	50	148
	26. Wi – Fi coverage	1	8	26	41	72	148
	27. Plugs and sockets	2	12	32	49	53	148
	28. Food and beverage	5	27	47	41	28	148

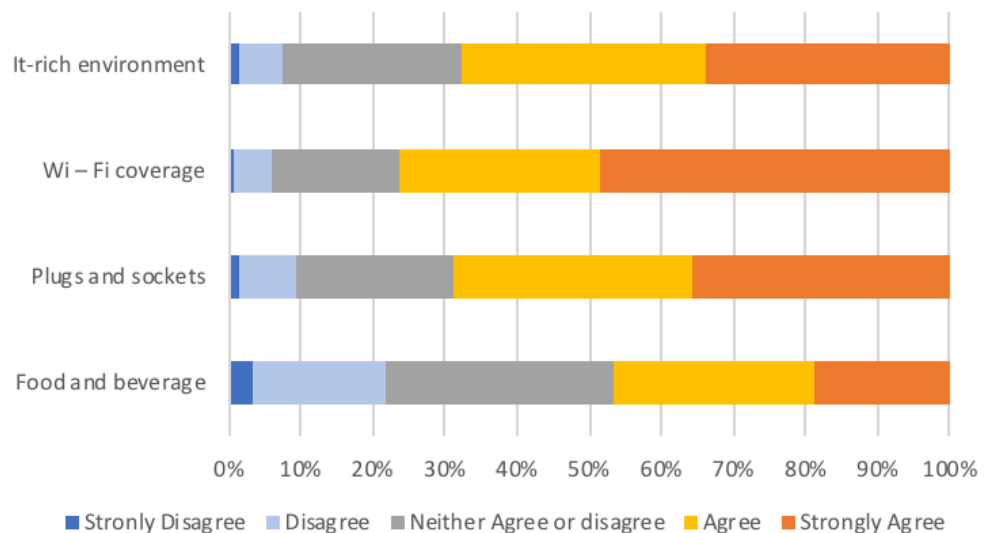


Figure 6-36: The percentage of the selection on student satisfaction with the other support facilities of the informal learning spaces at the Diamond based on the questionnaires.

With less than 10% of the respondents selecting ‘Strongly Disagree’ and ‘Disagree’ and around 70% of the respondents selecting ‘Agree’ and ‘Strongly

Agree’, the levels of satisfactions with an IT-rich environment, Wi-Fi coverage and Plugs and sockets reflect the same proportion. However, in terms of the satisfaction with food and beverages consumption in the informal learning spaces at the Diamond, the percentage of responses varies. More specifically, there were 5 people that selected ‘Strongly Disagree’ and 27 selected ‘Disagree’ regarding their satisfaction with the food and beverages. Moreover, 47 selected ‘Neither Agree nor Disagree’, 41 selected ‘Agree’, and 28 selected ‘Strongly Agree’. The bar chart in Figure 6-36 indicates that in total over 20% of the respondents presented a negative view by selecting ‘Strongly Disagree’ and ‘Disagree’ regarding their satisfaction with the food and beverage. There were over 30% of the respondents selecting ‘Neither Agree nor Disagree’. The remaining respondents selected the positive options of ‘Agree’, and ‘Strongly Agree’. Accordingly, the total percentage of the positive feedback was over 45%; that is to say, an average of over 45% of the respondents that selected ‘Agree’ or much more than ‘Agree’ regarding the satisfaction with the food and beverages at the informal learning spaces at the Diamond.

Table 6-15: The degree of student satisfaction with the other support facilities of the informal learning spaces at the Newton based on the questionnaires.

Design Quality	I feel that I am satisfied with...in this space	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	Total
<b>Other Support</b>	25. <i>It-rich environment</i>	3	19	37	22	16	97
	26. <i>Wi – Fi coverage</i>	2	15	20	33	27	97
	27. <i>Plugs and sockets</i>	11	31	28	16	11	97
	28. <i>Food and beverage</i>	1	9	22	39	26	97

The following paragraphs explain student satisfaction with the other support facilities within the informal learning spaces at the Newton. The data on student satisfaction with the other support facilities was collected from the respondents at the Newton. It is summarised in Table 6-15. In order to better show the



percentage of the selection, the data is translated into bar charts, as shown in Figure 6-37.

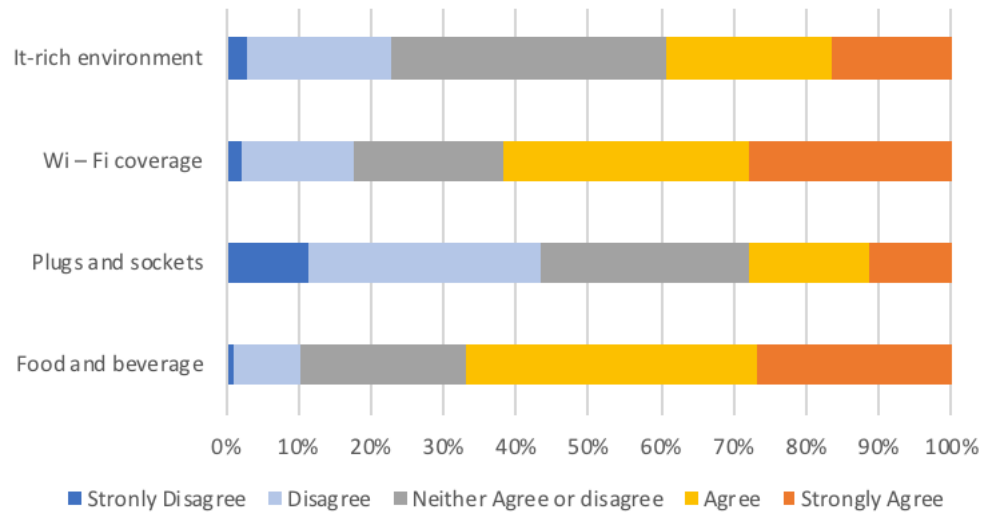


Figure 6-37: The percentage of the selection on student satisfaction with the other support facilities of the informal learning spaces at the Newton based on the questionnaires.

In terms of the satisfaction with the IT-rich environment at the Newton, there were over 20% of the respondents that selected ‘Strongly Disagree’ and ‘Disagree’. Furthermore, there were only less than 40% of the respondents that selected ‘Agree’ and ‘Strongly Agree’ on the satisfaction with the IT-rich environment at the Newton. The number of selecting ‘Strongly Disagree’ and ‘Disagree’ with their satisfaction with the Wi-Fi coverage of the informal learning spaces at the Newton is also almost 20%. However, there were over 60% of the respondents believed that they ‘Agree’ or ‘Strongly Agree’ with the effectiveness of the ‘Wi-Fi coverage’. In terms of the satisfaction with ‘plugs and sockets’ at the Newton, there were over 40% of the respondents selecting ‘Strongly Disagree’ or ‘Disagree’. There were only over 25% of the respondents satisfied with the use of ‘plugs and sockets’. They selected ‘Agree’ or ‘Strongly Agree’ at the Newton.

In terms of the satisfaction with the food and beverages at the Newton, there were over 10% of the respondents that selected 'Strongly Disagree' or 'Disagree' while over 65% of the respondents that selected 'Agree' or 'Strongly Agree' regarding their satisfaction with the food and beverages at the Newton.

All in all, student satisfaction with the other support facilities in the informal learning spaces in both cases were varied. More specifically, the students were more satisfied with the support of the food and beverages at the Newton than at the Diamond. With one canteen and two café bars opened daily, it is much easier for students to eat at the Newton. However, there was only one café area located on the ground floor of the Diamond. The students were worried about finding a new place for learning after having a lunch downstairs. In terms of plugs and sockets, over 40% of the respondents presented their dissatisfactions with the informal learning spaces of the Newton, which was 3 times higher than of the Diamond. Again, as a main space for passing through, there were not many monitors etc. allocated at the Newton. Therefore, there were only around 39% of the respondents presenting their satisfactions with the IT-rich environment of the informal learning spaces of the Newton while the percentage of satisfaction with the IT-rich environment of the informal learning spaces of the Diamond reached 68%.

#### ***6.8.2 The Impact of the Other Support upon Student Experiences.***

Analysed through quantitative methods, the data on student satisfaction with the Other Support of the informal learning spaces was collected through questionnaires from four specific aspects: It-rich environment; Wi – Fi coverage; Plugs and sockets; and Food and beverage (see Figure 6-36 and Figure 6-37).

In this section, the design quality – the Other Support of the informal learning spaces is debated to examine its impact on student socialising and informal learning activities.

Technological support has already become one of the characteristics of the learning environment in the 21<sup>st</sup> century (Beetham & Sharpe, 2013). The impact of information technology on learning spaces has already been further discussed, in-depth, by Oblinger et al. (2005: 14), who claim that '*The internet has changed notions of place, time, and space. Space is no longer just physical*'. Technology is important for the 21<sup>st</sup> century students. As McDaniel (2014) highlights, student preferences for technology influence how they seek to communicate and engage with their education experience. Future learning spaces require being designed with an IT-rich environment to support multiple modes of socialising and informal learning activities. Providing students with access to tools, the IT-rich environment that supports research, communication, and other learning-related activities (Lippincott, 2006).

