

**Perceptions of Quality in Higher Education Learning  
Environments and the Impact of Personality Types on  
Satisfaction: The Development of a Practical  
Framework**

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## **Abstract**

The design of the physical learning environment (PLE) in Higher Education facilities, has been found to influence students' satisfaction (Hill & Epps, 2010, Riley, 2013, Yang & Mino, 2013). With the initiation of the Teaching Excellence Framework, the consideration of students' satisfaction is becoming more prominent. Beckers et al. (2016a) concluded that further research should explore preferences of students to identify if preferences differed between groups of students. Features of the PLE were identified that required further examination as to the impact they can have on students' satisfaction, specifically, their individual requirements, which may be influenced by their personality traits. In the quality of the PLE; it was also noted that the sense of community is important.

Utilising a sequential mixed methods design this research aimed to identify students' specific requirements of their PLE. Case study methodology was adopted in Liverpool John Moores University (LJMU), across the schools Art and Design, Built Environment, Engineering and Business. Surveys were used to examine relationships with features of the PLE, school specific requirements and personality traits. Factor analysis was conducted to identify components of the PLE. Focus groups were undertaken with students to explore students' perceptions of the PLE and expand current understanding regarding students' specific requirements. Utilising grounded theory analysis, features of the PLE were identified and a framework developed. The research found that there is a notable difference in preferences for features within the PLE between students in different schools, and that these differences may be due to the influence of personality traits. The research also identified a framework for defining what students perceive to be a quality PLE. Alongside which, features of the PLE that students identify as being important for the development of a sense of community were identified. The research has led to the development of a framework for the design of the PLE based on students' specific requirements that can be used to inform universities of the aspects of design to consider in future developments or refurbishments. Validation of the findings of this research was also conducted to evaluate the usefulness of the final framework.

## **Publications/ Conferences**

Wilson, H.K. & Cotgrave, A. (2016). Factors that influence students' satisfaction with their physical learning environments. *Structural Survey*, 34(3), 256-275.

## **Presentations**

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## Contents

<b>1. Introduction .....</b>	<b>1</b>
1.1. Introduction .....	2
1.2. Higher Education Institutions .....	2
1.3. Changing higher education landscapes .....	3
1.4. Research aim.....	7
1.5. Research objectives .....	7
1.6. Contribution .....	10
1.6.1. Contribution to theory .....	10
1.6.2. Contribution to practice .....	11
1.7. Structure of thesis .....	12
1.7.1. Sample .....	14
1.8. Summary .....	14
<b>2. Literature review.....</b>	<b>15</b>
2.1. Introduction .....	16
2.2. Higher Education Learning Environments.....	18
2.3. Psychology of space .....	23
2.3.1. Human needs .....	23
2.3.2. Design of space.....	25
2.3.3. Conclusion .....	30
2.4. Learning environment .....	32
2.4.1. Teaching environment.....	33
2.4.2. Student learning styles .....	33
2.4.3. Current understanding of the physical learning environment ...	35
2.4.4. How the environment is currently assessed .....	40
2.4.5. Current initiatives and projects .....	43

2.4.6.	Conclusion .....	46
2.5.	Individual differences .....	48
2.5.1.	Introduction to personality .....	49
2.5.2.	Personality theory.....	51
2.5.3.	Personality and the environment.....	56
2.5.4.	Conclusion .....	58
2.6.	Quality.....	59
2.6.1.	Facilities management .....	63
2.6.2.	Quality guidelines.....	64
2.6.3.	Conclusion .....	69
2.7.	Community.....	70
2.7.1.	Community in Higher Education Institutions.....	71
2.7.2.	Place attachment.....	73
2.7.3.	Factors of the learning environment.....	74
2.7.4.	Conclusion .....	77
2.8.	The Gap in the literature .....	78
2.9.	Summary and themes drawn from the literature review.....	79
<b>3.</b>	<b>Methodology .....</b>	<b>82</b>
3.1.	Introduction .....	83
3.2.	Methodology and research design.....	84
3.3.	Research philosophy .....	85
3.3.2.	Research approach.....	89
3.4.	Overview of potential methodologies .....	92
3.4.1.	Qualitative approaches.....	93
3.4.2.	Quantitative approaches .....	98
3.4.3.	Mixed method approaches.....	100

3.4.4.	Selected methodology - Mixed methodology.....	103
3.4.5.	Research Strategy.....	103
3.5.	Data collection and analysis .....	105
3.5.1.	Phase one analysis .....	105
3.5.2.	Phase two analysis.....	107
3.5.3.	Phase three analysis .....	107
3.5.4.	Phase four analysis .....	109
3.6.	Overview of conceptual framework of research .....	111
3.7.	Overview of research .....	116
3.7.1.	Data collection- phase one to three.....	117
3.7.2.	Data collection- phase four.....	118
3.7.3.	Development of a framework/ model.....	119
3.7.4.	Ethics .....	120
3.8.	Summary .....	121
<b>4.</b>	<b>Phase one .....</b>	<b>122</b>
4.1.	Introduction .....	123
4.2.	Research approach and design .....	124
4.2.1.	Type of data collection instrument.....	125
4.2.2.	The method of approach .....	126
4.2.3.	Development of questionnaire.....	127
4.2.4.	Research tools .....	130
4.2.5.	Pilot testing of the questionnaire .....	137
4.3.	Analysis and discussion of data .....	137
4.3.1.	Learning Environments .....	137
4.3.2.	Personality .....	146
4.3.3.	Quality .....	150

4.3.4.	Community .....	155
4.3.5.	Open ended questions .....	158
4.4.	Summary .....	159
<b>5.</b>	<b>Phase two.....</b>	<b>162</b>
5.1.	Introduction .....	163
5.2.	Research approach and design .....	163
5.2.1.	Why focus groups.....	163
5.2.2.	How to conduct and design .....	165
5.2.3.	Target size .....	166
5.2.4.	Number of sessions.....	167
5.2.5.	Quality control .....	167
5.2.6.	Analysing of data.....	168
5.3.	How the focus groups were conducted.....	168
5.3.1.	Focus group guidelines .....	169
5.3.2.	Sampling strategy –phase two .....	170
5.3.3.	Focus groups size and session number .....	172
5.3.4.	Recording and transcribing .....	172
5.3.5.	Running the focus group .....	173
5.3.6.	Pre-testing/ pilot phase.....	174
5.3.7.	Reflexivity.....	174
5.4.	Analysis and discussion.....	175
5.5.	Quality and the design of the Learning Environment .....	177
5.5.1.	Operations.....	180
5.5.2.	Design .....	183
5.5.3.	Rooms.....	187
5.5.4.	Environment .....	192



5.5.5. Cosmetics .....	195
5.5.6. Facilities .....	197
5.5.7. Summary .....	198
5.6. Community.....	199
5.6.1. High level themes.....	200
5.7. Comparisons of features identified from focus groups.....	208
5.7.1. Aesthetics.....	208
5.7.2. Design features .....	210
5.7.3. Environmental Factors .....	211
5.7.4. Operations.....	211
5.7.5. Workspaces .....	212
5.8. Summary .....	213
<b>6. Phase three .....</b>	<b>215</b>
6.1. Introduction .....	216
6.2. Questionnaire phase two development.....	216
6.2.1. Construction of the questionnaire.....	218
6.2.2. Sampling strategy- phase three .....	219
6.3. Analysis and discussion of findings .....	220
6.3.1. Data screening .....	221
6.3.2. Quality .....	222
6.3.3. Community .....	225
6.3.4. Learning environment design .....	228
6.3.5. School differences.....	230
6.3.6. Personality .....	234
6.4. Summary .....	237
<b>7. Framework development .....</b>	<b>239</b>

7.1.	Introduction .....	240
7.2.	Principles of higher education physical learning space design .....	241
7.2.1.	Community framework identification.....	245
7.2.2.	Quality framework identification .....	247
7.2.3.	PLE framework identification.....	249
7.3.	Key features of the PLE .....	250
7.3.1.	Aesthetics.....	250
7.3.2.	Operations.....	251
7.3.3.	Integration of space.....	251
7.3.4.	Social spaces .....	251
7.3.5.	Convenient workspaces .....	252
7.3.6.	Access to facilities, equipment and resources.....	253
7.3.7.	Technology.....	253
7.3.8.	Peer collaboration .....	254
7.3.9.	Way finding design .....	254
7.3.10.	Accessibility of university .....	255
7.3.11.	Environment feeling .....	256
7.3.12.	Layout .....	256
7.3.13.	Identity .....	256
7.3.14.	Sense of belonging .....	257
7.3.15.	Environment- traditional .....	257
7.3.16.	Teaching rooms .....	257
7.4.	Preliminary framework .....	258
7.4.1.	PLE framework.....	260
7.4.2.	School specific framework development .....	262
7.4.3.	Framework for practitioners.....	276

7.5. Summary .....	278
<b>8. Discussion .....</b>	<b>279</b>
8.1. Introduction .....	280
8.2. Summary of research.....	280
8.2.1. The research aim and objective .....	280
8.2.2. Objective one .....	283
8.2.3. Objective two.....	284
8.2.4. Objective three .....	286
8.2.5. Objective four .....	289
8.2.6. Objective five.....	292
8.2.7. Objective six.....	293
8.2.8. Research aim .....	293
8.3. Framework validation – phase four.....	294
8.3.1. Contextual questions.....	296
8.3.2. Framework validation questions.....	298
8.4. Summary .....	310
<b>9. Conclusion.....</b>	<b>312</b>
9.1. Introduction .....	313
9.2. Main findings.....	313
9.3. Contribution to knowledge .....	315
9.4. Contributions to practice .....	317
9.5. Beneficiaries .....	319
9.6. Research limitations.....	320
9.7. Recommendations for future work.....	321
9.8. Summary .....	322
<b>10. References .....</b>	<b>323</b>

<b>11. Appendices .....</b>	<b>346</b>
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## List of Figures

Figure 1.1 overview of conceptual framework.....	8
Figure 1.2 Literature review outline.....	12
Figure 1.3 overview and objectives of chapters.....	13
Figure 2.1 overview of construction of literature review.....	17
Figure 2.2 interaction between users' and operators' perception of quality take from Riley (2013).....	60
Figure 2.3 Oakland TQM model (Oakland, 2011).....	68
Figure 2.4 Architectural Design Process (Rullman & Kieboom, 2012).....	75
Figure 2.5 conceptual framework developed from literature review themes	81
Figure 3.1 Mixed Method design.....	83
Figure 3.2 The research onion Simplified from Saunders et al. (2011).....	85
Figure 3.3 research philosophy.....	86
Figure 3.4 theoretical perspectives.....	89
Figure 3.5 Deductive approach.....	90
Figure 3.6 Inductive approach.....	91
Figure 3.7 Abductive approach.....	91
Figure 3.8 The methodology continuum.....	92
Figure 3.9 essential grounded theory methods adapted from(Birks & Mills, 2015).....	98
Figure 3.10 theoretical model of design of higher education learning environments.....	111
Figure 3.11 structure of research project.....	113
Figure 4.1 stage 1 research focus.....	123
Figure 4.2 stage three phase 1 data collection.....	124
Figure 4.3 natural lighting.....	141
Figure 4.4 Room layout allowing for easy visibility of teacher.....	142
Figure 4.5 Specialist teaching rooms.....	142
Figure 4.6 View out of windows.....	143
Figure 4.7 Layout of room allowing for both group and independent learning .....	143
Figure 4.8 What makes a quality university building environment?.....	152

Figure 5.1 stage 3 of research .....	163
Figure 5.2 sampling strategy for focus groups .....	171
Figure 5.3 Hierarchy of themes.....	177
Figure 5.4 High level themes focus group.....	178
Figure 5.5 themes for the feature operations .....	180
Figure 5.6 themes for the feature design .....	183
Figure 5.7 themes for the feature rooms.....	187
Figure 5.8 Themes for the feature environment.....	192
Figure 5.9 Themes for the feature cosmetics.....	195
Figure 5.10 themes for the feature facilities .....	197
Figure 5.11 aesthetics focus group comparisons.....	208
Figure 5.12 decor inside focus group comparisons.....	209
Figure 5.13 flexible space focus group comparisons .....	210
Figure 5.14 design features focus group comparisons .....	210
Figure 5.15 Function focus group comparisons .....	211
Figure 5.16 operations focus group comparisons .....	211
Figure 5.17 formal workspaces focus group comparisons .....	212
Figure 5.18 informal workspaces focus group comparisons .....	212
Figure 6.1 Stage 4 research process- data collection.....	216
Figure 6.2 level of importance for features of the PLE .....	223
Figure 6.3 school differences- colour schemes.....	231
Figure 6.4 school differences- aesthetics of design .....	231
Figure 6.5 school differences- design and furniture fit for purpose .....	231
Figure 6.6 school differences- up to date technology.....	232
Figure 7.1 stage five-research process- framework development.....	240
Figure 7.2 Framework of Learning Environment design .....	259
Figure 7.3 Design of PLEs features break down.....	261
Figure 8.1 Educational community.....	284
Figure 8.2 Quality definition .....	291
Figure 8.3 rating scale showing responses to extent to which the PLE framework could inform on the design process.....	299

Figure 8.4 rating scale showing responses to respondents use of frameworks in the design process- PLE .....	299
Figure 8.5 updated physical learning environment framework.....	303
Figure 8.6 7 rating scale showing responses to extent to which the school specific framework could inform on the design process.....	304
Figure 8.7 rating scale showing responses to respondents' use of frameworks in the design process- School specific .....	305
Figure 8.8 updated framework for practitioners.....	307
Figure 8.9 proposed implementation into design process.....	308
Figure 9.1 Practical impact .....	318

List of Tables

Table 2.1 Evaluation process of design taken from (Riley, 2013) ..... 41

Table 2.2 Five factor model traits and descriptive attitudes (Crozier, 1997) 55

Table 3.1 Quantitative, Qualitative and Mixed Methods Procedures (Creswell et al., 2003)..... 93

Table 3.2 Project phases; method and data analysis (qualitative aspects in grey) ..... 110

Table 3.3 Overview of the justification of selected methods ..... 112

Table 3.4 Ethical activities ..... 120

Table 4.1 Types of questionnaire adapted from (Saunders et al., 2012) ... 126

Table 4.2 Data variable for this research ..... 128

Table 4.3 Development of questionnaire- learning environments ..... 131

Table 4.4 Development of questionnaire- community features ..... 132

Table 4.5 Development of questionnaire- quality features ..... 134

Table 4.6 Descriptive statistics Learning Environments preferences ..... 138

Table 4.7 Likert scale scoring ..... 138

Table 4.8 Frequency of descriptive statistics for Learning Environments .. 139

Table 4.9 Top 10 means for Art & design, Built Environment and Engineering ..... 141