Based on the qualitative analysis, it is evident that student requirements impact the design quality of the informal learning spaces. More specifically, the respondent (PN5) expressed her wishes for an IT-rich environment, especially on big monitors in the informal learning spaces. She believed that necessary technological support could improve the efficiency and occupancy of the informal learning spaces:

*If the informal learning space could provide more big monitors, more small or big group discussion areas I would be happier to use this space.*

*I remembered there were some big monitors in the Central Gallery, but*

*we didn't know if we have the right to use them. So, some monitors are not used. However, the big monitors are always occupied in the Boots Library. That is to say, students have demands to use big monitor for practicing presentations. However, it will be nice to allocate some big monitors in this kind of social informal learning space. The efficiency of social informal learning spaces will improve. After the lecture, we will have small reviews with correction. After that, we immediately get into the group discussion and rush over details after it. So, social informal learning spaces should provide us a place to discuss and practice presentations.*

Moreover, the students were sensitive to the support of the Wi-Fi coverage. Even though over 75% and over 60% of the students were satisfied with the Wi-Fi coverage in the informal learning spaces of the Diamond (see Figure 6-36) and the Newton (see Figure 6-37) based on the questionnaires. The condition of the network was still a strong argument point during the interviews and focus group. Almost all the respondents agreed with respondent (PN5)'s opinion regarding improving Wi-Fi networks and the impact of the Wi-Fi network upon the student socialising and studying activities at the Newton, stating that,

*... The Wi-Fi of this area (Central Gallery) and especially large lecture hall is so bad. Even though you are successfully connected the Wi-Fi, you cannot surf on the internet and it is always disconnected. It extremely impacts our socialising and studying. Especially when we cannot open lecture slide online.*

In terms of sufficient plugs and sockets in the informal learning spaces, it is also an essential aspect to retain students in the learning environment. In this regard,

the support of the Diamond is better than that of the Newton. More specifically, the quantitative data indicates that more than 69% of the respondents were satisfied with the availability of the sufficient plugs and sockets at the Diamond (see Figure 6-36), while over 44% of respondents were dissatisfied with the Newton (see Figure 6-37). That is to say, students expressed their strong desire for the plugs and sockets in the informal learning spaces. As a key aspect, sufficient plugs and sockets could decrease the limitations of students selecting studying areas where they used electrical equipment that required charging batteries.

Furthermore, supporting students' dietary related activities can significantly attract students getting involved. Researchers (Brown & Lippincott, 2003; Jamieson, 2009) found that being able to eat and drink contributes to making a space attractive to learners. Over 65% of the participants reported that food and drink helped them to stay in the Newton which is 20% higher than that of the Diamond (see Figure 6-36 and Figure 6-37). In the Newton, the main canteen attracted a number of students involved, who have their lunch there (see Figure 6-38). Meanwhile, there are two café shops on each floor to support student daily usage.

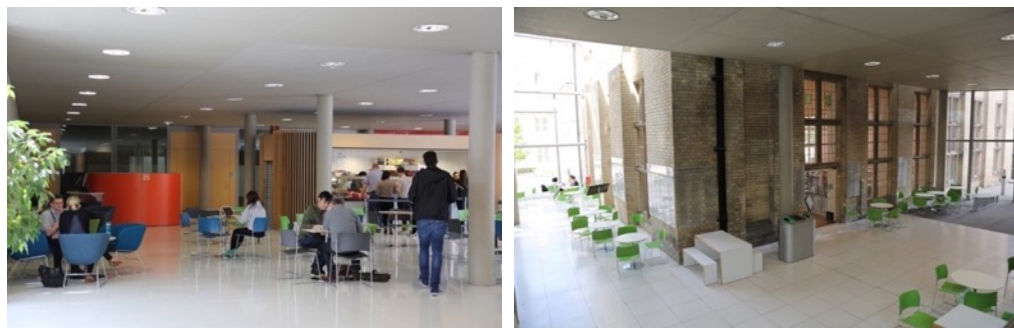


Figure 6-38: The food bar (left) and the food court (right) of the Newton at Nottingham Trent University.

*Source from: Photo by author.*



Figure 6-39: The Diamond Kitchen of the Diamond at the University of Sheffield.

*Source from: Photo by author.*

However, there was only the Diamond Kitchen situated on the ground floor of the Diamond. Even though the Diamond Kitchen offers ‘*a wonderful array of international flavours with a fantastic grab and go offer, complimented by a sleek and stylish design*’ as the website describes (see <https://www.sheffield.ac.uk/foodanddrink/diamond>), and attracts all the students eating and relaxing here, limited seats and spaces can only hold some of people. Based on the observation, it is clear that the Diamond Kitchen is the main area for holding Dietary Related Activities at the Diamond and that only around 30% of the participants did Dietary Related Activities (see Figure 5-2). Meanwhile, the score of the Usage Index reached to 7.44 (see Figure 5-1). Based on the quantitative data, the Café Area was the busiest area of the Diamond, where a large number of students got involved and engaged in Dietary Related activities with other student activities.

Based on the results of the observation (see Figure 5-2), except Dietary Related activities, the proportion of the respondents at the Diamond, mainly doing Focused Informal Learning, Focused Socialising and Ambient Sociality accounted for around 23%, 30%, and 12%, respectively. The results concluded that there were also ‘learning’ activities occurring in the Café Area at the Diamond. The positive impact of the Café Area, considered as a place for social learning, is also acknowledged by Brown and Lippincott (2003). The Café Area,

designed to support everyday experience, tends to stimulate informal learning as the outcome of incidental learning (Conlon, 2004).

Based on the results of the observation at the Newton (see Figure 5-3), Dietary Related activities were the main activities in the Café Area at the Newton. There were almost no informal learning activities occurring in it. That is to say, the informal learning activities are not encouraged in the Café Area at the Newton. This result proves the research conclusion by Bryant et al. (2009: 10), who highlighted that the Café Areas don't promote a '*conducive learning atmosphere*'. This result is conflicted with the performance at the Diamond. That is to say, it is hard to say a Café Area is a good place for supporting student informal learning activities. However, the Café Area is a good place for prompting student socialising activities and communication. Moreover, the support of the food and beverages enhances blended student experiences in the informal learning spaces.

## **6.9 SUMMARY.**

The sections above have systemically analysed the significant impact of the seven design qualities of the informal learning spaces on student activities. This has been done, by comparing the Diamond at the University of Sheffield and the Newton at Nottingham Trent University. The mixed methods research has provided solid evidence to show the impact of the design qualities of the informal learning spaces on student activities, while revealing the necessity of well-designed informal learning spaces. This chapter has enumerated the correlation between the students' subjective learning experiences and their satisfaction with the design qualities of the informal learning spaces. Combined

with the qualitative analysis of this chapter, the support factors of the seven design qualities of the informal learning spaces at the Diamond and the Newton have been discussed and they indicate the key spatial characteristics of the informal learning spaces. These are further discussed in the next chapter.



## **7. CHAPTER 7: DISCUSSION.**

Based on the questionnaire and observation methods, the Chapter 5 investigated the student experiences and student satisfaction with the design qualities of the informal learning spaces of two contexts, the Diamond at the University of Sheffield and the Newton at Nottingham Trent University. The investigation presents solid evidences regarding student experiences and how they determine the levels of student socialising and informal learning activities in relation to where, when, what and why they behave in the informal learning spaces. The six types of student activities occurring in the four functional zones of the informal learning spaces in four time-periods, reflect the students' daily usage of the informal learning spaces. Using a mixed methods design approach, including observation, questionnaires, interviews and focus group, the Chapter 6 interpreted students preferences of the seven design qualities, which are based on the analytical framework (see Table 3-15), and emphasised the impact of these design qualities on student experiences.

In this chapter, the meanings of the key findings are further discussed. More specifically, the student experiences, including the usage of the functional zones in the informal learning spaces, the time period of regular use in the informal learning spaces, reason of selecting and using the informal learning spaces, and student socialising and informal learning activities in the informal learning spaces, are firstly compared to highlight the main similarities and differences between the two case studies. After that, the analytical framework of evaluating informal learning spaces were regenerated to explicitly reveal the correlations of how the design qualities impact the student activities, and how they are used

to impact the spatial design strategy of the higher education informal learning spaces, while contributing to the literature around exploring the design of the informal learning spaces.

## **7.1 THE COMPARISON OF STUDENT USAGE OF THE INFORMAL LEARNING SPACES BASED ON TWO CASE STUDIES.**

### ***7.1.1 Café Area – a catalyst for activating student experiences in the informal learning space.***

The usages of the functional zones in the informal learning spaces are different regarding to the different contexts. However, all the well-designed informal learning spaces should have the similarities to copy with the new trend of design learning spaces in the 21<sup>st</sup> century. Figure 5-1 used UI score to give an indication of student using four different functional zones in the informal learning spaces at the Diamond and the Newton. As the result shows, the café area becomes a place with the highest score of UI, which means that comparing with the other functional zones, the Café Area is one of the most popular places for students' activities. One of the main reasons is its functional characteristic – providing food and drink, which extremely provides convenience to students and rejuvenates them from the tiredness. That is, the success of the Café Area is mainly based on their convenience. According to Figure 6-36 and Figure 6-37, most of the students are satisfactory with the Café Area at the Diamond (78%)

and the Newton (89%). The differences can be explained by the settings of the Café Area in two case studies.

Table 7-1: The comparison of the usage of the café area at the Diamond and the Newton

Source from: <https://www.sheffield.ac.uk/foodanddrink/diamond> &

<http://www4.ntu.ac.uk/apps/news/96222->

[25/Grab a bite to eat at our new cafes in Newton and Arkwright.aspx](http://www4.ntu.ac.uk/apps/news/96222-25/Grab+a+bite+to+eat+at+our+new+cafes+in+Newton+and+Arkwright.aspx)

Cases	Location	Open times	Tips
<b>The Diamond</b>	Ground floor next to the main entrance	8am - 10pm 7 days a week	The Diamond Kitchen offers a wonderful array of international flavours with a fantastic grab and go offer, complimented by a sleek and stylish design.
<b>The Newton</b>	Level 1 – Coffee Pod	8.30 am – 5.30 pm Mon - Fri	Located in the entrance of Newton, you can grab a drink from 85p. Our delicious range includes hot and cold drinks, fresh sandwiches and a selection of pastries to go.
	Level 0 – Deli Pod	10 am – 3 pm Mon - Fri	Why not try our new deli pod where you can create a deli sandwich freshly filled for you, from a range of delicious ingredients.
	Level 0 – Café Arkwright	8.30 am – 2 pm Mon - Fri	Serving freshly cooked meals including breakfast and daily specials, you're in for a treat when you come to Café Arkwright.



Figure 7-1: Diamond Kitchen in the Diamond at the University of Sheffield.

Source from: <http://withusatunicus.com/portfolio-item/case-study-2/>

As it is shown in Table 7-1, the Diamond, located on the ground floor next to the main entrance, opens 8am – 10pm every day, offers maximum conveniences for students to get food and drink. Except the convenient location, and extended

opening times, an array of international flavours with a fantastic grab and go offer, complimented by a sleek and stylish design, also attract students' attentions. Compared with the Café Area at the Diamond, The Newton provides a Coffee Pod on the Level 1 and two service points, Deli Pod and Café Arkwright on the Level 0. All these service points provide variety of food and open in different time period. The queue of the Café Area at the Newton can also be shorten compared with just one service point at the Diamond.