Table 4.10 Statistical differences in preferences for features of the PLE... 144

Table 4.11 Descriptive statistics- learning environments and schools ..... 145

Table 4.12 Descriptive statistics FFM ..... 147

Table 4.13 Descriptive statistics FFM and Schools..... 147

Table 4.14 Bivariate correlations learning environments subsections and personality ..... 149

Table 4.15 Bivariate correlations- learning environment and personality... 149

Table 4.16 Descriptive statistics- quality factors ..... 151

Table 4.17 Likert scale scoring ..... 151

Table 4.18 Factor analysis for quality ..... 154

Table 4.19 Descriptive statistics for community factors in universities (rank ordered) ..... 156

Table 4.20 Factor analysis for community factors in the university. .... 157



Table 5.1 Questions for focus group .....	170
Table 5.2 Participants in focus groups .....	171
Table 5.3 Sample for focus groups .....	172
Table 5.4 Community- environment references .....	200
Table 5.5 Community- sense of belonging references.....	201
Table 5.6 Community- identify with space references.....	202
Table 5.7 Community- layout references .....	204
Table 5.8 Community- social areas references.....	206
Table 5.9 Community- workspaces references .....	207
Table 6.1 Participant demographics.....	219
Table 6.2 Phase three demographics .....	220
Table 6.3 Missing cases .....	221
Table 6.4 Likert scale scoring .....	222
Table 6.5 Factor analysis for quality PLE phase three.....	224
Table 6.6 Descriptive statistics for the community .....	226
Table 6.7 Factor analysis for community phase three.....	227
Table 6.8 Factor analysis PLE .....	229
Table 6.9 Inferential statistics comparisons between schools.....	233
Table 6.10 FA components- statistical test for differences between schools .....	233
Table 6.11 Personality reliability analysis .....	234
Table 6.12 Conscientious relationships .....	235
Table 6.13 Openness relationships.....	236
Table 6.14 Agreeableness relationships .....	236
Table 7.1 Findings overview .....	244
Table 7.2 Community features.....	245
Table 7.3 Community- questionnaire and focus group individual characteristics.....	246
Table 7.4 Quality- focus group and questionnaire factors.....	247
Table 7.5 Additional features of the PLE to consider in framework development .....	248
Table 7.6 Community and Quality – Overall design of the environment ....	249

Table 8.1 Overview of thesis.....	280
Table 8.2 Research objective and method of achievement .....	282

## **List of Appendices**

Appendix 1 Example of University Organisational structure

Appendix 2- Examples of Participant information sheet, bio demographic questions and debrief for survey

Appendix 3 - Example of online questionnaire- Qualtrics

Appendix 4 - Example of raw data- phase 1

Appendix 5 - Open questions from phase 1 survey

Appendix 6 - Participant information sheet and consent form - Focus groups

Appendix 7 - Focus group schedule

Appendix 8 - Discussion aids- Vignettes

Appendix 9 - example of note taking for focus groups

Appendix 10 - example of focus groups transcript

Appendix 11 - example coding reports for focus groups

Appendix 12- development of second survey for phase 3 data collection

Appendix 13 - raw data for phase three analysis

Appendix 14 - descriptive statistics phase three data collection

Appendix 15 - standardised regression weights for the SEM models

Appendix 16 - Email to estates managers

Appendix 17 – participant information sheet and consent form for validation

Appendix 18 – questions for validation interview

Appendix 19 - Example of pragmatic survey

Appendix 20 - Example of interview transcript

Appendix 21- Guide to implementing framework into the design process

**List of abbreviations**

PLE- physical learning environment

HEI- Higher education institutions

FG- Focus groups

ENG- School of Engineering

A&D- School of Art and Design

BUE- School of the Built Environment

BUS- Business School

FFM- Five Factor Model

TEF- Teaching Excellence Framework

NSS- National Students Survey

DfE- Department for Education

SD- Standard deviation

M- Mean

EV- Eigen Value

FL- Factor Loading

## 1. Introduction

Introduction	
Higher education institutions	
Changing higher education landscape	
Research aim	
Research objectives	
Contribution	
Structure of thesis	
Summary	

## 1.1. Introduction

This chapter aims to outline the context of this research. The research problem, along with the aims and objectives are discussed at the end of this chapter. Finally, the theoretical framework for this research will be discussed, including the outline for the proposed research.

## 1.2. Higher Education Institutions

The role that estates and facilities management teams play across our Higher Education Institutions (HEI's) should never be underestimated.

*"University Estates and Facilities are worth nearly £27bn every year and are relevant to 2.4 million members of the British population as in many areas the facilities are accessed by local communities along with students and staff."*  
Sir Ian Diamond (Association of Universities Directors of Estates, AUDE, 2015).

The amount of money being spent on estates in the higher education (HE) sector has risen dramatically over 10 years (AUDE, 2015). In fact expenditure in the period 2013/2014 was at a sum of over 2.5bn, a rise of over 170 million from 2011/2012 (Ferrell, 2016), additionally this is the highest annual spend recorded (AUDE, 2015). Therefore, it is apparent that developing estates is a large business with a lot of money being spent, however the question that needs to be asked is:

Is this money being spent appropriately on building suitable learning spaces?

According to AUDE the quality of buildings' condition is steadily rising (AUDE, 2015, p. 40). Building condition is classified into four subsections with A being the best building condition down to D which is the worst, and below standards. Just over 20% still fall within the C/D classification with a large proportion (58%) only meeting a B classification (AUDE, 2015). Therefore, a large proportion of buildings are not meeting the best in building quality standards, in fact a large proportion still fall into the lower half. Furthermore, AUDE reported that it will cost just over 15% of institutions' academic budgets (2013/2014) to upgrade their current facilities. This is therefore a large proportion of their budget, and

should be spent appropriately to increase the satisfaction of the buildings' users.

Temple 2007 (cited by, Neary & Saunders, 2011) states that although there is some enthusiasm about the development of designing new teaching and learning spaces, the relationship between effective undergraduate learning and innovative learning spaces is not yet well understood. Therefore, further development in the understanding of learning spaces for the undergraduate student in HEI's should be considered. Neary et al. (2009) noted that in light of budget cuts to the HE sector, there is a need to re-evaluate universities to enable the efficient and effective use of space that contributes to students' satisfaction and academic achievement.

*"The term learning environment encompasses learning resources and technology, means of teaching, modes of learning, and connections to societal and global contexts"* (EDUCASE, 2016, p. topics).

Therefore understanding the complete HEI learning environment, from the students, to the teaching methods, to the environment required, is important in the consideration of developing learning spaces. The 2016 Horizon report (Johnson et al., 2016), an international initiative for HE to determine future plans in technology for higher education, identified the progression in teaching and learning. A mid-term plan identified by the horizon report is the redesign of learning spaces; this should be examined in order to develop the potential of teaching and learning. This is therefore a highly important feature for HE to focus upon. The horizon report identifies these initiatives by understanding trends of pedagogic research to recognise developments in HE learning. Therefore, initiatives are highly important in understanding the current and future changes that are required in HEI's.

### **1.3. Changing higher education landscapes**

Developing successful learning environments is critical in developing effective learning at all levels of instruction (Cleveland, 2011; Perks et al., 2016). The Universities and Colleges Information System Association UCISA (Ferrell, 2016) notes that learning and teaching have changed over the 21st century, in fact the entire landscape of the university is different. To begin to understand

## Introduction

the importance of the learning space it is important to explore the influence and integration of teaching and the environment and the development over time. Initiatives have been set up to try to integrate current pedagogic knowledge into learning spaces.

The outlook of the teaching environment has changed significantly with the development of technology and the students entering university. The new student is one who has grown up with technology and uses it in a whole new way (Valenti, 2015). Valenti (2015) even noted that these students coming into HEI no longer accept the old model of teaching and learning, and now require education on their terms. In a space of their choosing on their own schedule and in a style they choose. It is now all about offering choice to the students, so they can select their own educational plan. Consequently, educators need to identify how to satisfy this influx of students by identifying how to design their space, change the structure of teaching and understand how students want to be taught. Often new university buildings are designed to be shiny, striking and glamorous with the hope that students will attend (Dane, 2013). However, the requirements of the students are left in the background. The Times Higher Education (Dane, 2013) emphasises that the design of learning spaces is not being made by the people that understand the requirements of the space. Furthermore, Jamieson (2003a) recommends that universities have far more to learn about designing effective learning environments for the students. This further supports Valenti (2015), highlighting that more attention on the requirements of the spaces, from the perspective of the users of the spaces, is needed. Furthermore, Beckers et al. (2016a) concluded that further research should explore preferences of students to identify if preferences differed between groups of students. Therefore, research intends to determine the requirements of the main users of the space, who are currently overlooked in research.

Meeting students' expectations and creating positive and satisfactory learning experiences is an important endeavour for all universities. Most notably currently is the impact of the National Students Survey (NSS), which each year gathers feedback from students about their experiences within university. The NSS then provides Universities with an understanding of the learning



## Introduction

experiences of the students. Meeting students' expectations and requirements in the PLE may help to enhance the results of universities NSS scores. In the 2016 NSS results overall satisfaction with HE differed by 26% with a range of 71% to 97%, therefore there is a large disparity in students satisfaction ratings (Minsky, 2016). This is supported by Buckley (2015) who concluded that students are not sufficiently satisfied with their studies, therefore are proposing reforms. The Teaching Excellence Framework is (TEF) is set to be introduced into the Higher Education assessment criteria. The TEF is aimed at assessing the quality of teaching in HE to differentiate over and above the baseline of the quality assurance guidelines (HEFCE, 2016). Part of this assessment will be based around the NSS results, therefore meeting students expectations is important to achieve good TEF ratings. Although the NSS is limited because specific questions of the physical space are not asked it has been noted that the physical space influences other questions that students are asked. Furthermore the TEF is beginning to recognise the importance of the physical space by examining the resources available and personalised learning (HEFCE, 2016).

Through an extensive literature search three key elements in the design of the PLE were identified that were important in students satisfaction. These were, quality, personality and community. These will briefly be discussed to identify their importance in the student specific design of the PLE.

Quality appears to be the only consistent factor in students' satisfaction with the PLE (Riley et al., 2015). Quality has been found to be an important factor in educational outcomes in university. Durán-Narucki (2008) found that in run down educational facilities students attend fewer days on average and therefore have lower grades; this research shows empirical evidence for the effect of building quality on academic outcomes. However there is no definition regarding students perceptions of quality in the PLE, instead designers expectations of what students require (Riley, 2013). Therefore, research should aim to identify what students perceive quality to be within the PLE.

Meeting students specific requirements can be challenging as there are so many who attend university with different learning styles (Crozier, 1997), with

## Introduction

new learning requirements. Understanding individual differences can lead to a better consideration in designing PLEs. Pawlowska et al. (2014) highlighted that understanding how students' individual differences affect student requirements of the PLE requires further examination. In the research of individual differences, personality has been found to have a strong relationship with perceptions of the environment in general (Ibrahim et al., 2002; Keller & Karau, 2013) and additionally that the relationship is a strong predictor of students' satisfaction and their performance. Therefore, by identifying differences in personality may enable us to recognise a specific framework of design for students in the PLE.

The role of community is coming to the forefront of attention (Dawson et al., 2006), with Rullman and Kieboom (2012) highlighting the importance of developing a sense of community through the design of space. It has been found that there is a relationship between satisfaction and learning, most notably when students felt they were part of a community (Trigwell, 2005). The physical space has been found to have an influence on how people are able to develop this sense of community (Holley & Dobson, 2008; Grellier, 2013). With community being important in attrition (Dueber & Misanchuk, 2001) and attracting students (Shapiro & Levine, 1999), it can have detrimental effects of profits of HEIs (Raisman, 2013). Therefore considering the facilitation of a community is important in future work.

Overall, there is need to identify a framework in which to be able to identify students specific requirements in the PLE. In order to develop suitable environments to enhance students satisfaction a positively influence learning experiences.

#### **1.4. Research aim**

Constructed and identified through the review of current literature the research problem was identified, from which the aim of this research was recognised. The aim of this research is to develop and validate a framework that can be used to inform the design solutions for space in HE facilities that allow for variance in personality, educational community and quality requirements of students from different subject areas.

#### **1.5. Research objectives**

To enable the development of the framework, the following objectives were identified;

1. To analyse personality types, educational community and quality definitions of different schools at a case study HEI to establish whether there are differing levels of environmental satisfaction and therefore differing built environment requirements.
2. To analyse factors of an educational community within students' built environment by designing a questionnaire to identify what creates an educational community
3. To examine personality traits to identify if there are differences in general personalities between schools and to identify personality types within subject areas to assess any differences in needs
4. To identify what quality means in terms of the built environment, then develop and determine a definition through questionnaires
5. To develop a framework that can be used to inform on the design solution for space within the HE facilities.
6. To validate a framework that can be used to inform on the design solution for space within the HE facilities.

This research sets out to identify specifically what students require from the HEI buildings. Based on the extensive literature review, the above aims and objectives were identified. The conceptual framework (Figure 1.1) outlines the process by which these were established. This was produced to identify the process by which the aim of this research was considered.

## Introduction

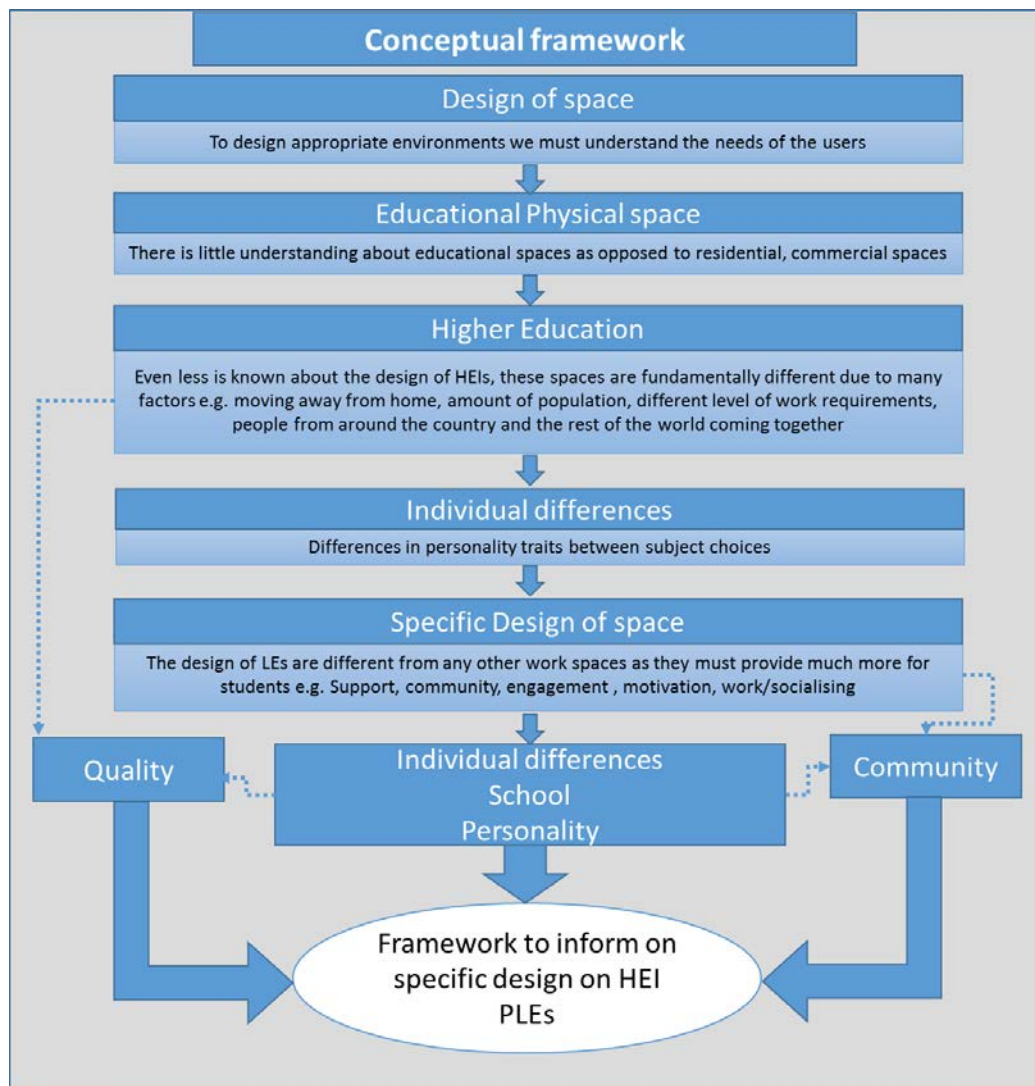


Figure 1.1 overview of conceptual framework

Figure 1.1 displays the process by which the aims and objectives of this research were developed. To begin with it was identified that physical spaces and human needs and behaviours are closely linked. However, although there is a large amount of literature exploring the design of space in residential and community areas, the literature is limited and fragmented into specific areas. The research is lacking understanding in the design of HEI's as a whole.

Examining the literature, we have also identified that specific literature exploring higher education HEIs is limited specifically to classrooms when it does appear. This is remarkable as HE is completely different to education at lower levels and therefore requires careful attention in its design. HEIs must

## Introduction

provide a different experience for students because many have moved from home, the level of education is higher, requirements are different; therefore it must provide a different environment. From this, it was important to consider how the physical space should be designed, quality was identified as the only consistent factor in the HEI building to predict satisfaction, and therefore this was the first objective of this research. As the physical learning environment must provide more than typical spaces it is important to consider what the university must develop. Bringing together many people into a learning space is a considerable task, and the research demonstrates the importance of a psychological sense of community in developing relationships and attachments, therefore this is an objective set out by this research.

The literature established that the HEIs are different to other forms of buildings and education levels, but additionally that the design of the space should be specific to that user. Research has highlighted that different students choose different courses, due to individual differences. Specifically the research highlights that people with different personalities choose different courses and that these therefore may influence the physical learning environment that one requires. As there tends to be general areas that one school uses, or a specific building, for example the art and design school spaces should be designed for those intended users. Therefore, to develop a specific framework for the design of HEIs the requirements of the specific people using the space should be taken into consideration. This currently is not explored within the literature and is therefore is an important avenue within this research; therefore the objective of this research is to identify if students require different things out of their physical learning environment and what these specific differences are. This research would close a current gap in the literature regarding the understanding of students' specific requirements in the PLE, and how the space can be design for people's individual requirements. To develop a specific framework for the design of the physical learning environment considering students' specific requirements, it is important to consider the elements outlined in Figure 1.1.

## **1.6. Contribution**

The research that formed the basis of this research project has resulted in the development of important themes, which have key contributions to knowledge. These contributions have been made to both theory and to practice.

### **1.6.1. Contribution to theory**

Prior literature has addressed the need for improvements in HE estates and learning spaces (Jamieson, 2003a; Temple, 2008; Valenti, 2015; Ferrell, 2016; Johnson et al., 2016). The literature has demonstrated how to increase student engagement in classrooms via active learning environments (Beichner, 2008), or catalogue innovative design instruments (FLEXSpace, 2017) and identified features of the environmental space that should be considered in the design process from the practitioner's point of view (Felix, 2011). However, much of this research has been obtained from knowledge and input from practitioners, such as, designers, campus buyers, faculty managers, scholars and librarians. Although this knowledge is without a doubt important and highly informative, however the main users of the building are quite often forgotten about in literature and the design process. Research has missed the opportunity to effectively synthesise this knowledge to identify from a student's perspective, the main beneficiaries of the space, and main requirements of the learning spaces.

In addition to identifying students' requirements out of the PLE, previous research fails to understand what students identify as a suitable learning environment as it is constructed of many different elements (EDUCASE, 2016). A factor of the design of HE Learning Environments that has appeared to be the only consistent feature in satisfaction with HE built environments is quality (Riley, 2013). Quality is a multifaceted concept that can enable the full understanding of students' requirements of the PLE. Therefore, identifying what students perceive as affecting their satisfaction with the space and consequently influencing their learning experiences, will help in developing suitable learning environments.

The additional areas of interest of this research and contributions to knowledge encompass individuals and the whole body of students. This research will

develop a framework to indicate the specific design of space within a HE institution to understand the impact of the space on students' learning experiences and fulfil requirements for student satisfaction, within different departments.

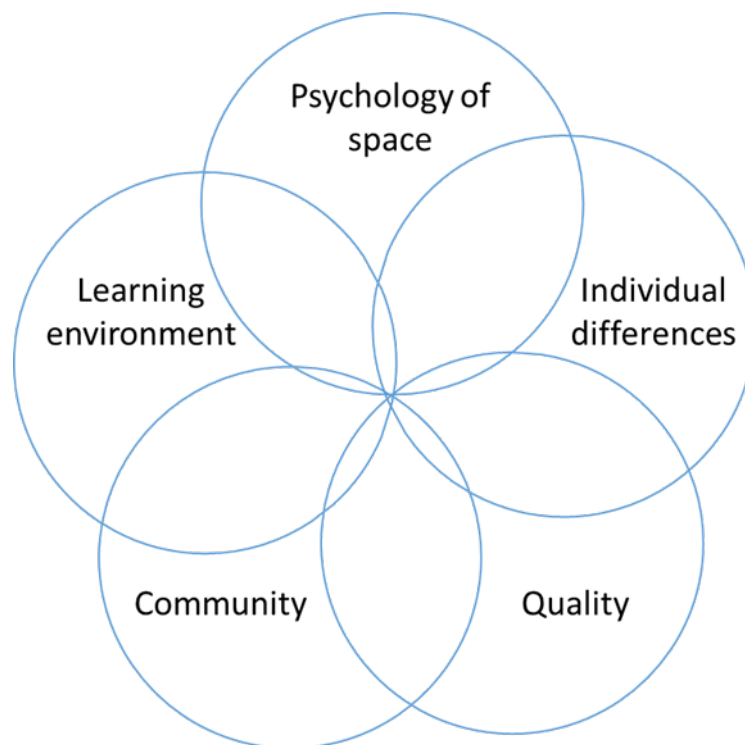
Research outlines that designing space for many people and many activities is problematic (Haugen & Fianchini, 2007) and that some environments may suit some people but not others (Luketic & Dolan, 2013), therefore this research will close this gap in knowledge. The research will identify if differing personality traits in different educational schools impact on preferences for features within the space and the type of learning environment that these different schools require. Furthermore, this research will identify a framework to inform on the design of space to enhance students' experiences that previously has not been considered when designing spaces (Bickford & Wright, 2006). The research will also encapsulate in the framework of design, the requirement for space to develop community. Although research has suggested the design of space should be considered to increase a sense of community (Bickford & Wright, 2006; McDonald & Glover, 2016) research has not specifically identified specific factors of the design.

### **1.6.2. Contribution to practice**

From a practical stance, developing a framework to support designers in the development of physical learning environments will positively affect the development process and the satisfaction of the subsequent HEI building. If HE learning environments are both developed and refurbished with the students' requirements in mind this could both improve the learning experiences and students satisfaction with the university and future proof the buildings' lifespan. Therefore, there is both an educational and economic impact of the development of a specific framework of design. Firstly, the appropriate learning environment would support the teaching and learning practices in higher education. Secondly designing appropriate learning spaces at the first opportunity, would confidently meet students' requirements straight away, therefore reducing the need for further re-modelling.

## 1.7. Structure of thesis

1. Introduction- the current chapter presents the area of research, outlines the research question and states the aims, objectives and hypothesis.
2. Literature review- the literature review chapter begins by discussing the psychological impact of the learning environment. It then moves on and identifies the area of research, the learning environment. The literature review then explore the three areas of research for this project, personality, quality and community. Finally, from this the gap in the literature will be identified along with the themes drawn from the literature review.



*Figure 1.2 Literature review outline*

3. Methodology - the methodology chapter will examine the research philosophy leading to the potential methodologies.
4. Phase one - this chapter will firstly outline the research methodology chosen, a survey approach. It will then outline the development of the questionnaire; finally, the data analysis will be reviewed.



## Introduction

5. Phase two - this chapter begins by outlining the research method chosen, focus groups. It then explores the analysis and the conclusion learned from this.
6. Phase three - this chapter begins by outlining the research method chosen, a survey design. It then discusses the development of a final questionnaire developed from the first two phases of the research project; finally the analysis is discussed.
7. Framework development- this chapter explores and discusses the development of the framework
8. Discussion - a discussion of the findings is commenced, placing the findings of this research into context
9. Conclusion- this chapter draws conclusions on the current research project, identifies limitations, areas of further research are outlined and the contribution to the wider knowledge is acknowledged.

Figure 1.3 provides an overview and objectives of each chapter.

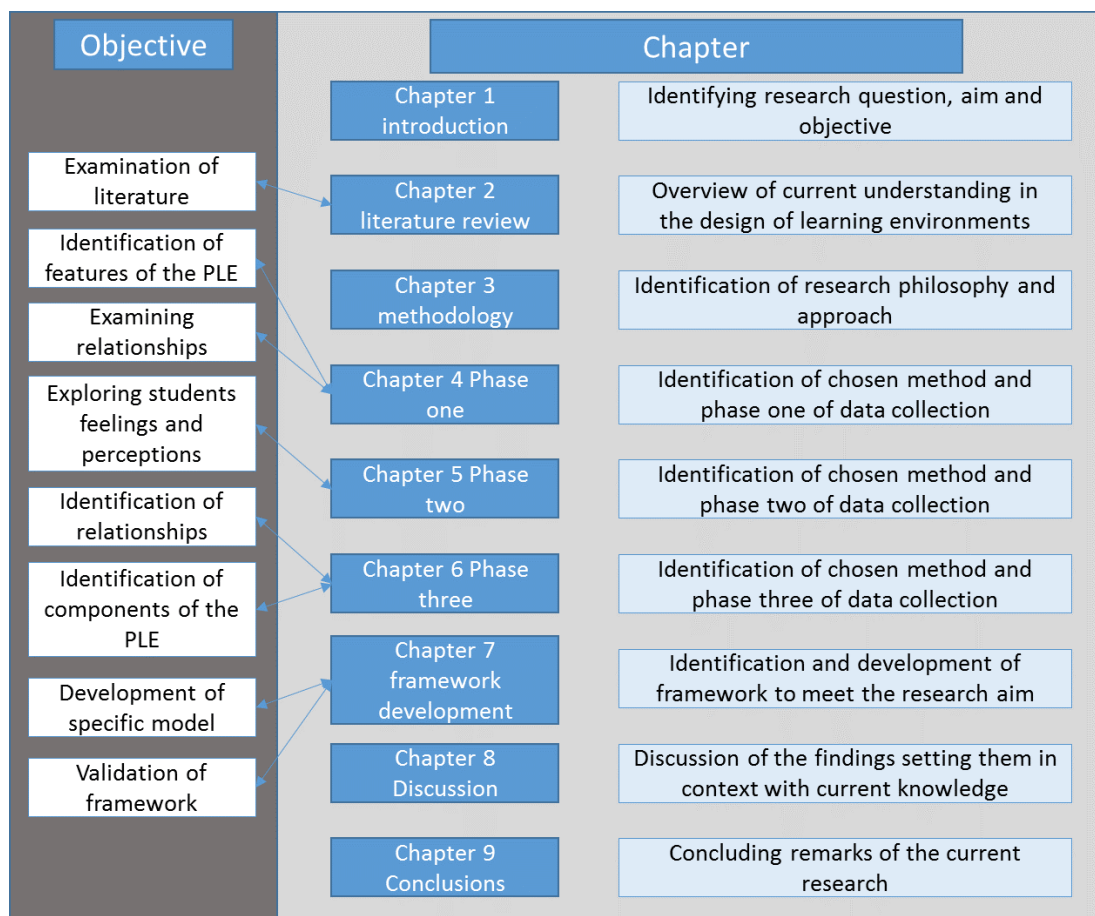


Figure 1.3 overview and objectives of chapters

### **1.7.1. Sample**

This research explored the individual differences in preferences in the PLE for students in different schools. In phase one of data collection three schools were identified to take part in this research because when it was commenced they resided in different buildings and schools across the university; Art and Design, Engineering and Built Environment. It was however identified in this first phase of analysis that the schools of Engineering and Built Environment students had very similar preferences for their PLEs; therefore the decision was made to include another school from across the university, from a different school and building. Consequently, for phases two and three of data collection the Business school were included in the sample.

### **1.8. Summary**

The introduction chapter outlined the context of the current research project. Firstly, the chapter identified that although there is a large amount of money being spent in the development of estates in the HE sector what is actually developed does not meet requirements. With the changing landscape of HE the estates is an important area of focus for meeting students' needs. It also identified that with student satisfaction measure such as the NSS and the introduction of objective such as TEF, finding ways of meeting students' expectations and therefore increasing their satisfaction is important for future work. The chapter has also stated the aim of the research project and outlined the objectives of the research. The potential contribution to knowledge was also identified to allow explicit identification of the scope of this research. In addition, the chapter highlighted the methods utilised by the project and the structure of the entirety of the thesis.

## 2. Literature review



## **2.1. Introduction**

The Literature review chapter provides an overview of the current knowledge and research surrounding the understanding of the design of learning spaces. This chapter is split into several sections that will cover the following broad areas; the psychological impact of the environment and current practices in the design of learning environments. It will then explore three areas identified through the initial literature review which are important in the design of HE physical learning environments (PLE's) to enhance students' learning experiences and satisfaction of the space. The chapter will then draw into the current gap in research knowledge and discuss the specific areas in the design of HE learning spaces that need to be understood more comprehensively. These areas focus upon the learning environment, therefore the spaces that students use around the university campus, that are made available to meet their learning needs.