Figure 7-2: Café Area in the Newton at Nottingham Trent University

Source from: [http://www4.ntu.ac.uk/apps/news/96222-25/Grab\\_a\\_bite\\_to\\_eat\\_at\\_our\\_new\\_cafes\\_in\\_Newton\\_and\\_Arkwright.aspx](http://www4.ntu.ac.uk/apps/news/96222-25/Grab_a_bite_to_eat_at_our_new_cafes_in_Newton_and_Arkwright.aspx)

From the perspective of the opening times, the extended opening times until 10pm at the Diamond provide a more opportunities for students even staying at the Diamond at night. In terms of the opening times of the Café Area at the Newton, three café service points are both open covering lunch time to ensure the sufficient food and drinks for students. Outside of the opening times, the tables and chairs around the Café shop can be used as a place for socialising and informal learning spaces. Consequently, it can be seen that café area at the Diamond (see Figure 7-1) and the Newton (see Figure 7-2) is a stimulating place

that keeps students staying in and is the spaces where the most blended experiences occur.

### **7.1.2 Time period of regular use in the informal learning spaces.**

How long the students can stay in the informal learning spaces and how many students keep staying in the informal learning spaces can indicate the efficiency of the informal learning spaces. According to the enquiry, the time period of regular use in the informal learning spaces at the Diamond and the Newton are investigated and the comparison can be seen in Figure 7-3.

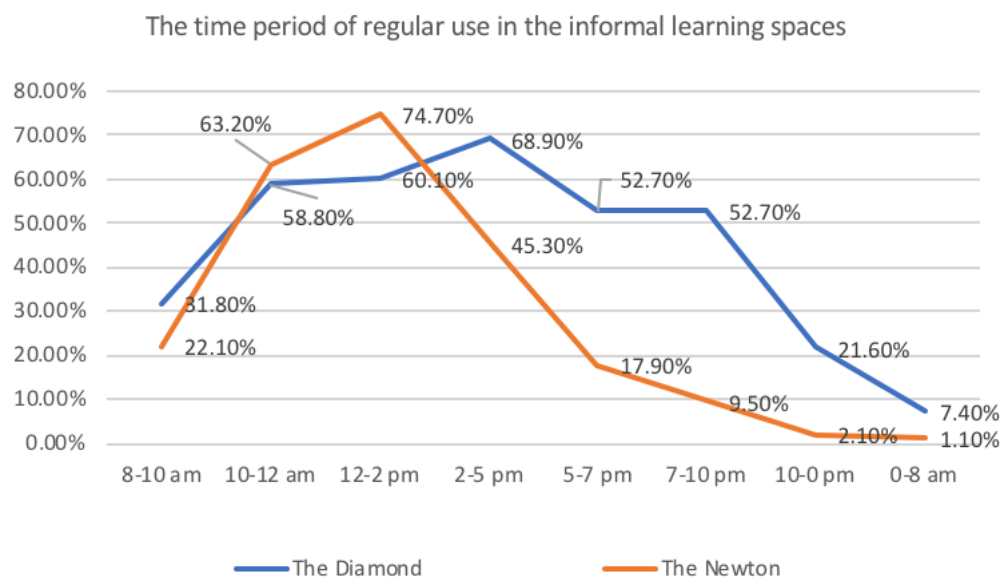


Figure 7-3: The percentage of student selecting time periods of regularly using the informal learning spaces of the Diamond and the Newton.

It can be clearly seen that the number of students staying at the Diamond keep in a high percentage for quite a long time (over 50% from 10am – 10pm). However, the 50% of the respondents stay in the Newton only from 10am – 2pm. This result is in relation to the functional characteristic of two informal learning spaces. The Diamond is organised as a learning space where learning process is well considered, and the architect aims to retain students in the

Diamond with satisfactory for a long time to support their studies. Therefore, the design qualities and spatial organisations of the informal learning spaces at the Diamond are aiming to provide more options for all the students. From the time period of regular use at the Diamond, students are free to access with their student cards in 24/7 throughout the year.

Comparatively, the function of the Newton is to link different departments and support students' transition from lecture to lecture. Moreover, the Newton is a place for students to have a rest a lunch time. Therefore, it can be seen that the peak time of the Newton is lunch time. The Newton will be closed when there is no lecture at night time. Consequently, it provides a relatively dark light environment and less support for student staying in due to energy consumption.

### ***7.1.3 Reason of selecting and using the informal learning spaces.***

Students have their own preferences to choose a learning space. In terms of the design quality and spatial organisation of the higher educational informal learning spaces, the investigation found out that some of the reasons are very important to indicate their choices. Figure 7-4 presents the percentage of the reason of student and using the informal learning spaces of the Diamond and the Newton. The data are collected based on the questionnaire. With 15 possible reasons (see Table 4-13), the percentage of students choosing the reasons of selecting and using the informal learning spaces at the Diamond and the Newton are marked blue and orange, respectively. Consequently, the Lit Environment (81.8%), the Other Support (80.4%), Functionality (68.2%), Accessibility (67.6%), Openness (64.9%), Temperature (62.2%), and Flexibility (52.7%), are top seven important design qualities for students selecting and using the

informal learning spaces at the Diamond while Accessibility (80.4%), Lit Environment (73.2%), the Other Support (67%), and Openness (62.9%), Temperature (60.8%), Flexibility (54.6%), Functionality (53.6%), are top seven keys design qualities at the Newton.

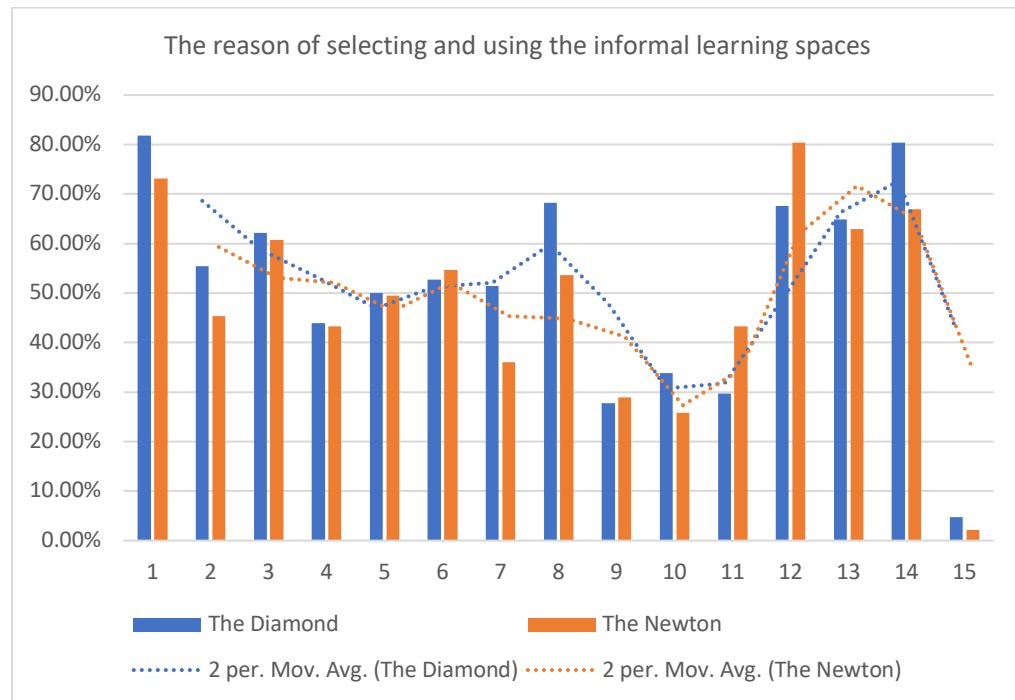


Figure 7-4: The percentage of the reason of selecting and using the informal learning spaces of the Diamond and the Newton.

Top seven design qualities are mentioned because the percentages of the respondents on these seven design qualities are over 50%. An astonished result is that even though the orders of the seven design qualities as the reasons of selecting and using the informal learning spaces at the Diamond and the Newton are different, there are the same seven design qualities as the reason of selecting and using the informal learning spaces in two case studies. That is to say, these seven design qualities can be seen as important to evaluate and design the informal learning spaces, which slightly different from the analytical framework mentioned in the literature review (see Table 3-15). These seven design qualities

can be used to evaluate the design of the informal learning spaces, which will be explained in the section 7.2.

#### ***7.1.4 Student socialising and informal learning activities in the informal learning spaces.***

The student socialising and informal learning activities in the informal learning spaces were collected based on the questionnaire. The percentages of the 22 different degrees of the student activities (Table 4-10) in the informal learning spaces of the Diamond and the Newton are compared (see Figure 7-5). As the 22 degrees of the student activities is ordered based on the descending order, which means that student activities tend from more informal learning process at left to more socialising at right in the Figure 7-5. As the results show, more informal learning activities occurred at the Diamond while more socialising activities at the Newton.

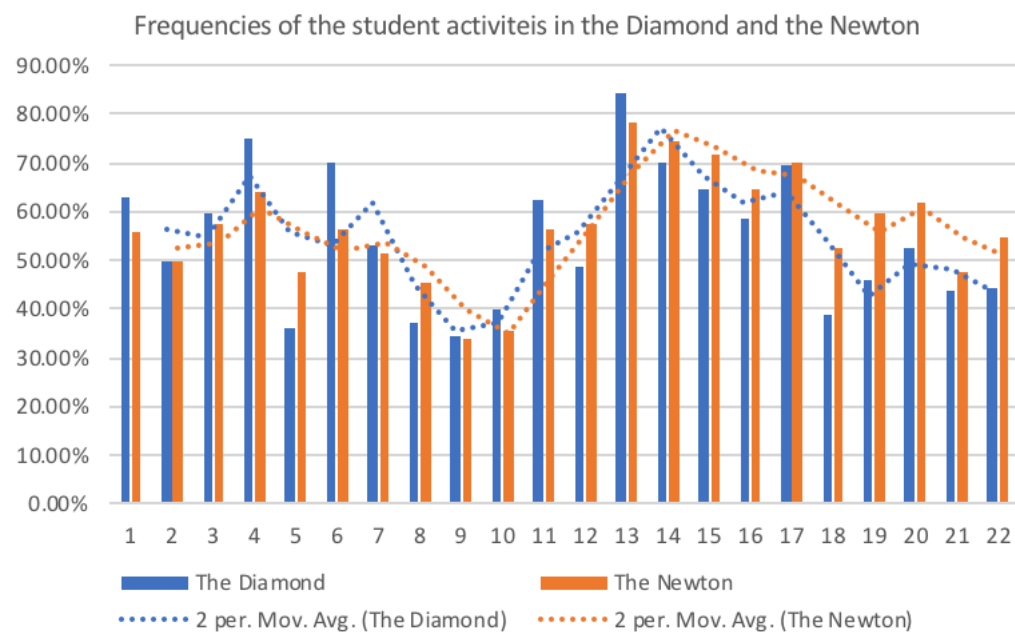


Figure 7-5: The percentage of the frequencies of the student activiteis in the informal learning spaces of the Diamond and the Newton.



However, there are some exceptions. In terms of the informal learning activities, the percentages of the student behaviours on talking about career plans and receiving prompt feedback from the faculty on academic performance at the Newton are higher than at the Diamond. The informal learning spaces at the Newton is widely reshaped as a place for review, seminar and giving feedbacks by the staff, which enhance the efficiency of the informal learning spaces during the off-peak time. In terms of socialising activities, the percentages of the respondents who have a meal and take a call at the Diamond is higher than at the Newton. Even though there is one popular and convenient Café Area next to the main entrance at the Diamond – the Diamond Kitchen, and they are not allowed to have hot food in the informal learning spaces at the Diamond, it cannot meet the requirements of food and beverages for such a lot of students during the peak time. Consequently, as the investigation shows, the percentage of the students having a meal in the informal learning spaces at the Diamond is higher than at the Newton.

## **7.2 ANALYTICAL FRAMEWORK OF EVALUATING INFORMAL LEARNING SPACES.**

The previous section compared student usage of the informal learning spaces based on two case studies. Take the two case studies as examples, this section emphasises the impact of the seven design qualities of the informal learning spaces and on student socialising and informal learning activities, which

generate an analytical framework to evaluate the design of the informal learning spaces.

### **7.2.1 Comfort.**

Comfort is a sense of physical or psychological ease (Kolcaba & Kolcaba, 1991) and the lighting comfort, acoustic comfort, thermal comfort in the educational buildings have been statistically analysed by academics (Barbhuiya & Barbhuiya, 2013; Butcher, 2006; Gilavand et al., 2016; Mumovic et al., 2009). Most of them focus on the formal learning spaces such as classrooms and the research on the informal learning spaces is limited. Meanwhile, the concept of the Neutrality (Gagge et al., 1967), such as Thermal Neutral Zones, blurs the degree of accuracy and meaning of the statistical results. More specifically, if the room temperature is around a certain degree, then people have no opinion about the temperature (Gagge et al., 1967). However, comfort is a basic need based on Maslow's hierarchy of needs (see Figure 3-9). Physiological needs are thought to be the most important and they should be primary. Consequently, this research discusses the student perceptions of the physical comfort instead of the statistical analysis first, beyond all the other design qualities of the informal learning spaces.

The results regarding physical comfort indicate how the overall satisfactions with physical comfort is met by students. Light, Acoustics and Temperature are three key aspects that determine physical comfort in the informal learning spaces. However, there are still some different opinions from different students and differences between the two cases.

More specifically, the student satisfaction with the lit environment at the Diamond is better than that at the Newton. Compared with the socialising activities, informal learning activities require a brighter environment. This is partly the reason why students used the informal learning spaces at the Newton more in day time than at night. However, the lit environment at the Diamond works in both day time and night time. Students were retained to do learning activities at the Diamond for a longer time period (See Table 5-3).

The student perception of the acoustics indicates that the acoustic level is more satisfactory at the Diamond than that at the Newton. This can be explained in two parts. Firstly, students in the Open Space and Corridor Spaces of the Diamond, doing informal learning activities, are almost 75% and 85%, respectively (See Figure 5-2). The majority of the background noise is also generated from group discussions or collaboration activities. These are relatively lower than the sounds of students doing socialising activities and passing by. Secondly, students that chose to study in the Open Space and Corridor Space of the Diamond are more tolerant of the background noise (PD3) stated that,

*‘Well, besides loud noises made on purpose, sounds from the surroundings have little effect on me. It really doesn’t matter if the discussion occurred in the booked private room or simply in the open study place. In fact, I prefer working with some background sounds.’*

There are also plenty of silent studying rooms at the Diamond for students who are not comfortable with background noises.

However, there were over half of students involved in socialising activities at the Newton and more people passing through the informal learning spaces at the Newton. Consequently, students who were doing Focused Informal Learning activities in it (see Figure 5-8), felt to be impacted by the noise of socialising activities and people passing by. Hence, to stimulate informal learning activities, it is important to create a place where students could realise that this is a place designed for informal learning activities rather than socialising activities. The learning atmosphere requires the control of the acoustic levels.

Temperature is also a considerable design quality for the informal learning spaces. The respondents at the Diamond and the Newton mentioned about the importance of keeping appropriate temperatures in the learning environment. To this point, the glass curtain walls and glass rooftops contribute to the dilemma. From one side, the transparent walls and rooftops provide sufficient natural lighting, which is highlighted by respondents (PN5 and PD7). However, from another perspective, they also effect the indoor temperature of the building. Well-considered architectural settings should be considered by managers and architects to improve student satisfaction with the temperature of the learning spaces.

### **7.2.2 Flexibility.**

Flexibility is a key characteristic of spaces that successfully support informal learning, allowing students to adapt their physical environments to accommodate individual preferences (McDaniel, 2014; Keppell et al., 2012). The two cases, the Diamond at the University of Sheffield and the Newton at

Nottingham Trent University, carefully consider the flexibility of their informal learning spaces. As Table 6-5 illustrates, the categories of the informal learning spaces of the Diamond and the Newton, especially the Open Space and the Corridor Space, support different group sizes of student learning and socialising activities, provide ample models of the boundary control, possess the abilities to reconfigure their learning space, and enhance diverse ambiances. These types of the informal learning spaces are designed for explore alternative modes of learning to support student different learning styles (Coffield et al., 2004). Based on this research, except for the diverse learning settings supporting varied student learning styles, it also mentioned the impact of the diverse movement flow upon student experiences in the informal learning spaces can be noted. The extended informal learning space at the Newton can hold many students passing through and doing socialising activities. The findings emphasise the importance of the spatial configuration and the spatial hierarchy. This will be discussed in the Spatial Hierarchy section.

### **7.2.3 Socialising.**

As an informal learning space, students could decide what they want to do, where they prefer to remain or to leave and to use the informal learning spaces, and which time period they want to get involved. They can also have their own reasons why they select and use the informal learning spaces. Socialising ambience refers to the way informal learning spaces support social interaction and improve this relaxed phenomenon. Focused Socialising activities, including casual chatting and taking a break from studies with friends, Dietary Related activities, and Ambient Sociality, including attending events such as exhibition,

open days or coursework shows, finding the space as a route to a lecture room or gathering to go to another place together and people watching, etc., are observed as a solid evidence to prove the existence of socialising activities in the informal learning spaces. These activities cannot be examined to reinforce the performance of the informal learning spaces in this research, but they are indeed not inevitable to occur in the informal learning spaces as they generate the socialising ambience. Meanwhile, this socialising ambience seems to be a key learning preference expressed by learners who viewed it as, *designed as a place where students do whatever they want to do (PN2)*. These activities, essentially, face-to-face social interaction, remain important to student experience (Weaver, 2006). Meanwhile, respondent (PN4) claimed that the socialising ambience made them really '*rejuvenated*' in the Newton. Furthermore, student experiences and their rejuvenation generate a learning model for the Intermittent Exchange: Study alone, but with occasional interaction with others. This type of the student activity refers to learners undertaking an independent piece of work, but working near to or next to peers who are known to them. This behaviour has also been reported by O'Connor (2005), who termed it studying alone and Harrop and Turpin (2013) who termed it '*working alongside*' (p. 16). As they mentioned, these types of activities are not capable of quantifying the frequency based on the observation method alone. However, with questionnaires, the frequencies of studying alone in two cases were inquired. Based on the questionnaires, the students indicate their frequencies of the study alone at the Diamond and the Newton, at 78% and 57% respectively (see Figure 5-7 and Figure 5-8). It can be seen from the data

collected by observation that study alone is really commonly seen in the informal learning spaces.

#### **7.2.4 Openness.**

The previous section indicates the impact of the socialising ambience upon student experiences in the informal learning spaces. However, it did not mention how socialising ambience is generated. In this thesis, the definition and models of the informal learning spaces are narrowed down (see Table 1-1 and explanation in Chapter 1 section 2) and the informal learning spaces leveraging circulation areas are selected as the objects of the study (see case study selection in Table 2-2). Consequently, in-between spaces, such as the corridor and atrium, are particularly designed to intensify the efficiency and efficacy of the learning process. Corridor space will be explained in detail in the Spatial Hierarchy section below. In terms of the atrium in the informal learning space, it provides a '*visual antidote*' (Douvoulou, 2004: 22) for students, who are coming out from the lecture halls and classrooms. This spatial configuration of the atrium brings people into a space, gives them reasons to linger, converse, share ideas or enjoy lingering in different areas of the learning environment. These spontaneously occurring activities are encouraged in the atrium, which provides a socialising ambience for the space. Particularly, over 55% of the students socialised at the Open Space of the Newton (see Figure 5-3). Beyond that, the functional role of the Newton in the educational complex, provides the connection between different departments. This role provides the dual function of keeping the informal learning spaces at the Newton active and giving students the opportunity for the larger communal connections in the building.