The structure of the literature reviews is outlined below in Figure 2.1, this shows the evolution of the literature review and how the sections have influenced the subsequent sections.

## Literature review

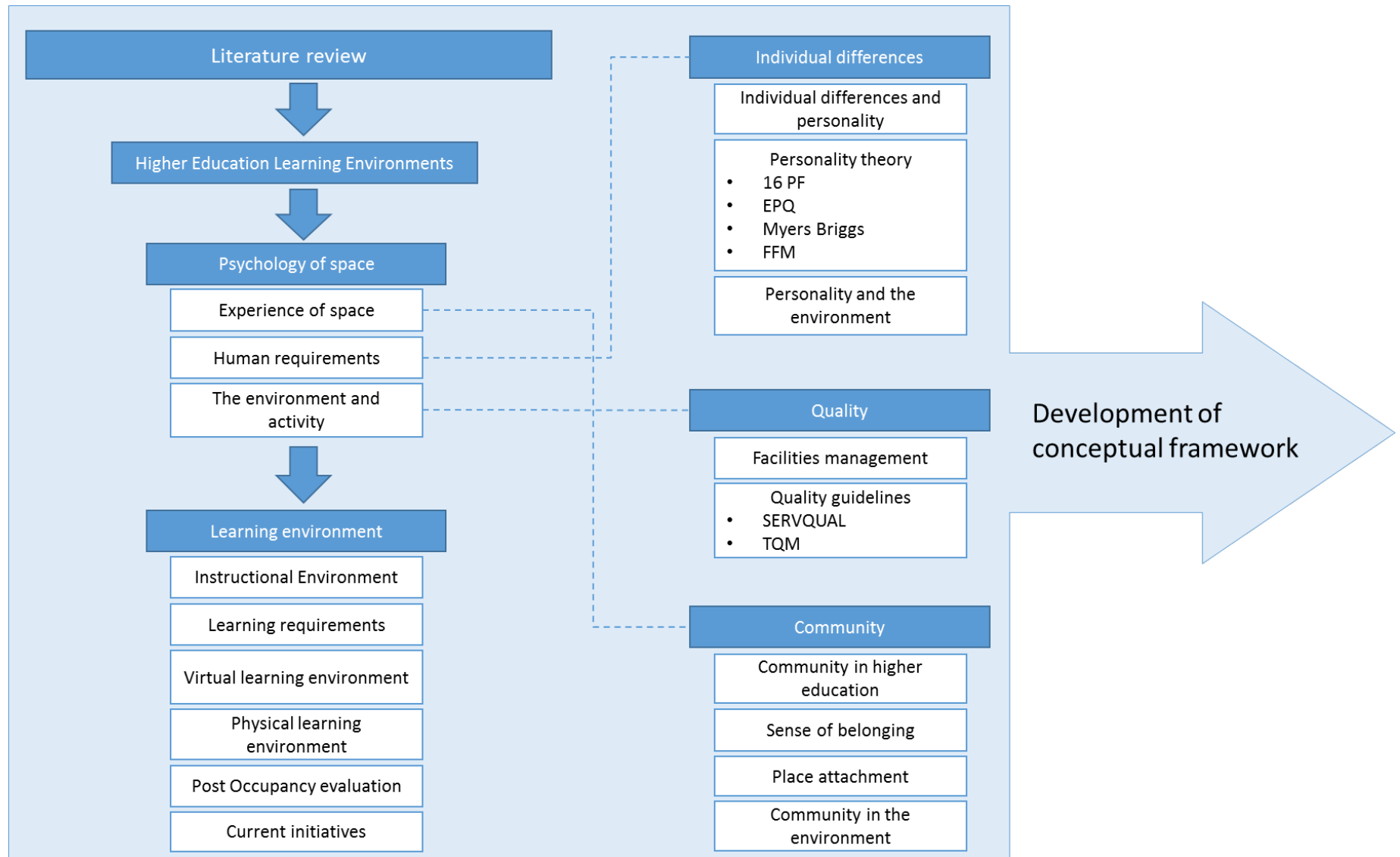


Figure 2.1 overview of construction of literature review

## **2.2. Higher Education Learning Environments**

Designing a HEI building that provides self-worth and is functional appears to not be achieved in current space design and currently the suitability of the learning environment of the students can be missed, as miscommunications can occur when pinpointing students' specific requirements (Johnson & Lomas, 2005). Although there are many levels of academic learning there is an extensive amount of research into lower and middle school learning (Rovai, 2002b; Young et al., 2003; Tupper et al., 2008; Cleveland, 2011; Dubé et al., 2014; Kelz et al., 2015), but there is little understanding the development of environments in HEI's. HEIs integrate students from many regions in the UK, internationally and with different cultures and many more diversities. Additionally, HEIs provide a different level of education, therefore are fundamentally different to other levels of education.

It can however be problematic to manage this when there are a large number of occupants and many differing activities (Hassanain & Mudhei, 2006; Haugen & Fianchini, 2007). With a diversity of students, attending there is no surprise that they like to work in many different ways. For example, Samsudin et al. (2006) found that students like to work in small co-operative groups to achieve better results. However Matthews (1992) noted that high ability students prefer to work with homogenous groups, those of the same or higher ability. Consequently, the space should allow for different working preferences. As a result of this understanding, how students use the physical space should be an important route to consider in the design of the HE PLE. As Luketic and Dolan (2013) suggested, by restructuring learning spaces based on these differing needs it may enhance learning experiences.

A range of literature has found that the college environment affects the student learning experience; a study of Chinese students identified that the perception of their college environment has a salient effect towards their educational outcomes (Chan, 2011). Furthermore, students' perceptions of their physical environment were found to be a stronger predictor of achieving learning outcomes than past academic achievement (Lizzio et al., 2002). A large scale study (Schapiro & Associates, 2001) of 1050 teachers across the United States indicated overwhelmingly, that the teacher

## Literature review

recognised that a well-designed classroom enhances not only their ability to teach, but students' capability to learn. Overall 92% believed that the design of the spaces had either a 'very strong impact' or a 'somewhat strong impact'. Furthermore, it has been found that the only consistent factor in students' satisfaction in the PLE, is the quality of the built environment (Riley et al., 2015). Therefore, it is important for students that the PLE is suitable to their requirements. The research suggests that there is an effect of the PLE on both the students' ability to learn and their satisfaction.

Considering students satisfaction is becoming a high priority for HEIs. Meeting students' expectations and creating positive learning experiences can positively influence students' satisfaction. With the HE landscape looking to imminently change with the introduction of the Teaching Excellence Framework (HEFCE, 2016), considering student satisfaction is important for meeting new assessment criteria. The TEF assessment criteria consists of three aspects; teaching quality, learning environment and students' outcomes/learning gain. Importantly the TEF includes an assessment of the learning environment, which examines features such as the resources, and enriching environment and personalised learning, where experiences should be tailored to the individual. It includes evaluation of teaching quality, which this research identified as being influenced by the PLE that the students use. Therefore using the recommendations from the framework identified in this research will mean students' expectations are met regarding the PLE, and will keep them happy within the space. Consequently, if students are satisfied with these aspects of the TEF, a higher score should be achieved.

Although it is currently being rolled out, it is still in its infancy and the Department for Education (DfE) are intending to implement year two developments later this year with years three and four to follow. Currently TEF has a 'meets expectations reward' however a trial of bronze silver and gold awards are in the year two plan. The new development will mean universities will be evaluated on their TEF score and be awarded a rating from these levels. Consequently, this rating will have an impact on the level at which universities will be able to set their fees and on loan caps. Therefore, the rating a university will gain on the TEF score will have a large economic impact on the HEI. It is important therefore to understand the university as a whole to achieve a

## Literature review

good TEF rating. This research therefore outlines recommendations for universities to consider in designing HE buildings to increase students' satisfaction and consequently this has the potential to improve the HEI's TEF score.

Additionally looking towards year three there will be the addition of a subject level score, therefore each subject will be given an individual TEF award (bronze through gold). The specific frameworks in this research would be important in this future TEF development. As the TEF will become assessed at subject level, it is important that the environment is satisfactory for the specific students in the environment. Therefore creating specific environments means students will have exactly what they require. Making students happy within the environment could improve their satisfaction and therefore the individual subjects could achieve better TEF scores.

Looking further ahead, the TEF development will culminate in year four with an evaluation specifically at postgraduate level. Therefore, this development in the TEF highlights the importance of designing appropriate PLEs to meet students' requirements, as universities should achieve higher TEF scores. Therefore, designing HEI that meet students' specific requirements is a highly important direction for future development and research.

In this context there is little research based around students' requirements and perceptions of their learning environment. When designing learning spaces three things must be considered;

1. How will information be presented to the students
2. What kinds of interaction will there be between the students and teachers
3. What kinds of activity will students be required to engage in

(Cannon & Kapelis, 1976, pg.13)

These three questions will, if asked, help in the consideration of the design process. If close attention is paid to the outline of the questions, they all refer to how the student uses the space; therefore it is highly important to consider them in the design of PLE's. The design of learning environments is often overlooked, and perceived as only where lessons transpire, however research has begun to understand how the buildings can



inspire and scaffold learning. In fact Nordquist et al. (2016) explored processes on how new learning spaces should be designed and concluded that there needs to be more interaction between teaching methods and the development of suitable learning spaces. As Leijon (2016) demonstrated, people's interaction with the learning space is strongly related with learning therefore, should be compellingly explored. Additionally, it was noted that although research has discussed specific spaces such as classrooms and libraries it has not identified the interaction between the design and the users of the space. Nordquist et al. (2016) concluded academic stakeholders need to understand the purpose of the proposed space. Therefore, these stakeholders need to gain a better understanding how the learning environment is used and how it can be developed. Furthermore, Beckers et al. (2016a) concluded that further research should explore preferences of students from different universities and educational groups to identify if preferences differed between groups of students.

To understand students specific preferences in the PLE, Kasalı and Doğan (2010) noted that students are useful in identifying their requirements, which is unsurprising as these are the people who will actually be using the space. A summit on the design of HE space concluded that although literature does exist on designing learning environments, this rarely informs actual planning and design processes (Rullman & Kieboom, 2012). This may be due to the current literature not focusing on the evidence based needs of the user, and not constructing this in a suitable and applicable way (CABE, 2005; Bickford & Wright, 2006). Therefore, it appears necessary to consider how to best convey understanding to the practitioners. Neary and Saunders (2011) noted that the commercialisation of the design of HEIs affects the overall vision for the universities. Those involved in the design tend to worry about the current process of the project rather the building end use. The importance of the requirements of the end users, the students, needs to be highlighted to the designers of the buildings to ensure suitable spaces for students, as currently this appears to be lacking. Jamieson (2003a) determined developers need to play a key role in helping universities to create a more effective PLE. HEIs have been said to be a unique setting as a university is made up of many components (Quinn et al. 2009). There are the staff, for example auxiliary staff and teaching staff and there are also the students. Wakefield & Blodgett, (1999)

## Literature review

suggested that a major disadvantage in the pursuit of improving the design of the physical environment is the fact that employees may have become used to the physical environment as they use it on a daily basis over a long period of time and therefore overlook the disadvantages in the environment. Therefore, they suggested that the managers of the estate should monitor the users' perceptions and preferences of the physical environment. However, it has been postulated that perhaps there may be some resistance to using students to inform on the design of space. Quinn et al. (2009) observed that when attempting to manage quality in HEIs, faculty members in particular were reluctant to consider students' needs when developing HEIs, therefore this could explain why this is currently a gap in knowledge. Langstrand et al. (2015) highlighted that although universities have many users, the students should be considered the primary users of education. Therefore, the focus must be on what the students value and additionally, what would facilitate their learning. Furthermore, Hill (1995) pointed out that it is not enough to focus on the personnel (employees) of the service provider, but focus must also be paid to the consumers' motivation and behaviours. Therefore, the users, the students, must be considered in their preferences towards the quality of the service provided. The literature has currently aim to develop PLEs by using staff, academics and design perceptions of students' requirements, however this appears to have not achieved the required results. This supports the requirement to identify the preferences of the students in HEIs to identify accurately what are their requirements out of the environment so managers can identify aspects for improvement.

Overall, it can be established that a focus needs to be placed on forming a functioning framework of the design space that would allow for the best possible learning experience for students. This framework should also focus on students specific requirements from their own perspective instead of relying on other stakeholders expectations of their requirements.

## **2.3. Psychology of space**

The awareness of an interaction between human psychology and the physical environment has been understood for centuries. Sime (1986) noted that the concept of 'place' has been in philosophical writing for centuries, noting that Aristotle considered 'place' was the dimension of 'where' in one's relationship with the Physical space which instilled feelings of 'belonging'. Augustin (2009) also presented the ancient Greeks philosophy of space, by noting that greek temples are large but perfectly balanced to represent the gods who would be seen as serene and all powerful. Furthermore, there is the study of Biophilia which suggests that humans have an inherent inclination to affiliate with natural systems, which is encoded into humans' physical, emotional and intellectual prowess during our long evolution (Kellert et al., 2011). Therefore researchers in this area suggest that the physical environment should be designed with the understanding of human evolutionary needs. This philosophical research demonstrates how the idea of 'place' and the physical environment have been important over millenia and how our evolutionary past may influence our perceptions of our physical environment.

### **2.3.1. Human needs**

It has been stated that we spend upwards of 90% of our lives within buildings (Evans & McCoy, 1998). As we know the built environment plays an integral part of our lives, however people are complicated, and their reaction to spaces is also complicated (Vischer, 2008). Renewed interest from the design community has been placed on the psychological fit between individuals and their surroundings (Sime, 1986). Sime (1986, p.49) called this, 'place making' and concluded that it is impossible to design spaces for the users of buildings by only creating environments on 'their' behalf, not considering the users. 'Place' is different to space and physical environments as it is associated with an emotional tie between the person and the space (Sime, 1986); therefore the term 'place' is generally given to spaces that provide a positive and satisfactory experience.

Place has a strong influence on human behaviour, Reiss (2004) identified 16 intrinsic motivations that dictate human behaviour. These are all unassociated desires, which

## Literature review

may stem from our evolutionary history. These motivations are as follows: power, curiosity, independence, status, social contact, vengeance, honour, idealism, physical exercise, romance, family, order, eating, acceptance, tranquility, saving. Augustin (2009) highlighted that all of these can be associated with the physical environment which, she suggested, should guide place design. For example, Augustin (2009) suggested that places are influenced by

- Curiosity - spaces should be designed to encourage and develop you
- Independence - we should be able to control space to control our own destiny;
- Social contact - space should help human interaction, but should also allow one privacy if required.