As a centre of the informal learning spaces, can the atrium contribute to student informal learning activities? To answer this question, the openness of the informal learning spaces provides a different result in two cases. There were over 95% of the respondents doing informal learning activities at the Open Space of the Diamond and there were still almost 70% of the students doing Focused Informal Learning activities at the Open Space of the Diamond (see Figure 5-2). The feedback collected from focus groups confirms that the Openness provides a more relaxed atmosphere, where they could have good views and a relaxing experience. With this relaxed feeling, students can be *rejuvenated* (PN4) from the long periods of studying and also do something, like group study or collaboration, where they speak to another person or learn with another person. However, the respondents admitted that the atrium of the Newton supported their socialising activities and the informal learning activities which required communicating with their friends. More specifically, based on the observations, there were less than 10% of the students learning individually at the Open Space of the Newton (see Figure 5-3). That means, the atrium at the Newton contributed opportunities for talking but not self-revision or private studying. To explain this difference, this gives the credit to the openness and socialising ambience. Openness provides an open and active place where students prefer to communicate and socialise at the Newton. However, the Open ambience at the Diamond provides a sense of a learning community, where students mainly do learning specific activities. Even though there are discussions in the space, the students doing individual study can be tolerant of the distraction caused by the surrounding discussions to some extent. Respondent (ID3), at the Diamond gave this explanation,



*'In silent study, I find it's harder to concentrate. Whether there's people talking or a bit of background noise it helps me focus in on my work more.'*

Furthermore, the openness of the informal learning spaces supports people watching and movement through space and the enjoyment of social life. Spatially, the openness reinforces an image that enriches student experiences in the campuses and an *'increased the impression of the university'* (PN1). The spatial experiences improve the value of the informal learning space design.

Meanwhile, the atrium is not only used as a learning space to support student daily life and enriching student experiences. It is also not only a place for gathering, and multiple activities, it is but also a place for memories. The participants were proud of having the fantastic learning environment at the Diamond (PD2) and the Newton (PN1). The universities could enrol students by presenting these modern astonishing atria as an attraction.

#### **7.2.5 Functionality.**

As an informal learning space, it is inevitable to possess student socialising spaces and activities in it. However, the key support to determining the design value of the informal learning space is based on the support of the informal learning activities. This research has explored the students' experiences in the informal learning spaces at the Diamond and the Newton. The result reveals that there is a significant difference in supporting student informal learning spaces in two cases. As observed, there were different types and degrees of informal learning activities (see Table 3-7), which are based on the nature of the work:

the intensity of that work (and thus the need for seclusion) or the extent to which progress resulted from discussions with others (Crook & Mitchell, 2012). Focused Informal learning activities are inclined towards formal learning, such as individual-revision, coursework preparation, and study alone, which demands for seclusion and avoiding distraction. The function of the informal learning space at the Diamond provides a relative stable and quiet learning environment, where almost 70% and over 50% of the students do focused informal learning activities at the Open space and the Corridor Space of the Diamond, respectively (see Figure 5-2). However, Intermittent Exchange and Serendipitous Encounter activities refer to communications. The function of the informal learning spaces at the Newton, creates a socialising ambience to encourage peer to peer learning, group study, and discussions. Consequently, over half of the informal learning activities were based on the communication (see Figure 5-3).

These results cannot articulate how to better design the informal learning spaces. However, through the analysis, it can be seen that there are differences between the cases. Even though they are both informal learning spaces leveraging circulation areas, they play a different role in their educational complexes. Hence, the more specific advice on the different types and roles of informal learning spaces should be discussed separately in the future studies.

#### **7.2.6 *The Spatial Hierarchy.***

Spatial hierarchy refers to spatial legibility and privacy. From one side, students require that the space is easily understood and they can easily find where they want to go. Atriums at the Diamond and the Newton are both located in the

centre of the educational complex, which provides a hub to link different destinations. This provides a great place to support diverse activities. Meanwhile, the extended Corridor Space at the Newton, with sufficient and adequate furniture, provides opportunities for conversations that develop within the group discussion and a quick rush over certain details after lectures (PN5). This is also approved by O'Neill (2013) as partly the reason why the Corridor Spaces in both cases are used frequently as a learning spaces. Also, the frequencies of the Intermittent Exchange activities at the Corridor Space of the Newton are even higher than that at the Open Space (see Figure 5-3).

From another perspective, the more serious the learning process, the more the students prefer to study in a more silent part of the learning space, or in a place where there is less contact with the surroundings. The spatial configuration can enhance a sense of privacy through the control of the boundary and the reconfiguration of the learning settings. To this point, the diverse learning settings and spatial configuration at the Diamond provide students a relatively private space to facilitate informal learning activities. The flexibility of the informal learning space also contributes to privacy through student self-organisation of the spatial configuration.

#### **7.2.7 Other Support Facilities.**

The development of the 21<sup>st</sup> century's higher education is experiencing a rapid change. Consequently, the potential of new digital technologies is listed as one of the characteristics of 21<sup>st</sup> century higher education practice (Barnett, 2014; Beetham & Sharpe, 2013), which has been reviewed in the literature (see Table 2-5). The use of technology perceived to meet not only current and but also

future needs (Narum, 2013). The informal learning spaces, designed to offer a combination of spaces that support individual activity and research as well as social learning activities (Attis & Koproske, 2013), should enhance the importance of technology. The quantitative analysis through questionnaires indicates that students are more satisfied with the IT-rich environments at the Diamond than at the Newton (see Figure 6-36 and Figure 6-37). Even though the usage of IT-rich environment involved a mixed pattern of use that support research, communication, and other learning-related activity (Lippincott, 2006), this research cannot articulate how the technology helps students to engage in informal learning activities.

Furthermore, the support of the food and beverages contributes to making the space attractive to learners (Brown & Lippincott, 2003; Jamieson, 2009). In this research, over 65% of the participants reported that food and beverages helped them to stay at the Newton, constituting a ratio 20% higher than that at the Diamond (see Figure 6-36 and Figure 6-37). The observation method demonstrates similar result. Even though the Café Area supported almost all the Dietary Related Activities at the Diamond, there were still over 70% socialising and informal learning activities occurring in it (see Figure 5-2). Meanwhile, the score of the Usage Index reached 7.44 (see Figure 5-1), which also indicates that the Café Area at the Diamond was the busiest area of the Diamond, where socialising and informal learning activities were also stimulated. This result is in conflict with the research conclusions of Bryant et al. (2009), which highlighted that the Café Areas do not promote a 'conducive learning atmosphere' (p. 10).

However, interestingly, as it can be seen from Figure 5-3, students doing Dietary Related Activities in the informal learning spaces of the Newton were more scattered. From one side, with almost 80% of the respondents doing Dietary Related Activities in the Café Area of the Newton, one can rarely see students doing informal learning activities at the Café Area of the Newton, which presents the same result with the research conclusions by Bryant et al. (2009). From another perspective, students could also decide their own eating areas because of the socialising ambience. That is to say, it is hard to say the Café Area at the Newton is a good place for supporting student informal learning activities.

### **7.3 SUMMARY.**

As the literature review presents, the evaluation of the informal learning spaces can be considered from different perspectives. It is also evident that the evaluation of the success of the informal learning spaces are more or less considering as an interdisciplinary subject. Combining the considerations of the informal learning space in higher education from different perspectives, this chapter firstly compared student usage of the informal learning spaces based on the two case studies. The discussion presents a series of solid evidence to illustrate student usage of the informal learning spaces. The results show that: 1) café area is a place as a catalyst for activating student experiences in the informal learning space; 2) 10am – 2pm is the busiest time period of student regular use in the informal learning spaces; 3) Seven design qualities, including the Comfort, the Flexibility, the Socialising, the Openness, the Functionality, the Spatial Hierarchy, and the Other Support, are key aspects to impact student

selection of using the informal learning spaces; 4) More informal learning activities occurred at the Diamond while more socialising activates occurred at the Newton. The quantitative analysis provides empirical evidences in relation to student experiences in the informal learning spaces. Then, the design qualities of the informal learning spaces were further discussed accordingly to critically emphasise the design qualities of the informal learning spaces from the students' perspective. The result presented a more specific analytical framework to evaluate the higher education informal learning space. The seven design qualities discussed in this chapter are slightly different from the analytical framework listed in the literature review (see Table 3-15). The new analytical framework (Figure 7-6) enhances the impact of the Openness and Socialising, which more suitable the evaluation of the informal learning spaces rather than general learning space in higher education.

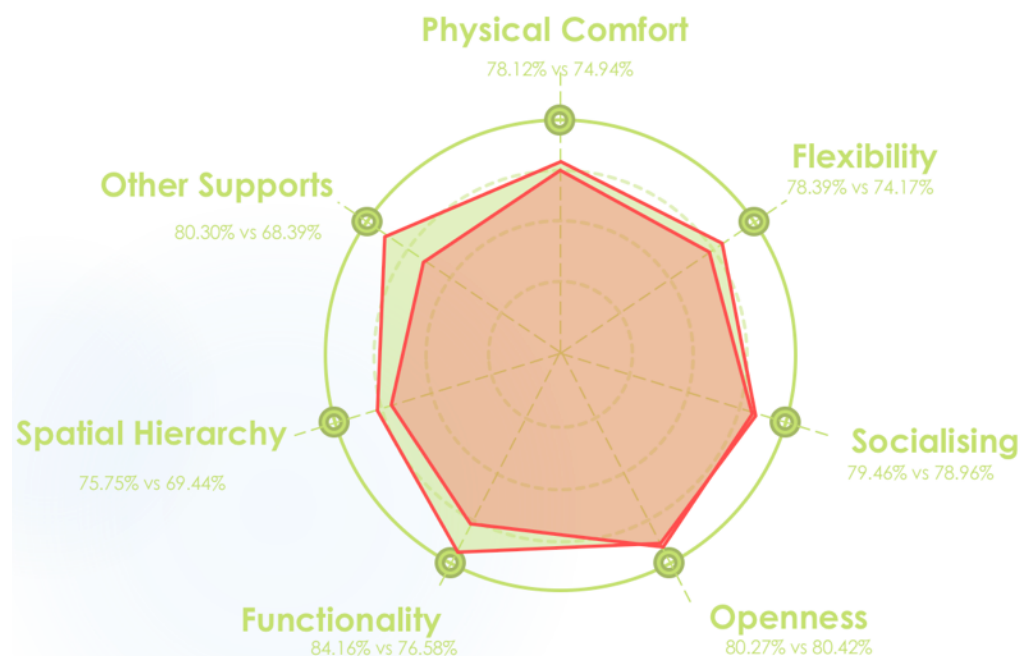


Figure 7-6: Evaluation Framework of the Informal Learning Spaces.