This research demonstrates how the human-environment interaction is important in the design of the built environment. It suggests that people are always evaluating the environment to make sure spaces can meet these basic human needs.

As outlined, the physical environment is an important component in people's perceptions and attitudes. The physical environment has also been found to have an important interaction with humans' emotional and cognitive response. A vast amount of research has focused on how the sensory world affects humans' emotional and cognitive state. Many factors in the sensory world have been found to influence our emotions. Lighting has been found to influence one's morality, people in well lit environments tend to show an increase in ethical behaviour (Chiou & Cheng, 2013). We may be influenced emotionally by the lighting to be more moral. Our emotions have also been found to influence the perception of light and dark. For example happy people judged a grey picture to be brighter in appearance than sad participants (Zhang et al., 2016). Not only does the environment influence human emotions, human emotions have been found to influence the perception of the sensory environment. Additionally other senses such as that of smell have also been found to elicit an emotional response. Lavender has been found to increase performance on mathematical tasks (Augustin, 2009). So this sensory response may help on cognitive tasks, which is interesting in pedagogic research, as there may be factors that can be considered to enhance learning. Furthermore within the classroom, noise has also

been found to elicit stress responses and annoyance in learning environments (Enmarker & Boman, 2004). Therefore, humans' sensory perception of factors such as noise, light and smell can affect human behaviour and the perception of the physical environment.

Enclosed space has also been found to influence emotions. Vartanian et al. (2015) found that individuals' perceptions of being enclosed affected their judgements of beauty, finding that more open rooms were found to be more beautiful. They also found that enclosed spaces were more likely to gain an emotional reaction that led to desires to leave the space. Therefore the structure of the environment can also elicit emotional responses. In addition, the structure of the building impacts human behaviour, the building height has been found to have a negative impact on how restorative the environment is (Lindal & Hartig, 2013). Furthermore, they found that architectural variation on a street increases the likelihood of personal restoration, demonstrating that the physical built environment has an impact on people's well-being. Certain buildings have also been found to have a detrimental effect on health, the building or services can evoke symptoms know as sick building syndrome (Burge, 2004). Symptoms can be anything from a blocked nose to headaches and lethargy and can be due to many features, such as, ventilation, temperature or lighting, although many more are predicted (Burge, 2004). Furthermore, in the urban environment a study on classrooms found that colour affected the reading abilities of children (Stone, 2001). Therefore, the colour of the environment may have a detrimental impact on cognitive ability. Natural environments however, have been found to have significant additional cognitive benefits, which can last at least 30 minutes after leaving the natural environment (Gidlow et al., 2016). Therefore, the natural space can have a positive impact on one's interaction with the physical environment. As demonstrated, the physical environment seems to be influential on human behaviour and therefore one's requirements.

### **2.3.2. Design of space**

Considering the human reactions to space, what should be considered a suitably designed space? Augustin (2009) outlined five factors that space needs to unite:

## Literature review

- Complying - it must meet the demands of the activity by including the tools and facilities necessary. Designing healthcare environments with the required features results in improved provision (Mourshed & Zhao, 2012).
- Communicating - the space must convey what the space is intended for and how people use the space. The space must also describe whether it is for socialising or not, because, as a large part of human life is socialising, space must allow for this interaction. Public social spaces have been found to have a significant relationship with a sense of community and encouraging a sense of well-being (Francis et al., 2012).
- Comforting - the space must meet the psychological needs of people; as outlined previously the physical environment has a large impact on human emotions and cognitive abilities. Comfort is important for satisfaction in an environment, therefore is important in designing spaces (Shin, 2016).
- Challenging - the space should allow people the opportunity to grow and develop. For example designing spaces that are motivating for physical activity can help people better look after themselves (Ford & Torok, 2008).
- Continuing - the spaces needs to be able to develop across time with evolving needs. If space does not have the ability to change then it will not last the test of time and will need to be refurbished and developed costing time and money.

Developing spaces that encapsulate all of these features, complying, communicating, comforting, challenging and continuing should be a priority for designing space. However, there are many features of the environment and it is important to understand what features should be prioritised in the design process.

As the literature outlines, space must provide the correct environment for the people using the building. When designing the built environment, the processes are costly and time consuming. Therefore, if a business is ploughing time and money into a project, it is important to understand from the beginning the physiological impact of the environment that is being designed. It is important to understand how specific elements are going to affect the intended users of the building's physical environment. A few items are specifically highlighted throughout the literature as important considerations, which affect human behaviour.

### *2.3.2.1. Colour*

Colour has been found to influence people's attitudes and perceptions. One theory is that this may be an evolutionary trait. For example, if asked today, most people will still say that their favourite colour is blue. This harks back to a time when in the Sahara desert a blue sky meant good weather and good hunting abilities (Augustin, 2009). This theory is supported by Yildirim et al. (2015) who found that students found the colour blue to be more favourable in classrooms compared to pink and cream, which impacted their perceptual performance. Furthermore, the colour of the environment has been found to affect task performance and emotions (Stone, 2001, 2003). Therefore choosing the correct colour may be important for the performance of the physical environment, but also for the performance of the users. Colour can influence both positive and negative emotions due to social and natural associations (Wang et al., 2014). It is important to understand the impact of colour on designing environments to make sure they construct the appropriate physical space. It is also important to remember what colour says about a space. Research in retail environments found that there was a significant impact on not only the impression of the space but also the identity of the retailer (Tantanatewin & Inkarojrit, 2016). Therefore, the colour can have an impact on the customers' response to the product. Additionally warm colours have been found to be indicative of remembrance and attractiveness compared to other colours (Hidayetoglu et al., 2012). This research illustrates that colour choice should be considered carefully in environmental design.

### *2.3.2.2. Spaciousness and crowding*

In the built environment, spaciousness and a sense of openness has been found to be important to human perceptions. Herzog (1992) found that in urban environments a preference for openness of the space is as salient as in natural settings, therefore providing open spacious environments is important within the design concept. In the perception of the making of quality neighbourhoods, openness along with diversity and organisation, are the most important dimensions (García-Mira et al., 1997). Conversely, enclosed spaces have been found to be linked to feelings of distress and exit decisions (Vartanian et al., 2015).

Spaciousness rather than the density of space is advantageous because people can perceive their personal space as being invaded, eliciting behavioural outcomes e.g. stress (Evans & Wener, 2007). When overcrowding occurs, this behavioural outcome is more likely to occur. Crowding theory suggests that there are three behavioural impacts of crowding (Evans & Lepore, 1992):

- behavioural constraints - people feel they are constrained by the people around them
- diminished control - people feel they do not have the control over their space they require
- over-arousal - there is an over stimulation from the sensory environment as it becomes more unpredictable

However, enclosed offices performed better for office workers over open plan layouts by increasing users' satisfaction (Kim & de Dear, 2013), therefore in some situations openness may not always be beneficial. It was suggested that this could be due to overcrowding, Kim and de Dear (2013) found that one of the most negatively rated factors of open plan offices are acoustic levels, they are too noisy. Therefore, these open spaces are perceived negatively because they feel overcrowded.

### *2.3.2.3. Territories*

A territory can be a space of any size that helps humans have their privacy and identify who they are as people (Augustin, 2009). Providing physical spaces that can instil this feeling of identity is important across many physical environments. Place identity has been found to be highly correlated with neighbourhood satisfaction (Bernardo & Palma-Oliveira, 2016). The sense of place identity has also been found to affect transition of undergraduate students to university (Chow & Healey, 2008). Both groups and individuals require territories. The design of the physical space is imperative in creating spaces for these territories and creating features that mark boundaries. Designers could incorporate the opportunity for boundaries into the space, which could be in the form of changes in colour partitions or changes in design. Understanding that humans require territories in their environment is advantageous to designers, so when



the space is used it offers this opportunity and users can interact with the vision of the space.

### *2.3.2.4. Seating*

Seating is important for people in many situations, social, commuting, eating, working and many more. As seating is part of everyday life understanding how we make decisions about where to sit and how this affects us may shed light on the influence of the built environment. Research has found that when people had to sit close to each other on a train, people experienced adverse reactions, for example stress reactions (Evans & Wener, 2007). Passengers note that this is generally down to an intrusion into their personal space. Additionally, people have a preference for sitting in the centre at a music concert, however not if they go to a piano concerto, or rock band (Kawase, 2013). The authors understood this difference to be due to the possibilities of interactions with those on stage. Seating position has also been found to influence class participation for students, those in the front are more likely to participate (Montello, 1988). In restaurants people use architectural cues about picking a seat more than in other situations (Robson, 2008). This may be due to the reason that stressful situations lead to more need for behavioural control and opposition to unwanted intimacy. Therefore, we choose physical or visual boundaries, for example booths to sit in. Abdulkarim and Nasar (2014) found that seating was a very important factor in how restorative plazas were, which made them more inviting. Therefore, seating design has to be an integral feature in the process, and not at the end, when the building is completed.

### *2.3.2.5. Nature*

Nature in the physical environment is related to light and space, plants, natural shapes, patterns and forms and is explored in Biophilic research (see; Kellert et al., 2011). A connection with life satisfaction and connectedness to nature, when engaged with natural beauty, has been found (Zhang et al., 2014). Therefore, to increase people's wellbeing creating a connection to nature may be beneficial.

The natural environment had beneficial effects on heart rate, stress and mood (Beute & de Kort, 2014). Also those who experience daylight experience more vitality, this

was most significant in the morning when people feel less vital (Smolders et al., 2013). The impact on the body, a reduction in blood pressure, suggesting a decrease in stress, has been found in natural environments as opposed to urban settings (Hartig et al., 2003). Therefore, this suggests that a natural environment offers restorative benefits on the human body compared to the urban environment. However, there may be features of the natural environment such as daylight that may be incorporated into the urban environment to provide similar benefits. Kaplan (2001) explained this phenomenon by the attention restoration theory. This is, when one experiences nature, it attracts the individual's automatic attention, which allows someone with low attention spans the capacity to recover and reduce their mental fatigue. In addition, to well-being, the natural environment has other benefits to people. The natural environment evokes improved cognitive functioning (Berman et al., 2008; Kellert et al., 2011) and this effect also lasts after leaving the natural environment (Gidlow et al., 2016). Therefore, including natural surroundings in situations such as schools, universities and libraries may support the cognitive functioning of those using the space. When designing the physical environment, it would be beneficial for designers to consider how to incorporate a natural landscape into the urban environment.

The built environment obviously has influential power over humans; it has the power for people to create their own identity through territories. The environment can also provide people the opportunity to socialise and meet others by providing seating, places where people can meet and restorative places to inhabit.

### **2.3.3. Conclusion**

With the understanding of factors such as sick building syndrome (Burge, 2004) cognitive effects (Stone, 2001) and restoration (Lindal & Hartig, 2013) people are demanding to understand the effects of the environment on their health and well-being (Finnegan et al., 1984). This overview of the influence of the built environment on humans in many ways sheds lights on the fact that human psychology should have implications on design decisions. Consequently, the design of buildings should never be distal from this fact. All involved in the design of the physical space should consider understanding the important influence.

## Literature review

Several factors appear to be important from this review, firstly that the environment affects human behaviour. Secondly, the environment is where human behaviour occurs and we should design it to reflect the requirements of the user. Finally, many factors within the environment influence human behaviour in many different ways. To further explore this interaction between humans and places, further investigations into literature surrounding this in other areas of research will be ongoing throughout this literature review. The development from this in the subsequent features will explore specific influences of satisfaction from the environment.

## 2.4. Learning environment

As established through the current literature the design of appropriate spaces is beneficial for the users of the environment in many ways. Perceptions of the physical learning environment have significant implications on the user's experiences. The study of the built environment is widely discussed across many fields. The *Journal of Environmental Psychology* with forty-seven volumes spanning twenty-six years, explores the psychological interactions with our built environment. Journals such as the *Journal of Housing and the Built environment* and the *Journal of Building Pathology and Refurbishment* focus on the structure and design of the buildings. There is a large body of research whose aim is to examine the physical environment. However it has been noted that research into the design of learning environments is lagging behind research on buildings such as commercial, residential and industrial (Riley et al., 2010). There is a large body of literature that examines how the physical environment influences the perceptions and behaviour of individuals who work in offices (Kim & de Dear, 2013). Therefore, the learning environment does not need to be understood from the employee's point of view as this has been extensively researched. However, there is little understanding about the PLE from the student's perspective, where this space acts as a learning space as opposed to a workspace.

The focus on the taught learning environment has been on the teacher rather than on the physical space (Fraser, 1998). Pedagogical research assesses the ideal practices for learning, however this question is becoming to be seen as a question for classroom design as well (Hill & Epps, 2010; Perks et al., 2016). This lack of discussion in education research (Jamieson et al., 2000) regarding how the physical place of the learning environment interacts with learning experiences, has contributed to the lack of dialogue on the topic. Although Fraser (1998) and Jamieson et al. (2000) work is fairly dated the work conducted by Riley et al. (2010) confirms that these propositions still ring true. Commercial, residential and industrial facilities are however very separate entities and must be treated as such, the distinction between the environments has been stated as,

*“Building a school is different from building an office building. The building not only has to be functional and economical, it has to give a sense of self-worth to the student”* (Young et al., 2003, p. 4)

It can be seen that there is currently a discrepancy between workplace design and HE facilities design therefore this area should be further discussed. Consequently, this chapter will review literature into the physical learning environment to explore what is currently understood.

### **2.4.1. Teaching environment**

There is a vast quantity of research on students ‘learning environments’, however this phrase can have two meanings. In the majority of research ‘learning environments’ are discussed in the sense of an environment of learning that the teacher forms within the classroom. Vinales (2015) notes that the learning environment is integral for students as this is where students develop their skills, knowledge, attitudes and working behaviours. To develop these skills, pedagogical research explores how the learning environment can develop these competencies. For example, an analysis of inquiry tools for the learning environment in a classroom (Fraser, 1998) discussed factors such as, involvement, personalisation, task orientation and speed of the lesson. These scales contain statements such as ‘*The teacher takes a personal interest in the students*’ and ‘*Different students use different books, equipment and materials*’ (Fraser, 1998, p. 11). Although this research is integral for designing teaching and learning practices for teachers in the classroom, research has also begun to recognise that this is not the only factor effecting learning. For the purpose of this research, the phrase ‘learning environment’ is going to be used to describe the physical place that students learn in. Learning occurs everywhere, in coffee shops, on the bus, in a playground. In fact, we have the capacity to learn everywhere, to pick up new skills to enhance our knowledge. It is first important to understand how people learn in order to understand how we can develop PLEs to support this.

### **2.4.2. Student learning styles**

The interest in student learning has developed due to the realisation that learning behaviours within the academic environment could not be fully explained (Tickle,

## Literature review

2001). Skinner (1950) outlined three areas of learning theory, firstly physiological, that there is a biological component of learning. Secondly, although similar to the first, is a cognitive component. And finally, an explanation referring to the central nervous system. Current literature has however demonstrated the importance that individual differences have on learning. Learning styles are a factor of learning that has gained a lot of attention in the literature. This refers to the style in which a person adopts to learning (Crozier, 1997). Learning style has been said to be the representation of personality within academia (Tickle, 2001) as it encompasses learning strategy, (Pask, 1976) motivation (Crozier, 1997; Busato et al., 1998), attitudes and cognitive style (Busato et al., 2000). Learning style consequently is the embodiment of individual differences, as it determines how individuals may approach learning. Furnham (1992) noted that this was an important acknowledgement in the academic environment as students with different learning styles consequently learn differently. Therefore, when designing the learning environment, understanding of individual differences in students' learning could be considered to improve student learning.

In the past university teaching was considered to be a lecturer at the front of the class dictating to the audience whilst the students took notes (Lom, 2012). This design however does not appear to meet with current pedagogic theory and therefore the design of the physical environment may need to be reconsidered. Advancement in current learning theory to a focus on constructivism, the learner constructing knowledge, has implications on the ways learning occurs (Yoders, 2014). This construction on knowledge for learning refers to students participating more within their own learning. It has been established that students should become more active learners (Lumpkin et al., 2015). Active learning is centred on the thought, that if students actually do something they will learn better than if they are just told. Students should have access to more learner centred approaches, however most universities and teaching institution keep lectures in traditional lecture theatre as their main teaching method (Lom, 2012).

The postulation of students being more active learners has been encouraged by the use of technology for example, recording of lectures to watch back (Owston et al., 2011). This only partially addresses the idea of increasing students' participation as

active learners, although it does encourage students to actively seek out information and control their learning, it does not satisfy the active learner in a teaching context. Currently University designs do not allow for active learning, it has been stipulated that, *“traditional classrooms and lecture halls do not provide the affordances that encourage engaged learning”* (Thomas, 2010, p.503).

Therefore, redesigning space to encourage learning should be addressed. When this pedagogic research is applied, the curriculum is being enhanced in management programmes (Hoidn & Olbert-Bock, 2016), nursing (Vinales, 2015) and social work (Teater, 2011) to name a few fields of study, which in all cases lead to increased student satisfaction. Chism (2006) suggested environments that *‘provide experience, stimulate the senses, encourage the exchange of information, and offer opportunities for rehearsal, feedback and application and transfer are most likely to support learning’* (p.2.4). By designing environments that attend to the requirements of the user’s and encourage this construction of knowledge can increase satisfaction which can consequently improve learning experiences for the students.

Although it cannot always be anticipated where pedagogic developments may lead us in the future, it is important to understand people learning differently (Parra, 2016), But the learning styles and strategies that students use are influenced by the resources at their disposal and the physical environment they use. Therefore, the opportunity for development can be embedded within the design, therefore future proofing progress (JISC, 2006). As a result, more appropriate physical learning environments are required to enhance the satisfaction of the students and their learning experiences.

### **2.4.3. Current understanding of the physical learning environment**

As highlighted in the discussion on students’ learning styles it is important that the learning environment supports student learning, this is also the case for physical learning environments. The environment is therefore an important factor to consider to increase students’ satisfaction.

As identified, the environment and human behaviour relationship is important to understand in the design of the PLE. To design the PLE for the intended students it is

important first to consider how one would proceed when designing this specific space. Greattz (2006, p.6.1) suggested that there are three fundamental ideas that motivate the psychology of teaching and learning extrapolated from the environment, which therefore should be considered when understanding the requirements of the PLE for students.

1. *All learning takes place in a physical environment with quantifiable and perceptible physical characteristics*
2. *Students do not touch, see or hear passively; they look, feel and listen actively*
3. *The physical characteristics of learning environments can affect learners emotionally*

These three factors should be considered when designing students' PLE's. Firstly, all learning, no matter if it is in university or at home, on and off campus application takes place with perceptible features such as, light, chairs and desks. Secondly, students are actively aware of their physical surroundings, they actively hear and feel the environment around them and therefore it affects them both knowingly and subconsciously. Finally, it is important to consider the design of the PLE as this affects students emotionally; therefore, this affects students' learning abilities, which influences their learning experiences.

*'There is no simple guide to human behaviour which architects can use but recommendations rather than an understanding of the principles of behaviour and of man's interactions with buildings'* (Shemirani et al., 2011, p. 237).

This statement makes it clear that unravelling the interactions of users with buildings is important. This is to enable architects to fully understand how to design buildings, to allow for the interactions, rather than having to rely on current un-researched recommendations.

So what about the learning environment that students consider as being important?

It has been suggested that the ultimate test of a building is whether the user still makes use of the building's facilities, even at points when they don't need to be there



(Hawkins & Lilley, 1998). For example, when lectures have finished, are students still making use of the facilities for learning or social interaction? There are many factors that have been identified in workspaces that influence working ability, such as, the features mentioned previously, traditional factors (Winterbottom & Wilkins, 2009) and more modern considerations (Bluyssen et al., 2011). Many factors have been recognised as key in the design of learning environments. There are factors to consider across the whole university both within classrooms and between, in the spaces students congregate. Within the rooms themselves, there are factors that have been identified that need to be considered, Research has found that students' perceptions of the PLE rely on ambient attributes such as ventilation, lighting (Winterbottom & Wilkins, 2009) and temperature (Douglas & Gifford, 2001; Yang et al., 2013). Gurung (2005) noted that those who got distracted by noise, music or friends performed worse on exams; therefore noise had an impact on their learning capabilities.

These items are environmental factors but other factors that should be considered when designing a learning space, such as, spatial factors including visibility (Montello, 1988) furniture and comfort of seating (Hawkins & Lilley, 1998) and colour schemes (Hawkins & Lilley, 1998). Beckers et al. (2016a) found that the aesthetics of the physical environment are not important in student perceptions of their learning environment. They concluded that this does not mean that these factors are irrelevant, just the effectiveness of the space is more important to students.

There are also specific spaces of a building that need to be considered such as, formal and informal learning spaces (Thomas, 2010). Additional factors that need to be considered in the general design of university buildings, such as, durability (Durán-Narucki, 2008), accessibility (Heaven & Goulding, 2002), safety (Rivlin & Weinstein, 1984) and spaciousness to avoid overcrowding (Evans & Wener, 2007), have all been recognised as factors that influence or can enhance students' perceptions of their learning environments. Furthermore, the ability to navigate the space is important as inappropriate design or poor signage can result in people experiencing negative emotions towards the environment. A term coined 'spatial anxiety' can occur if people cannot way find easily around the environment (Lawton, 1994). More up-to- date

theories of space design include the utilization of natural views from windows (Aries et al., 2010), the creation of natural space (Berman et al., 2008) and daylight in university buildings (Shemirani et al., 2011). Although this research shows a range of factors there is no one study that identifies which are the most important. Three elements of the design of HEI PLEs have been identified through the literature that are consistently reported as increasing students' satisfaction and their learning experiences. These will therefore be discussed in further depth.

### *2.4.3.1. Social spaces*

Social spaces have been identified as integral to the PLE for students. It has been found that some students tend to prefer spaces where they know their friends will be (Harrop & Turpin, 2013). Therefore, it was concluded that space should allow interactions for students, places for them to meet and develop friendships. To develop the appropriate physical learning environment with the social spaces included, Dittoe (2006) suggested a more integrated learning environment. This is as opposed to the traditional learning environment which can encourage students to engage more with others. This also allows students to engage more with the course, for example turning up early to use the learning spaces or to interact more with staff.

### *2.4.3.2. Flexibility*

Taking into consideration concepts that have been suggested to improve the design of learning spaces, Holm (2011, p.178) suggested that,

*'most workplaces need a kit of parts, to cater for different work styles and to provide a diversity of settings that individuals can self-select to maximise their own productivity'.*

(Beckers et al., 2016b) found that students need spaces where they can work together in small groups or individually, however many learning spaces lack this area for students to 'retreat' to. Consequently, students tend to conduct most of their learning at home as the environment can be controlled for their concentration and comfort. Therefore, it is important for universities to provide more student led spaces that they can change into their own suitable learning environments.

The idea of being able to adapt space to requirement has become more documented. Students like to be able to adapt their environment for different tasks (Thomas, 2010;

Holm, 2011), so for example, to work as a large group on lecture material or to work in smaller groups to revise. Harrop and Turpin (2013) concluded that universities should offer a variety of space to the students to allow for multiple preferences. It has also been suggested that this works better for staff as it enables group learning in the classroom so students can move around and discuss things with different groups. Flexibility can allow for different teaching and learning styles (Lomas & Oblinger, 2006), and as research has suggested collaborative learning enhances learning ability (Greatz, 2006; Lomas & Oblinger, 2006). McNamara (2012) found that students used any space but aimed to manipulate it to best suit their requirements, therefore designers should aim to make spaces as flexible as possible to allow students achieve their needed physical space. The adaptability of space appears to be an important factor to consider in moving forward in its design. Although there are many factors of the PLE there are a few specific features that have been found to be important to students' PLE specifically as opposed to other environments.

### *2.4.3.3. Technology*

Technology has become more integrated into daily life, students now have a phone, maybe a laptop or MP3 player, an iPad or a Kindle with them at any one time, they use these devices to contact each other or to google topics that are of interest instantly. Students not only live in the physical world, they live in a virtual world. To stimulate learning using what students know and do each day without a second thought the learning environment should be enhanced to support this modern pedagogy. Students own a range of personal devices therefore there should be space and access to power to accommodate this. However, for students carrying around a laptop can be cumbersome so incorporating access to technology in the learning space should also be considered. Lomas and Oblinger (2006, p. 5.11) observe that;

*'Students are changing, technologies are changing, and learning spaces are changing. Students will use the spaces that best suits their needs'.*

Therefore, identifying that one source of requirement for students is technology, it must be understood how to incorporate this into improved learning space design.

### *2.4.3.4. Virtual learning environment*

Through the development of technology students are becoming far more computer literate. The advent of this technological age has also allowed for a more blended learning model (Fisher & Newton, 2014). For example, it is allowing students to become more active learners by developing virtual online learning environments (VLEs) for students to take control of their own learning (O' Shea et al., 2015). This also allows students to work together and develop learning communities (Melkun, 2012). Additionally, tutors are able to upload recordings of lessons to the VLEs for students. This use of technology enables more flexible and personalised teaching programmes for students to access when required (Zhang et al., 2004). This is therefore changing the landscape of the teaching environment.

It has been recognised that the PLE and the VLE are becoming indistinct from one another (Thomas, 2010). Where once they were separate entities they are beginning to rely on each other to successfully deliver a blended learning model. With this understanding it appears to be important to integrate many areas into the design of the university space making a place for the VLE. It should encompass VLEs as well as formal and informal learning (Johnson & Lomas, 2005) as well as considering that a range of activities will occur in spaces over and above standard teaching and learning (Thomas, 2010). This presently is not considered in current PLE design and therefore should be focused upon (JISC, 2006). This research proposes that there are specific requirements that students need out of their PLE. Their environment must provide the facilities and resources that meet their needs.

### **2.4.4. How the environment is currently assessed**

To design university space, it is important to understand what the users', the students', preferences are. As has been established user satisfaction is important, additionally it has significant impacts on the performance of the physical environment, therefore it is important to recognise that factors are important for physical environmental performance. The evaluation of building performance is important in understanding how the environment works for the user. Post Occupancy Evaluation (POE) is a building performance evaluations technique which aims to evaluate building

## Literature review

effectiveness after the building is in use (Cleveland & Fisher, 2014). It is used in the aftermath of building completion, within a couple of years, to assess the users' perceptions of the building's effectiveness.

*“By evaluating the feedback from users of HE facilities, university planning departments are more prepared to understand the inputs for programming and future project planning.”* (Tookaloo & Smith, 2015, p.515)

Reviewing a framework put forward by Riley (2013) most POE occurs in the later stages of the design process, stage four onwards. However it was suggested that this evaluation method should begin right back at stage one, to understand users' requirements from the design conceptions phases.

Project phase	Stage of Model	Activity
<b>Direction Setting</b>	<b>Stage 1</b>	Operators identify functional brief, challenges and goals for the project/building together with perceptions of user expectations
	<b>Stage 2</b>	Engage with users to refine functional brief and overarching service expectations for building/ facility.
	<b>Stage 3</b>	Engage with data from previous projects & review lessons learned existing knowledge base & best practice guidance to inform brief
<b>Scorecard Creation</b>	<b>Stage 4</b>	Scorecard created to reflect 4 performance dimensions Translation of institutional strategies to project deliverables/outcomes Key functional objectives Statement of objectives within four performance dimensions Determination of performance indicators Define final scorecard
<b>Evaluation</b>	<b>Stage 5</b>	Conduct evaluation of facility using defined scorecard
	<b>Stage 6</b>	Analysis and interpretation of data from evaluation
	<b>Stage 7</b>	Internal review of findings and linkage to institutional goals and strategies
<b>Reporting</b>	<b>Stage 8</b>	Final report with knowledge sharing and presentation of findings linked to institutional and sector strategies

*Table 2.1 Evaluation process of design taken from (Riley, 2013)*

POE is therefore a useful tool in the design process for HEI's to understand users' preferences and requirements. POE is important for many stakeholders across the lifespan of the building (Hadjri & Crozier, 2009). There is a high prevalence of usage of POE in HE institutes, however it is applied in many different forms (Riley, 2013). The application of the POE is very different in many universities gaining many differing results. Only 38% of POEs fulfilled the intended outcomes (Riley et al., 2015) therefore, POEs may not be the most effective evaluation method to understand preferences of the users. POE is however a logical end point in the design cycle as there are lessons that can be learned from the users of the space to improve the existing space

## Literature review

(Zimmerman & Martin, 2001). Neary et al. (2009) highlighted that the lack of effective POEs which cover factors other than rates of usage may contribute to the lack of academic research. Therefore, understanding how the users of the space use the environment can provide important information for the design process.

The development of innovative higher education learning environments has reinforced the need for more efficient tools in the evaluation of effective learning environments, and identifying what actually works for the users of the space. Most importantly this research highlights the importance of students (Cleveland & Fisher, 2014). In the evaluation of POE's Preiser and Nasar (2008, cited by, Cleveland & Fisher, 2014) suggest that a bottom up approach is important that values the users' needs, recognising that communication, honesty and community building are important. If a look is taken back to Table 2.1, stage 1-3 needs further identification and consideration of the direction of the design project should be identified before design is begun (Riley, 2013). Therefore, by identifying how students perceive the space, whether they think it works or not, thorough POEs can help in the understanding of how effective the design of the space is for their individual needs.