As it shows in Figure 7-6, the two case studies, which are awarded as the successful learning environment design in higher education, are examined in the

framework. The green polygon indicates the scale of student preferences on design qualities of the informal learning spaces at the Diamond while the red one indicates the scale of student preferences on design qualities of the informal learning spaces at the Newton. Even though there are slightly different between two case studies, the analytical framework can be used to evaluate the design of higher education informal learning spaces.

## **8. CHAPTER 8: CONCLUSION.**

What has attracted more and more attention is that the design of the 21<sup>st</sup> century learning landscape in higher education is required to promote student learning experiences as well as meet the requirements of the pedagogical theoretical evolution. In particular, the design qualities and spatial organisation of higher education informal learning spaces should be approached from a holistic perspective, taking into account the spectrum of learning activities and student preferences on a variety of environments necessary for the optimisation of their learning (see McDaniel, 2014). A well-designed informal learning space can better achieve this because student learning experiences can be enhanced. Nevertheless, the evaluation of the design quality of the informal learning spaces is affected by a dearth of research. Also, how the design qualities of the informal learning spaces impact student activities, needs more empirical researches. Consequently, an analytical framework, including the seven design qualities of higher education informal learning spaces – the Physical Comfort, the Flexibility, the Socialising, the Openness, the Functionality, the Spatial Hierarchy and the Other Support, are generated in promoting student socialising and informal learning activities as well as enhancing student learning experiences.

The aim of this research is to critically assess the design qualities and the spatial organisation of higher education informal learning spaces in shaping the students' spatial perceptions and different activities. Based on the investigation of the two case studies, the Diamond at the University of Sheffield and the Newton at Nottingham Trent University, this research seeks to provide an



empirical evidence base in relation to understanding student socialising and their selection of informal activities as well as their usage of higher education informal learning spaces. This has been done while identifying the design impact on student satisfaction with the different design qualities of informal learning spaces based on the frequencies of student activities within such environments.

More specifically, with a mixed methods design approach, including questionnaires, observation, interview and focus groups, this research firstly empirically investigated student socialising and informal learning activities in relation to where, when, what and why they behaved in the informal learning spaces. The quantitative analysis seeks the usage of the functional zones in the informal learning spaces, time period of regular use in the informal learning spaces, reason of selecting and using the informal learning spaces, and student socialising and informal learning activities in the informal learning spaces. The results indicate that one of the functional zones, the Café Area, is a place as a catalyst for activating student experiences in higher education informal learning spaces. Even though Bryant et al. (2009:9) highlighted that the Café Areas do not promote a '*conducive learning atmosphere*', this thesis confirmed the contribution of the food and beverages in the informal learning spaces: it is a good place for prompting student socialising activities and communication. In terms of time period of regular use, different informal learning spaces have different arrangement. 10am – 10pm is the most popular time periods at the Diamond while 10am – 2pm is at the Newton. The time period of regular use of both case studies covers 10am – 2pm, which indicates that 10am – 2pm is the key time period for student to regular use the informal learning spaces in higher

education. Furthermore, 15 reasons of selecting and using the informal learning spaces were enquired and as a result, the seven design qualities of the informal learning spaces are recognised to shape the analytical framework of evaluating informal learning spaces. The investigation of the student socialising and informal learning activities emphasises the efficiency of the informal learning spaces, which gave an indication that a successful design of informal learning space prompts different degrees of the student activities in relation to the informal learning process and socialising.

Secondly, the research investigated student satisfaction of the design qualities and spatial organisation of the informal learning spaces in two case studies and examined the impact of their satisfactions on the student experiences. The results present a correlation between student preferences on design qualities of the informal learning spaces and student experiences in relation to why they behaved in the informal learning spaces.

Finally, The Comfort, the Flexibility, the Socialising, the Openness, the Functionality, the Spatial Hierarchy, and the Other Support, are interpreted to generate an analytical framework of evaluating informal learning spaces. The emphasis of seven design qualities and the spatial organisation of the informal learning spaces better supports a successful design of the higher education's informal learning spaces in the 21<sup>st</sup> century.

In terms of the Comfort of the informal learning spaces, Lighting, Acoustics and Temperature have proved to be the three key features for students to respond to. As a whole, the respondents were satisfied with the comfort of the physical environment at the Diamond and the Newton. More specifically, the strategy of

the lighting system at the Diamond seems to provide a more attractive learning environment for students studying in it during both day time and night time, while sufficient lighting at the Newton could seem to meet student requirements for socialising. This is specifically apparent through the glass rooftop of the Central Court, and an Atrium, at the Newton, bringing natural lights into the space, and reinforcing student experiences in the informal learning space. Based on the quantitative methods, there was a 20% difference regarding their satisfaction with the acoustics at the Diamond and the Newton. More specifically, the percentage of student satisfaction with the acoustic condition of the informal learning spaces at the Diamond measured approximately at around 68% of the respondents while there were around 48% of the respondents that were satisfied with the acoustic condition of the spaces. The qualitative data stresses the students' differing opinions regarding the acoustic level at the Diamond and the Newton. The respondents have proved that they do not mind the low background sounds while learning at the Diamond, while students doing informal learning activities at the Newton felt that they were disturbed by the noise. In terms of preferences of the temperatures of the informal learning space, the quantitative data presents similar results. Over 65% of the respondents in both cases were satisfied with the design quality of the temperature. Meanwhile, the qualitative analysis highlights that the temperatures at the Diamond are more stable. However, the temperatures at the Newton dramatically change between the night and day time. The research illustrates the significant correlation between student preferences of the Comfort of the informal learning spaces on student experiences in the informal learning spaces. However, the specific impacts, such as how the

student behaviours in the informal learning spaces are differ based on their different perceptions on the Comfort does not mentioned, which can be examined in the future research.

In terms of the Flexibility of the informal learning spaces of the Diamond and the Newton, three aspects, the movement flow, the adaptability, and the diversity seem to be apparent. Considering the convenience of the daily usage, the flexible allocation of the tables and chairs in two case studies to support student different learning models, and the multi-functional use, enables the usage of the informal learning spaces effectively. As successful informal learning spaces, the designs of the informal learning spaces of the two case studies are both flexible in their considerations. As McDaniel (2014) and Keppell et al. (2012) stress, the Flexibility is an essential characteristic of the spaces that successfully support informal learning. This seems to allow students to adapt to their physical environment, which seems to accommodate individual preferences.

In terms of the Openness and the Socialising of the informal learning spaces, the percentages of the respondents who were satisfactory with these design qualities at the Diamond and the Newton were both around 70%. High rates of the student satisfactory with the informal learning spaces gave an indication that students were happy to linger in the space. It provides a solid evidence that the informal learning spaces of two selected case studies provided a good ambience for them to communicate. Psychologically, the openness of the atrium, at the Diamond and the Newton, created a social ambience where students' Focused Socialising activities and Intermittent Exchange activities were stimulated. As

the communication can emphasise the reinforcement of the latent learning performance (Rapoport, 1982). Consequently, these socialising activities are key activities occurring in the informal learning spaces. That is to say, a successful informal learning spaces should well consider the Openness and Socialising, to better support student experiences.

The Functionality of the informal learning spaces highlights the ability of the learning space to support the students' different learning preferences. Evidently, a successful informal learning space should encourage and support student both individual studies and group work and collaboration.

The Spatial Hierarchy investigated the spatial organisation of the informal learning spaces at the Diamond and the Newton. Student preferences of spatial organisation for individual learning, were more private and tended to be concentrated in places where they were situated in deeper and more private spaces. Based on the observations at the Diamond, the students preferred to do more Focused Informal Learning activities in the spatial capsule, where the arrangement of the furniture shaped a learning unit in the Open Area. However, the majority of the student activities in the informal learning spaces occurred immediately outside of the formal learning space. The Spatial Hierarchy of the informal learning space guided student to use the informal learning spaces efficiently and conveniently. A successful informal learning space in higher education should carefully enhance the spatial organisation and plan the spatial hierarchy for better support student socialising and informal learning activities.

In terms of the Other Support of the informal learning spaces at the Diamond and the Newton, the students were more satisfactory with the support at the

Diamond. IT-rich environments and necessary supports seemed to enhance the convenience of spatial usage. This is a key spatial character of the informal learning spaces to support student informal learning activities. Even though it is not a design quality of the informal learning space but more like a support from learning space managers, the Other Support still played a significant role for supporting student experiences.

The seven design qualities of the informal learning spaces mentioned above shaped a framework of evaluating the design of the informal learning spaces. The outcomes of this study have significant implications for designing informal learning spaces. The three main academic contributions are listed below.

Firstly, the study demonstrates the impact of the design qualities and the spatial organisation of higher education informal learning spaces on student experiences. The outcomes can be used as a solid evidence for designing informal learning environments in the future. Based on the environmental behaviour theory, there is a strong correlation between human behaviour and the space used (Ajzen, 1985). This research explores the application of the theory on learning environments. More specifically, the impact of the seven aspects of the spatial design, the design qualities and spatial organisation of the informal learning spaces on student socialising and informal learning activities are interpreted. The results illustrate that the design qualities have significant impacts on activities. There is definitely a correlation exists between student preferences of the design qualities and the frequencies of student activities. This research provides empirical evidences to support the belief that good quality higher education requires good quality environments. It reinforces the need for

further capital investment to modernise and upgrade buildings and the related equipment (Britain, 2005). These evidences allow for inferring that these results can be replicated in higher education informal learning spaces.

Secondly, the study shows a rigorous and sequenced mixed methods design approach used to collect student preferences of the design qualities and the spatial organisation of informal learning spaces and student experiences in the informal learning spaces. The application of the chosen study methods and analysis and discussion of the study findings has enabled the creation of the typology of learning space preference attributes which can be used to inform the design of the informal learning space. The employed methods, starting from questionnaires and observations, followed by interviews and focus groups, indicate a sequential research form: one type of data provided a basis for the collection of another type of data (Mertens, 2014). Meanwhile, instead of involving all stakeholder groups with interests in the learning environment like other academics did (Neary, 2010; McCarthy & Nitecki, 2010; Scott-Webber et al., 2013), this thesis focuses on investigating the student usage of the informal learning spaces in relation to where, when, what and why they select and use the informal learning spaces. It also considers user satisfaction with the design quality of the informal learning spaces. It explores the relationship between the preferences of the design qualities and the frequency of student socialising and informal learning activities.

Thirdly, the study provides empirical evidence regarding the design qualities of the informal learning spaces for future space planning. Selected case studies, the Diamond at the University of Sheffield and the Newton at Nottingham Trent

University, were awarded the 21<sup>st</sup> century higher education learning spaces awards. They have been investigated to provide an empirical analysis regarding the 21<sup>st</sup> century higher education informal learning spaces. Campus planners, architects and learning settings managers aim to explore and evaluate the learning environments and their impacts on student learning performance. Existing research indicates that environments impact behaviour (Scott-Webber, 2004). This study adds to the body of knowledge relative to how the design qualities of the higher education informal learning spaces impacts student experiences.

Consequently, the design qualities and spatial organisation of the informal learning spaces play a pivotal role in student experiences. The limited empirical research can only interpret the impact on a case by case basis, attempting to generate a design strategy for better designing the informal learning spaces. However, the analytical framework can be generalised in learning environment in higher education. Considering the worth of informal learning spaces in academic environment, it is suggested that more empirical and comprehensive studies should be conducted in a comparative nature covering some more academic institutions together to know the students' opinion and behaviour regarding informal learning spaces.

In order to enhance the design strategy in more different contexts, this generated guideline, or design strategy, should be examined by using more empirical studies. The design strategy should be adaptable and needs to be revised based on the development of the technological and pedagogical theory.



Furthermore, further research should focus on how to quantify the design quality of the spatial organisation of the informal learning spaces while correlating students' experiences with smart technology. More specifically, this thesis only considered the impact of the design quality of the spatial organisation of the informal learning spaces on student experiences. Informal learning spaces are spaces in-between, where they are always aimed to attract and engage students in and create an aesthetic ambience. The atria with a glass rooftop or glass curtain walls are employed to enhance spatial performance. The correlation between student experiences and key technology characteristics, such as lighting, temperature and so on, should be used to further optimise carbon emission and energy-saving in the campus. Architects should work together with other related experts to consider both sustainable technology and spatial appreciation in order to improve student experience in higher education's informal learning spaces.

Even though the nature and extent of student engagement in the organisation and development of their learning differs greatly between institutions and there does not seem to be any link between the type of institution and the way they engage with students (ALT, 2013), this research has demonstrated both the value of student preferences on the design qualities of the informal learning spaces and their frequencies of socialising and informal learning activities. The research also finds the need for users to propose spatial design strategies for the informal learning spaces so that they can contribute to the design of their facilities effectively. This exploration of the spatial design strategy sheds new light on designing higher education informal learning spaces and how they can be used to generate a solid and empirical evidence.

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## **APPENDIX – QUESTIONNAIRE FORM**

You are invited to complete a questionnaire about your experiences of social spaces in the Newton Atrium in the Nottingham Trent University. It should take approximately 10 minutes and some open questions will also be asked. As part of my PhD research I am exploring the impact of social spaces on students' experiences. The research will contribute to my advanced research study, be written up and submitted as a PhD thesis at the University of Nottingham.

All of the data collected will be anonymous. Your name will not be linked to any of the data collected and you will not be identified in the writing in the research. Your participation is entirely voluntary and you can choose to stop taking part at any time you wish. The research has been approved by UoN Department of Engineering ethics committee through a research ethics application. If you have any further enquiries, please contact me Xianfeng Wu: [xianfeng.wu@nottingham.ac.uk](mailto:xianfeng.wu@nottingham.ac.uk)

My research supervisors are: Katharina Borsi: [katharina.borsi@nottingham.ac.uk](mailto:katharina.borsi@nottingham.ac.uk) & Tim Heath: [tim.heath@nottingham.ac.uk](mailto:tim.heath@nottingham.ac.uk)

By completing the questionnaire overleaf, you consent to take part in the research and give permission for me to access, analyse and report the data that you provide.

Thank you for your time.

1. Questions about activities.

**1.1 How often have you done these activities in this social space per week?**  
*You can tick (✓) at the space given.*

Subject	Scale				
	1 Never	2 Slightly Frequently	3 Frequently	4 More Frequently	5 Most Frequently
<i>Focused Informal Learning (Paper-based or book-based self-study)</i>					
1. Prepared coursework					
2. Discussed ideas from reading books or lectures					
3. Worked with others on coursework					
4. Study alone					
<i>Intermittent Exchange (information interchange)</i>					
5. Talked about career plans					
6. Study alone, but with occasional interaction with others					
7. Worked with others on activities other than coursework					
8. Received prompt feedback from the faculty on your academic performance					
9. Tutored or taught other students					
10. Had serious conversations with students of a different program or department than your own					
<i>Focused Socialising</i>					
11. Took a call					
12. Used of tablet, laptop or phone					
13. Casual Chatting					
14. Took a break from studies with friends					
<i>Dietary Related Activities</i>					
15. Had a meal					
16. Had a snack					
<i>Serendipitous Encounter (Seeing, greeting or short chats with each other because of encounter)</i>					
17. Met a friend of someone you know, but neither of you planned to					
<i>Ambient Sociality</i>					
18. Attended events such as Exhibitions, Open Days or Coursework Shows					
19. Found the space as a way to a lecture room or gathering for going to another place together					
20. Used as a meeting point before or after lectures					
21. People watching					
22. Had a rest					

### 1.2 During what time do you regularly use this social space?

Please tick (✓) the time period of you select and use social spaces. You can tick (✓) more than one.

Time	Please tick (✓) if yes
8 am to 10 pm	
10 am to 12 pm	
12 pm to 2 pm	
2 pm to 5 pm	
5 pm to 7 pm	
7 pm to 10 pm	
10 pm to 0 am	
0 am to 8 am	

2. Questions about the spatial experiences and perception of social informal learning spaces in higher education.

### 2.1 I select and use this social space because the space...

Please tick (✓) the reason(s) of you select and use this social space. You can tick (✓) more than one.

I select and use this social space because the space...	Please tick
1. Provides comfortable light environments	
2. Provides comfortable noise environments	
3. Provides comfortable temperature	
4. Provides comfortable ventilation	
5. Provides comfortable colour/material of furniture	
6. Is flexible, adaptable and diverse	
7. Provides informal ambience	
8. Support individual and group work	
9. Provides good view of seeing what other people are doing	
10. Provides good outside views	
11. Makes people feel easy for way finding	
12. Is easily accessible	
13. feels generous, open and spacious.	
14. Provides other support (such as Wi-Fi, enough plugs and sockets, IT-rich environment)	
15. Other, please specify: _____	

### 2.2 Based on my experience, I think...

Please rate how agree the following subjects described and tick how the height of the space (its vertical dimension) enhances this perception.

Subject	Scale				
<b>Physical Comfort (Light)</b>					
The space provides good natural light.	Strongly disagree			Strongly agree	
	1	2	3	4	5
The space provides sufficient lighting after dark.	Strongly disagree			Strongly agree	

	1	2	3	4	5
<i>The space provides a good comprehensive light environment</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Physical Comfort (Acoustic)</b>					
<i>The Noise level of the space is good for socialising.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The Noise level of the space is good for informal learning activities.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Physical Comfort (Temp/Ventilation)</b>					
<i>The temperature of the space is adequate for socialising.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The temperature of the space is adequate for informal learning activities.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>Windows and air condition can be controlled by myself.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Physical Comfort (Colour/Material of Furniture)</b>					
<i>The colours of furniture support a comfortable learning environment.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The materials of furniture support a comfortable learning environment.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The furniture is light weight and movable for reconfiguring according to its use by individuals or groups</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Flexibility (Adaptability)</b>					
<i>The space can be easily reconfigured in a short period of time for group and individual work.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space is usable 24/7 and maximises use over time.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Flexibility (Diversity)</b>					
<i>The space supports a diversity of learning styles.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space offers a combination of spaces that supports socialising and informal learning activities.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The availability of food and drink is important for using this space.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Ambience</b>					
<i>The space feels welcoming.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space provides a good sense of learning community.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space is attractive</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5

<i>The space is stimulating</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space is contemplative.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Functionality</b>					
<i>The space supports group work and collaboration.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space supports individual study and learning</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space provides opportunities for socialising.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space provides opportunities to meet peers, friends and acquaintances</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space supports casual learning activities</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space appeals to students from different courses and encourages interdisciplinary learning</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Situation</b>					
<i>The space supports discussions about course content following lectures or seminars.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space provides good outside views.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Adjacency</b>					
<i>The space makes people feel easy for way finding.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The staircase is accessible and destination reachable.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The broader, open staircase allows for travel between floors at a more leisure pace.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Hierarchy</b>					
<i>The circulation is helpful to increase opportunities for socialising (students can easily and accessibly meet up in this area because of sufficient and efficient staircases and lifts.)</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The circulation is helpful to increase opportunities for informal learning (students can easily have discussions after courses or lectures in this area because of the convenient staircases and lifts.)</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The location of the space is easily accessible.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Openness</b>					
<i>The space feels generous, open and spacious.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5

<i>The space provides good visibility of the activities of other people.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space is bright.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<b>Other Support</b>					
<i>The space provides good Wi – Fi coverage.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>There are enough plugs and sockets available.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The toilet is easily accessible.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space provides an IT-rich environment.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space provides food and beverage.</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5
<i>The space provides a sense of safety (Provides evacuation marks/stair railing/guardrail/entrance guard/staff support/card only system).</i>	Strongly disagree			Strongly agree	
	1	2	3	4	5

### 2.3 I feel that I am satisfied with...in this space

Please rate how agree you feel the spatial experiences and opinions described.