This technique takes into consideration the user, however although good to evaluate function after the handover of the building, it does not evaluate users' requirements before design. This means that mistakes can often be made in the design and construction phase of the building that are only identified at the end when the building is finished. This means that money is unnecessarily being spent to refurbish and redesign buildings to make them more suitable. Cleveland and Fisher (2014) support this assumption that formative assessments of the requirements of the learning environment are required in future building model development. Although POEs can be used in subsequent building projects it has been stated that this information is difficult to conduct post build and is sometimes overlooked as it is costly (Vischer, 2002). This means that POE is not readily considered in these succeeding projects. For that reason, research should aim to focus on users' needs before construction to accomplish an appropriate design.

#### **2.4.5. Current initiatives and projects**

There are initiatives currently underway to develop PLEs that better harmonise with students' learning requirements.

CABE (2005) measured the impact of design on the performance of HEI's and highlighted the importance of identifiable features of the buildings in recruitment and more specifically how students behave when working in the environment. This initiative identified a few specific features that affect recruitment and retention, such as, structural and functional, environmental and cosmetic. Although the commission for architecture identified a few aspects, it was suggested that future research should measure the quality of design. Furthermore, it was suggested that a wider sample of institutions was required to include universities that are not considered to display good design quality. This suggests that there may be a variance in students' attitudes depending on where they may attend, therefore further research needs to be conducted that can identify specific factors throughout institutions. This suggests that different PLEs may influence students' perceptions of the efficiency of the building, therefore it is important to explore universities that have PLEs that may display different levels of quality and efficiency for the students.

SCALE- UP (Beichner, 2008) is the Student-Centred Active Learning Environment for Undergraduate Programmes which aims to design collaborative, interactive, computer-rich learning environments. This initiative is set around the classroom design. The SCALE-UP project has identified many interesting features of the environment that should be considered. Through experimentation it was identified that circular tables with comfortable chairs worked best, it was noted that this produced the best communication between students. A pedestal for tutors is also placed at the centre of the rooms to step away from the traditional set up. This meant the tutor was visible at all times and could interact with students.

This initiative also found significant positive outcomes on students' learning, specifically for women and those in minority groups. For example, increases in positive attitudes and a decrease in the rate of failure. Furthermore, students' achievement on engineering and physics programmes was positively impacted. This therefore

## Literature review

supports research that suggests the PLE influences students' educational abilities and their perceptions of the learning environment, both teaching and physical. Although this initiative is confronting the redesign of traditional learning environments with astonishing outcomes, the research is based solely on large intake classrooms, therefore does not consider all possibilities of student learning environments.

Another initiative aimed at the development of improved learning spaces is FLEXspace (FLEXSpace, 2017). FLEXspace is an online resource for the design of innovative HE learning environments including components such as, photographs, drawings, research papers and inventories for practitioners to use in the design process. It offers the ability for designers to have a huge amount of resources readily available to help in designing new HEI buildings. This highlights the understanding of a need for designers to have support in understanding specifications for designing HEIs has been identified.

The beacon project currently underway located at Sheffield Hallam University (McDonald & Glover, 2016) aims to understand graphic design students' perceptions and use of the space, with the aim of achieving an understanding of a contemporary studio space, and additionally, how to integrate technology into the environment and reflect upon factors that can develop and support a community of practice. The beacon project being undertaken highlights the direction that HEI's are beginning to follow. They are seeking to understand students' perceptions of the environment and specifically what they want out of their PLE, and what factors they can develop to meet these requirements. This research is however is in its infancy, but does demonstrate how teaching bodies are developing their knowledge for the development of appropriate learning facilities.

Another initiative that does examine the environment as a whole is JISC. JISC (2006) conducted research into designing spaces for effective learning, they identified that space needs to be flexible, future-proofed, bold, creative, supportive and enterprising. JISC (2006) noted that their PLEs should be the physical representations of an institution's vision for learning, it should be responsive, inclusive and supportive for all. They reviewed several institutions and practices that have been implemented to create



## Literature review

a more stimulating environment. Several factors identified are, inspiring entrance halls, tools, such as furniture and resources that are fit for purpose, interactive learning spaces, vocational learning space and learning centres. They identified that although there may be not one fit for purpose design, it is possible to identify broad points for guidance. Overwhelmingly they highlight that the view of the students and their requirements of the PLE should underpin learning space design. Although it should also reflect the institution's vision, the stakeholder and the students should always be considered in this design process. JISC (2006) highlight that there can be no one blueprint for space design, as there is substantial variety in the process. This initiative, although an in depth review of PLE space design, does not simply outline how developments of PLE should be conducted. This review of PLE does highlight that the PLE should be considered as all of the spaces on campus, not just classroom space, however further work should aim to understand students' specific requirements out of the PLE. By identifying quality, the degree of excellence in the PLE may identify students' specific requirements.

The teaching rooms in university environments are noticeably very important in students' learning, however currently appear not to recognise students' specific requirements. To understand this further we must first look to explore how students learn and therefore how this may affect their requirements for the PLE. The development of such space needs to be established through a discussion of the requirements of the spaces. From a review of designing academic space, both tutor-led and student-led spaces are necessary, with access to presentation, discussion, collaboration, information retrieval and sharing areas required (JISC, 2006). Students' learning does not just occur in the formal learning environments, learning can occur at any point around the campus in informal learning environments (Bourne et al., 2005; Dabbagh & Kitsantas, 2012). Therefore, it is important to consider the learning environment as a whole entity in the conception of design. Not only does the formal space, such as lecture halls and seminar rooms play an important role in student learning, the rest of the university is integral to the students' learning capabilities. Places such as cafes, social spaces, outside space and hallways need to be reflected

upon. The whole of the HE environment must be considered when designing space for learning.

These initiatives have revealed some scope for areas of improvement in University learning environments. However, they have not identified factors on the whole that understand and satisfy student perceptions of their learning environments. Considering how the teaching and learning landscape has changed is key to understanding the influence learning spaces have and why more attention should be focused on them. The research is exploring how to design environments to enhance student learning however, there is a lack of understanding about student specific and variable preferences in the HE PLE (Fisher & Newton, 2014).

### **2.4.6. Conclusion**

Overall, this review has identified that students should be offered the access to more alternative learning spaces that meet the specific requirements of students (Matthews et al., 2011; Kuntz et al., 2012; Ross & Pillay, 2015). To identify students' preferences, it appears that students may be the best at providing this understanding. Kasalı and Doğan (2010) concluded that students are good sources of information in the design and planning of the environments they occupy. However, previous research has failed to concentrate on the evidence based needs of the end user (Amaratunga, 2000; CABE, 2005; Bickford & Wright, 2006). Beckers et al. (2016a) concluded that further research should explore preferences of students from different universities and educational groups to identify if preferences differed between groups of students. Therefore, this research should aim to identify students' individual needs and this should be found through students' own feedback.

By reviewing both human psychology of space and knowledge in the current built environment design, several factors have been identified. It has been identified that there is a large amount of variation between students, their background and their learning styles, which therefore affect their requirements from the physical learning environment. There is a need for the PLE to deliver more than other environments such as office spaces or the residential environment, as it must provide students with the best opportunity to learn. It must also allow for students to develop their own self-

## Literature review

worth and develop their own identity. Through providing social spaces, one of the basic human requirements of interaction, students can begin to develop their self-worth. The process of designing PLE should be 're-engineered', as the space should function within the complexities of HEIs (Thomas, 2010). Therefore, providing students with an environment where they can develop within the social environment, is integral to their learning experiences and satisfaction with the PLE. There is a large body of literature exploring the design of the PLE' however no literature has attempted to outline a framework of design for practitioners to use to identify the specific requirements of the students. Furthermore, a specific outline of students' requirements of the PLE should be given attention. Therefore, three elements that influence students' satisfaction in the HE PLE are going to be explored in the next stage of the literature review.

## 2.5. Individual differences

Individual differences influence preferences in many different ways, for example taste (Sagioglou & Greitemeyer, 2016), diet (Oudman et al., 2016), films (Kallias, 2012), photography (Axelsson, 2007) and work motivation (Andrisani & Miljus, 1977) to name a few. Individual differences are the differences between people, there are many individual differences including learning styles, culture, gender or personality.

Hassanain and Mudhei (2006) highlight that higher educational facilities consist of a large number of users who therefore have differing needs. If this is taken into consideration, there is a requirement for environments to be suitable for many differing people and activities and this has been reflected in educational settings. In view of this, current research has explored how the individual differences between people influence requirements in the PLE. Luketic and Dolan (2013) found that an 'open ended' environment can be ideal for students in research laboratories but not so much for those in undergraduate teaching laboratories, who could be struggling to connect ideas. Perhaps the physical learning environment therefore, needs to reflect the task and the people within the space; additionally, different people may require different things out of their environment (Holm, 2011). Furthermore as noted previously the individual differences in learning styles affects the requirements of the PLE (Furnham, 1992). It is therefore important to understand how students' individual differences may affect preferences in the PLE.

Understanding of these individual differences can lead to a better consideration in designing PLEs. Pawlowska et al. (2014) highlighted that understanding how students' individual differences affect student requirements of the PLE requires further examination. In the research of individual differences, personality has been found to have a strong relationship with perceptions of the environment in general and additionally that the relationship is a strong predictor of students' satisfaction and their performance. Furthermore, Keller and Karau (2013) noted that one's personality traits are linked to perceptions and impressions of an online learning environment. However it has been noted that personalities influence preferences within the learning environment and this needs to be further explored. Ackerman et al. (2011) suggested

that personality might affect where someone may sit in a classroom or where they prefer to work. However although this has been suggested no work had identified if personality does influence requirements in the PLE. Therefore, this research would add to the understanding of the influence of personality in the choice of the PLE. Therefore, identifying students' individual requirements would develop understanding of how to design HE physical learning environments.

As has been identified there is a relationship between place and human behaviour. Exploring the influence of a measure of individual difference on human behaviour, personality will provide the opportunity to develop PLEs that meet the requirements of each individual. Therefore, this would provide students with the best learning experiences possible.

### **2.5.1. Introduction to personality**

People differ in many ways, one of which is their personality type. A large body of research has identified that personality traits are an excellent predictor, and explanation of individual differences. This has been found in many instances for example, in academic performance (Poropat, 2009; Ciorbea & Pasarica, 2013; McIlroy et al., 2015), the real estate market (Ben-Shahar & Golan, 2014), musical involvement (Corrigall et al., 2013), preference for abstract art (Gridley, 2013), aesthetic activities (McManus & Furnham, 2006), work involvement (Bozionelos, 2004), Citizenship (Borman et al., 2001) and Brand loyalty (Lin, 2010). Therefore, perhaps this difference in personality factors also affects the requirements of the learning environment that the student inhabits.

Research that investigates the thought that personality and the perceptions and requirements of the built environment may be associated is limited. However understanding the relationship could provide support in identifying the influence of individual differences, which would enhance the design of the PLE and therefore, maybe an important consideration for research to explore. Research does exist that has found that each environmental situation presented its own interaction between an individual's personality and their environmental perceptions (Ibrahim et al., 2002); therefore, supporting the assumption that personality may influence students'

requirements in their learning environment. Campbell et al. (1981) found through empirical research that the size of a secondary school influences the development of certain personality traits. This research highlights that there may be an interactional relationship between personality and the PLE. The environment can influence the production of certain personality traits, but also personality traits can influence students' perceptions of the environment. Ibrahim et al. (2002) also identified that non-architecture students were more subjective and emotional in their responses to the environment than architecture students who were more objective. This difference, they suggest, is due to architecture students developing certain personality traits, which therefore influence their perceptions of the learning environment differently. Although this research is only based upon either architects or non-architects it offers an insight as to whether there may be a difference in students' personalities between academic schools and their feelings towards their learning environments.

A difference in personality has correspondingly been found between students from different subjects. Yueh et al. (2013) found that students from engineering scored most highly on self-efficacy followed by conscientiousness whereas Science students also scored most highly on self-efficacy but second was generative cognitions. They suggested that this difference may be due to science which aims to advance knowledge, which is supported by Mendolia and Walker (2014). This research suggests that there may be a motive to research differences between subject choices as this may interact with preferences with buildings' designs.

Differing personalities may be a factor to consider when designing spaces for students, as space must work for different sets of people therefore many differing personality traits. Ibrahim et al. (2002) suggested that the personality environment relationship was due to an adaptation of the person to their environment due to their personality. So, personality may influence how we perceive different environments around us, however, do differing personalities affect one's requirements of the PLE? This issue perhaps reflects some students requiring more structured space but some being more flexible in their requirements. Therefore, exploring this relationship between personality and the PLE may lead to a better understanding of the environment that different individuals require.

From the literature it seems reasonable to assume that students' personalities may affect their perceptions of the environment, which could be reflected in their behaviour, additionally to the aforementioned effects of the learning environment (Chan, 2011). Research conducted by Allport (1966) ascertained that personality traits do not wait to be aroused by external stimuli, but that an individual actively seeks stimulus situations that encourage their traits. Therefore, this suggests that the physical environment that students work in needs to suit their personality traits, or will not be utilized by them, consequently affecting their behaviour. Therefore, if Universities want students using the facilities they offer and to come onto campus as opposed to staying at home (Sellgren, 2014) then designing university learning spaces best suited to them seems logical. This demonstrates the importance of establishing a framework that will indicate how space should be designed to suit the personalities of the community that work in specific environments.

From a review of literature regarding personalities of students and how this affects their learning experience it can be seen that personality plays a significant role in students' perception of their environment. It also seems essential that personalities may need to be considered in the appropriateness of space design. What is it about personality that affects this perception of the environment? Understanding what personality is and how it influences our behaviour is important to understanding the influence this may play on one's requirements of the learning environment.

### **2.5.2. Personality theory**

To fully understand the role personality may play in the perceptions and requirements of the PLE, an examination of personality is important. Much of psychology centres around making generalizations that can be applied to nearly everyone. For example Eysenck (2014) observed that cognitive psychologists make assumptions about everyone having the same perceptual and attentional process and that we all store and recall memory in the same way. However Eysenck (2014) noted that this may be limited as it doesn't take into consideration how diverse humans actually are. Research conducted into working memory found there were individual differences in cognitive functioning (Gevins & Smith, 2000) as a result substantiating Eysenck's suggestion.

## Literature review

Individual differences are most commonly associated with personality. These individual differences in personality stand as beneficial predictors of behaviour.

Although there is much debate on a suitable specific definition, prominent psychologists have suggested explanations.