Subject	Scale				
	Strongly disagree			Strongly agree	
<b>Physical Comfort</b>					
<i>Light</i>	1	2	3	4	5
<i>Acoustics</i>	1	2	3	4	5
<i>Temperature</i>	1	2	3	4	5
<i>Ventilation</i>	1	2	3	4	5
<i>Furniture (Colour/Material)</i>	1	2	3	4	5
<b>Flexibility</b>					
<i>Movement flows</i>	1	2	3	4	5
<i>Adaptability</i>	1	2	3	4	5
<i>Diversity</i>	1	2	3	4	5
<i>Flexibility</i>	1	2	3	4	5
<b>Ambience</b>					
<i>Socialising</i>	1	2	3	4	5
<i>Sense of community</i>	1	2	3	4	5
<i>Informative</i>	1	2	3	4	5
<i>Attractiveness</i>	1	2	3	4	5
<i>Openness</i>	1	2	3	4	5
<i>Enclosure</i>	1	2	3	4	5
<i>Safety</i>	1	2	3	4	5
<b>Functionality</b>					
<i>Supports group work or collaboration</i>	1	2	3	4	5
<i>Supports individual learning</i>	1	2	3	4	5

<b>Situation</b>					
<i>Continue classroom discussions immediately following class time</i>	1	2	3	4	5
<i>Outside views</i>	1	2	3	4	5
<b>Adjacency/hierarchy</b>					
<i>Circulation</i>	1	2	3	4	5
<i>Legibility</i>	1	2	3	4	5
<i>Privacy</i>	1	2	3	4	5
<i>Spacious</i>	1	2	3	4	5
<b>Other support</b>					
<i>It-rich environment</i>	1	2	3	4	5
<i>Wi – Fi coverage</i>	1	2	3	4	5
<i>Plugs and sockets</i>	1	2	3	4	5
<i>Food and beverage</i>	1	2	3	4	5

3. If you have any additional comments that you would like to make about any aspect of the building and your working environment, please note them here. If relevant to a particular question, please give the question number.

4. Questions about personal background information.
- **Are you an international student? Please circle:** Yes/No
  - **Gender, please circle:** Male/Female/wish not to say
  - **Which department do you study or work in? Please write down:**
  - **Mode of Study, please circle:** Full time/Part time
  - **Level of Study, please circle:** PhD/Undergraduate/Masters
  - **Type of Programme, please circle:** Lecture-based/Studio-based/Lab-based
  - **Year (How many years have you studied here), please circle:** less than 1/1-2/3-more

## Consent Form



**Title of the Study: Research on Student Behaviours and preferences of social spaces at the Newton at Nottingham Trent University and at the Diamond at the University of Sheffield**

Name of the Researcher: Xianfeng Wu

Please tick the boxes as appropriate

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I could take a break at any time during the questionnaire.
4. I understand that I have the right not to answer particular questions if I consider them to be sensitive.
5. I give my consent for the questionnaire to be audio-recorded as described in the information sheet.
6. I give my consent for my data to be used as it has been explained in the information sheet.
7. I agree to allow my questionnaire to be published and to be attributed to the researcher's organization (University of Nottingham).

I also agree to being identified by position. (Please note that: if your position title might easily identify your name, you can disagree to be identified by it).

8. I understand that the research findings, including the comments / data I provide in the questionnaire, may be published as a PhD thesis, academic conference papers, journal articles and other academic publication/ dissemination channels.
9. I understand if the academic findings are to be published in other places, for example media articles, no specific references to individual interviewees will be made.
10. I agree to take part in the above study.

_____	_____	_____
Name of the Participant	Date	Signature

_____	_____	_____
Researcher	Date	Signature



## **APPENDIX – INTERVIEW FORM**

### **1. Introduction**

#### **1a. Welcome and introduction of interviewer**

#### **1b. Objective**

Informal learning refers to student learning outside of designated class time. The objective of the informal interviews is to gather information for a research project investigating students' perceptions on how social informal learning spaces impact on student experience.

#### **1c. Process**

I will be taking audio record during the interview, so I can revisit and reflect on the information provided. We respect your right to privacy. Our Ethical Clearance ensures that any information that is obtained in connection with this study and that could be identified as relating to you will remain confidential. If you decide to participate in the interview, you are free to discontinue participation at any time without prejudice.

### **2. Questions**

#### **Personal Background Information**

1. Could you please introduce yourself?
  - a. What's your occupation?
  - b. Which department are you in? what's your subject? Which year are studying?
  - c. Where is your nearest classroom or workplace?

#### **Frequency, Activity and Reasons**

2. What brings you here?
3. Which types of activities do you normally do there?

If yes, please answer the following questions.

If not, skip questions 3 and proceed to question 4.

4. Which types of activities do your friends normally do there?
5. How often do you use this space as a whole? Why?

#### **Student perceptions of social spaces/role in student experience**

6. Who do you (all) think this space was designed for?

#### **Use of space:**

7. How do you (all) think this space should be used?
8. How do you (all) use it?
9. How do you think using the social informal learning space impacts on students' academic performance?
10. What are the three most important things about this space that you would not want to change?
11. What are the three most important things that you would like to change or add on these spaces?

#### **Student voice:**

12. What is your favourite social informal learning spaces story/memory?



## Consent Form

Title of the Study: **Research on Student Behaviours and preferences of social spaces at the Newton at Nottingham Trent University and at the Diamond at the University of Sheffield**

Name of the Researcher: Xianfeng Wu

Please tick the boxes as appropriate

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I could take a break at any time during the questionnaire.
4. I understand that I have the right not to answer particular questions if I consider them to be sensitive.
5. I give my consent for the questionnaire to be audio-recorded as described in the information sheet.
6. I give my consent for my data to be used as it has been explained in the information sheet.
7. I agree to allow my questionnaire to be published and to be attributed to the researcher's organization (University of Nottingham).

I also agree to being identified by position. (Please note that: if your position title might easily identify your name, you can disagree to be identified by it).

8. I understand that the research findings, including the comments / data I provide in the questionnaire, may be published as a PhD thesis, academic conference papers, journal articles and other academic publication/ dissemination channels.
9. I understand if the academic findings are to be published in other places, for example media articles, no specific references to individual interviewees will be made.
10. I agree to take part in the above study.

_____	_____	_____
Name of the Participant	Date	Signature
_____	_____	_____
Researcher	Date	Signature

## APPENDIX – FOCUS GROUP FORM

### Focus Groups Discussion Guide: The Impact of Design Quality of Informal Learning Spaces upon student experiences (1 hour)

- ◆ Consent forms (xN per set of groups)
- ◆ Recorder (smart phone & iPad)
- ◆ Focus Group Registration Form

Time	
5 mins	<p><b>Welcome and Introduction</b>  <i>Provide respondents with:</i></p> <ul style="list-style-type: none"> <li>• <i>Consent forms</i></li> <li>• <i>Pens</i></li> </ul> <p>• Ask respondents to complete permission forms and collect in.</p> <p>• <b>Welcome</b> participants and explain general <b>purpose</b> of the discussion: <i>"Thanks very much for coming. This group is being run to understand your thoughts about the design quality of your learning experience at university/college and your ideas about it for the future. This is one of a series of groups being run with students as part of wider research project. The information will be used to help us improve the quality of students learning experiences and to better support a social informal learning spaces in the future."</i></p> <ul style="list-style-type: none"> <li>• Explain <b>confidentiality</b> of opinions shared.</li> <li>• Explain that it is <b>not a test</b> and that we want an honest an open discussion.</li> </ul> <p>Explain that the group will:</p> <ul style="list-style-type: none"> <li>- Start off with a general discussion of university life</li> <li>- Move on to explore your expectations of different aspects of your learning experience in the social informal learning spaces</li> <li>- How things have been whilst you have been there</li> <li>- How you think things can be improved for students</li> </ul> <ul style="list-style-type: none"> <li>• The group will last about 1 hour</li> <li>• Explain the presence and purpose of <b>recording equipment</b> (to help facilitator write up notes later rather than during the focus group) and ask for permission.</li> <li>• Explain that <b>discussion notes</b> will be analysed and no personal data will be shared.</li> <li>• Set out <b>ground rules</b> (speaking up, one at a time, respect for others' opinions, etc.)</li> <li>• Go through any <b>health and safety</b> procedures for the building, timed fire alarms, etc.</li> <li>• Explain that I am a PhD student in the University of Nottingham and that all work is conducted ethically and in accordance with the UoN <b>code of conduct</b></li> <li>• Explain that as participants in the research, the respondents are entitled to a copy of the final report if requested</li> <li>• <b>Start recording</b></li> </ul>
5 mins	<p><b>Icebreaker</b></p> <ul style="list-style-type: none"> <li>• Moderator to introduce themselves</li> <li>• Ask each person to please briefly:</li> </ul>

	<ul style="list-style-type: none"> <li>- introduce themselves</li> <li>- Where they come from</li> <li>- which Subject, School &amp; Department they study</li> <li>- which year they are in</li> <li>- If needed to break ice: What's your summer plan? Where is your hometown? What's your favourite food?</li> </ul>
20mins	<p><b>Students experiences</b> (informal learning and socialising activities)</p> <p><b>Question:</b> a) What do you think of the space? b) How do social informal learning spaces support social &amp; learning activities?</p> <p><b>Probes:</b> peer learning/collaboration/support/Different degrees of informal learning process</p>
15 mins	<p><b>Design Quality</b></p> <p>Ask respondents to identify key design quality of a successful social informal learning spaces based on their own experiences of learning and socialising activities by themselves and discuss what they wrote.</p> <p><b>Question:</b> Thinking about the experiences of learning or socialising activities here, describe the characteristics of a successful social informal learning spaces.</p> <p>Prompts – this could include the likes of:</p> <p><b>The Physical Comfort:</b> Light/Acoustics/Temperature/Ventilation/Furniture (Colour/Material)</p> <p><b>The Flexibility:</b> Mobility/Adaptability/Diversity/Flexibility</p> <p><b>The Ambience:</b> Socialising/Sense of Community/Informative /Attractiveness /Openness /Enclosure /Safety</p> <p><b>The Functionality:</b> Support group work and collaboration/Supports individual learning</p> <p><b>The Situation:</b> Location (continue classroom discussions immediately following class time)/Outside Views</p> <p><b>The Spatial Hierarchy:</b> Circulation/Legibility/Intelligibility/Privacy/Spacious</p> <p><b>The Other Support:</b> IT-rich environment/Wi-Fi Coverage/Plugs and Sockets/Food and Beverage</p>
15 mins	<p><b>Space In-Between</b></p> <p><b>Questions:</b> What influence the design of the atrium gives you in the social informal learning spaces?</p>
	<p><b>Thank and Close</b></p> <ul style="list-style-type: none"> <li>• Thank them for all their help in this group.</li> </ul>