- *“That which permits a prediction of what a person will do in a given situation”* (Cattell, 1950, p.2, cited by, Carducci, 2009).
- *“The distinctive patterns of behaviour (including thoughts as well as ‘affects’ this is feelings and emotions and actions) that we characterise each individual enduringly”* (Allport, 1961, p.28, Carducci, 2009)

For the purposes of this research and review of personality, the definition that is most commonly used for personality will be referred to.

*Personality is the individual differences in characteristic patterns of thinking, feeling and behaving.*

When thinking about personality it is important to consider four key concepts (Eysenck, 2014, p.287). These are the foundations of what personality is;

- Stable - personality remains fairly constant and unchanging over time
- Internal - personality lies within us but our behaviour is determined only in part by our personality
- Consistent - if personality is constant and behaviour is determined by personality we would expect people to behave consistently
- Different - in terms of personality the assumption is made that there are individual differences, which lead people to behave differently in similar situations

These four concepts; stable, internal, consistent and different describe why people's behaviour is different due to personality and therefore why it is so important in day-to-day life.

Personality however is a difficult concept to research and measure, we cannot observe it, it is internal and therefore is difficult to identify. How many trait descriptions should be included to describe a person accurately is an important question in personality



psychology (Ackerman et al., 2011). In personality traits conception two structures dominated personality theory (Zuckerman et al., 1993). There was firstly Eysenck's personality questionnaire (EPQ) constructed of three factors; neuroticism extroversion and psychoticism (Eysenck & Eysenck, 1975). Secondly the theory of 16 Personality factors (16 PF), with dimensions such as warmth, reasoning and dominance (Cattell & Drevdahl, 1955). It has been widely debated how many factors should be considered (Zuckerman et al., 1993). It has been noted that there could be almost 200 personality traits that explain individual differences (Ackerman et al., 2011), this is however an impractical stance on personality traits. Identifying the correct measure of personality traits is important as too many would not allow for simple action plans to be constructed. However, too few would not allow for accurate identification of personality trait individual differences. Therefore it would not allow stakeholders to integrate the consideration of these traits into educational choices (Ackerman et al., 2011)

Eysenck (1991) noted that many original theories of personality cannot be considered valuable as they are not empirically measured and therefore do not portray personality traits they have just "reasonable psychometric parentage" (p.4). Therefore, although many attempts at developing personality theories have been tried there has been much violation of the rules defining theories. To be able to measure and explore personality and its influences a scientific approach is required. We must have a valid and reliable measure of personality, which has proven itself across many situations. For this reason, personality measurements will be explored along with their benefits and limitations.

### *2.5.2.1. 16 PF*

The 16 PF (Personality Factors) questionnaire constructed by Cattell and company (Cattell, 1986) measured these factors; Warmth, Reasoning, Emotional stability, Dominance, Liveliness, Rule consciousness, Social Boldness, Sensitivity, Vigilance, Abstractedness, Privatness, Apprehension, Openness to change, Self-reliance, Perfectionism and Tension. The 16PF was found to have two dimensions, the anxiety-adjustment and the introversion-extroversion dimension (Costa & McCrae, 1976). This was partially supported by (Abdel-Khalek et al., 1986) however they found that of the scales, anxiety specifically did not cross over culturally, therefore suggesting that the

16 PF has errors with its validity. Furthermore, it was noted that the test was too long and the factors overlap to other super factors, and are therefore not good measures of the specific super factors. This research suggests the 16 PF may not be a reliable and valid measurement of personality and therefore other criteria should be sought.

### 2.5.2.2. EPQ

Although some research has supported the use of the three broader factors used in the EPQ as opposed to the 16 PF (Abdel-Khalek et al., 1986), Eysenck developed two biologically based dimensions which were then extended to the three. Eysenck and Eysenck (1975) scale which is a three-trait measure of personality including the factors Extraversion, Neuroticism/Anxiety and Psychoticism. Extraversion is associated with being social, dominant, active and expressive. Neuroticism is associated with being anxious, moody and having a low self-esteem. Psychoticism is associated with being assertive, egocentric and manipulative. Barret and Eysenck found that the EPQ had a strong cross cultural validity, therefore suggesting that this is a good measure of personality (Barrett & Eysenck, 1984). The Eysenck Personality Questionnaire (EPQ) was however noted as having some inconsistencies with its factor loadings when analysed through factor analysis (Barrett & Kline, 1980).

### 2.5.2.3. Myers-Briggs

Myers-Briggs Type Indicator (MBTI) of personality contains 16 possible personality types, and is constructed using four orientation factors (Aranda & Tilton, 2013, p.15); extraversion vs introversion, sensing vs intuition, thinking vs feeling and judging vs perceiving. The MBTI "*personality inventory attempts to operationalize Jung's the theory of psychological types*" (Leary et al., 2009, p.421). The aim of the MBTI is to identify ways in which people work, their "*natural way of doing things*" (Aranda & Tilton, 2013, p.19). This scale has been used across many countries, ages and job types, and has been found to be a highly reliable measure of personality (Conti & McNeil, 2011). The MBTI is a type indicator of personality therefore it does not measure traits and is widely used in organisational and industrial psychology (Hendrickson & Giesecke, 1994; Kuipers et al., 2009) and personal and management development (Leary et al., 2009). Although much personality psychology research has found a relationship between personality and learning styles (Chamorro-Premuzic et al., 2007;

Ruffing et al., 2015), research utilising the MBTI failed to replicate these findings (Conti & McNeil, 2011). Perhaps the use of the MBTI is useful in certain situations, for example identifying suitability for a job role or personal development (Leary et al., 2009), however in the context of the current research it may not be a reliable measure of personality. The theory of the instrument has also come under fire. McCrae and Costa (1989) found no support for its underpinning theory and that the 16 types did not appear to be different. Therefore, the MBTI appears to have its use in practices such as team processes however it may not be a good measure for identifying preferences in the PLE.

#### 2.5.2.4. Five Factor Model

The five-factor model of personality is extensively discussed throughout the literature (Goldberg, 1990; Costa & McCrae, 1992; Busato et al., 1998; McCrae & Costa Jr, 1999; Babakhani, 2014; Morizot, 2014). There are four main reasons why the five factor model has received so much attention (Costa & McCrae, 1992). Firstly, both longitudinal and cross- section students show that the five factors are stable, and demonstrate themselves through behaviour. Secondly, the traits have been found to be related to many personality measurements. Thirdly, the results have been found through many different demographic groups. And finally, there are some suggestions of a biological basis (Costa & McCrae, 1992). However Eysenck (1991) argued that the underpinnings of the five factors model are unfounded and it is a premature conceptualisation of personality traits. Nevertheless overall the five factor model of personality appears to be the most comprehensive and valid measure of personality (Goldberg, 1990; Paunonen, 2003). The five factors model consists of the traits Openness, conscientiousness, extroversion, agreeableness and neuroticism., a break down of these personality traits can be seen in Table 2.2.

Table 2.2 Five factor model traits and descriptive attitudes (Crozier, 1997)

Trait	Descriptives
Openness	Artistic, curious, imaginative, insightful, original
Conscientiousness	Efficient, organised, playful, reliable, responsible
Extraversion	Active, assertive, energetic, enthusiastic, outgoing
Agreeableness	Appreciative, forgiving, generous, kind, sympathetic
Neuroticism	Anxious, self-pitying, tense, touchy, unstable, worrying

The overview of the four personality theories provides understanding of how personality presents itself. The five factor model has been used in educational settings many times for example exploring academic performance (Paunonen, 2003; McIlroy et al., 2015). Therefore, it would be a good measure for the understanding between personality and preferences in the PLE.

### **2.5.3. Personality and the environment**

It has been established that the five-factor model would be a good measure of a relationship between personality traits and preferences for the PLE. Based on what is already know about personality theory each of the traits will be explored to identify what influence they may have.

#### *2.5.3.1. Openness*

People who score highly on openness tend to be creative and value aesthetic and intellectual pursuits and because they seek a wide range of experiences they may be writers or artists (Eysenck, 2014). Therefore, this personality trait has a relationship with how people view the world aesthetically. Gridley (2013) explored personality and abstract art and found that the preference for abstract art is connected with those personality traits consistent with sensation seeking and open mindedness. This correlation between art and personality may suggest the parameters for differences in the preferences for factors of the design of the environment as both of these elements lie within the perceptions of the individual. This relationship may be due to a difference in thinking styles (Gridley, 2013). Entrepreneurs have been found to score highly on openness, this being that they are have a more innovative orientation (Eysenck, 2014). There are therefore more likely to think outside the box, be more imaginative and insightful (Crozier, 1997), this therefore may affect the way they perceive the environment, in addition aesthetically, they may be prefer more innovative and modern environments.

#### *2.5.3.2. Conscientiousness*

The first personality trait to explore in its relation to personality traits and one's behaviour. Conscientious people do well at work in corporate settings, their persistence, responsibility and strong sense of purpose helps them accomplish goals

and secure their boss's admiration, they also do well in college (Eysenck, 2014). Comparisons of entrepreneurs and managers suggest that entrepreneurs tend to be higher on conscientiousness, this being that they have high achievement motivation (Eysenck, 2014). As this trait has a relationship with academic performance (Chamorro-Premuzic & Furnham, 2008; McIlroy et al., 2015), this may be due to conscientious students being more committed to the learning experience (Babakhani, 2014). Therefore, in relation to the PLE this may mean that students prefer factors such as teaching spaces or libraries and independent learning spaces. Therefore, the learning experience is a priority for conscientious students as they have a desire to achieve highly.

### *2.5.3.3. Extraversion*

An extravert individual is likely to have greater sociability and activity levels (Richardson et al., 2012). Extraversion was found to be more connected with their community and therefore they make better connections among peers and staff in the university environment, and therefore feel a sense of belonging within the university (Babakhani, 2014). Consequently, students who score highly may prefer spaces that provide a sense of belonging and community, for example social spaces of features that identify the university. However, those who score highly on extraversion tend to have limited ability to self-regulate their academic priorities over social activities (Bidjerano & Dai, 2007), therefore environments may need to attend to regulating students' priorities.

### *2.5.3.4. Agreeableness*

Those high on agreeableness are likely to be altruistic, involved in helping others, they may be leaders of non-profit organisations, members of the clergy and good parents. (Eysenck, 2014). Consequently, these students may also prefer features that mean they can interact with other, for example social spaces. Agreeableness has also been found to have a relationship with academic performance (Babakhani, 2014), therefore these students may also have a preference for workspaces and individual learning spaces. Additionally agreeable students have been found to be more compromising and flexible when faced with differing environments (Babakhani, 2014), therefore, these students may also want spaces that allow flexibility.

### *2.5.3.5. Neuroticism*

Neurotics who may be anxious tense and fretful can sit in two ranges, either channelling their worry into a compulsive success or letting their anxiety lead them into recklessness (Eysenck, 2014). Neuroticism is highly influential on academic performance; stability, the low score of neuroticism, typically implies students are less anxious (Furnham & Mitchell, 1991) and perform better academically (Sánchez et al., 2001). Therefore, students who score high on neuroticism may have troubles academically. Those who score low on neuroticism tend to have better coping strategies with stress (Eysenck, 2014). Those high on neuroticism have also been found to use less adaptive coping strategies for pain management and react with more distress (Gunthert et al., 1999). This heightened sensitivity to negative stimuli (Tellegen, 1985), therefore affects their behaviour. Consequently, students may be affected by stressful situations in university.

### **2.5.4. Conclusion**

Overall personality has been found to predict a whole variety of behavioural outcomes (Friedman & Schustack, 2013). It has been suggested that teachers' awareness of student personality traits may add to the quality of teaching (Bolhari & Dasmah, 2013). Therefore understanding the relationship between individual differences, measured by personality will enhance the understanding of the PLE in terms of students' requirements. Designers will therefore understand how to incorporate the influence of individual differences into the PLE to enhance students' satisfaction and learning experiences. This will be achieved by providing environments specifically for the intended students and the individual differences they have. Furthermore, the five factor model of personality may be the best theory of personality in understanding its relationship with the PLE. The traits openness, conscientiousness, extraversion, agreeableness and neuroticism appear to provide a good, simple outline for the possible relationships with the environment. This could therefore provide designers with a simple framework for the interaction of individual differences and the PLE. Although this research is a suggestion for the improvement of teaching strategies, gaining an awareness of personality traits would also benefit the development of appropriate PLEs, by understanding areas for improvement.

## 2.6. Quality

As concluded in the first section of this literature review there is not a specific framework for the design of space to identify the students' requirements of the PLE. Quality of the learning environment is important for students (JISC, 2006; Riley et al., 2015), furthermore it appears to be the only consistent factor in students' satisfaction with the PLE (Riley et al., 2015). Of course, it is important to understand how the quality of the teaching affects students' satisfaction and academic achievement. Langstrand et al. (2015) discuss how educational quality can be enhanced through the effective design of courses, which is also supported by a large range of literature (Venkatraman, 2007; Chen et al., 2014). However, the quality of the course design and teaching appears not to be the only factor in the academic outcomes, satisfaction and the perceptions of students. A dominant thought process beginning to appear in the design of HEI buildings is that the quality of the physical environment can also improve students' satisfaction and therefore academic outcomes. However there does not appear to be one denotable definition for quality in the PLE (Riley et al., 2015), furthermore definitions that do exist within the built environment relate only to factors such as indoor air quality (Riley et al., 2015). So why does quality seem to be one of the only consistent factors in student satisfaction in HEIs. Cronin et al. (2000) found that quality influences not only value and satisfaction in patronage, but also behavioural intentions directly, therefore this suggests that quality plays an important role in consumers' feelings and actions within buildings. By evaluating the features of quality this could support in identifying specific features of the PLE to develop a framework for the design of space. Research into the quality of the physical environment of the office explored factors such as air quality cleanliness and maintenance and suitability of furniture (Sindhu & Gidado, 2014). Although offices and educational facilities are very different places (Riley et al., 2010) these features are still important to explore with the aim of identifying students' definition of quality in the PLE. Therefore Sindhu and Gidado (2014) work provides a good frame work to start the consideration of factors of the PLE that students identify as important to their perceptions of quality.

## Literature review

Quality has been found to be an important factor in educational outcomes in university. Durán-Narucki (2008) found that in run down educational facilities students attend fewer days on average and therefore have lower grades; this research shows empirical evidence for the effect of building quality on academic outcomes. Additionally, CABE (2005) also found through their research that approximately 60% of staff and students stated that the quality of the buildings impacted their choice of university. It can be seen that this is an important factor when considering how a building should be designed to best satisfy users, as it affects academic outcomes and seems to be the only factor that is consistent in the perceptions of user satisfaction. Furthermore research conducted by (CABE, 2005) suggested that the scope for future research is to consider the importance of quality in institutions. It has been identified that the gap between the operators of the facilities and the expectations of the users should be closed (Riley, 2013) (see Figure 2.2). Therefore, the identification of the specific features of the PLE should be considered.

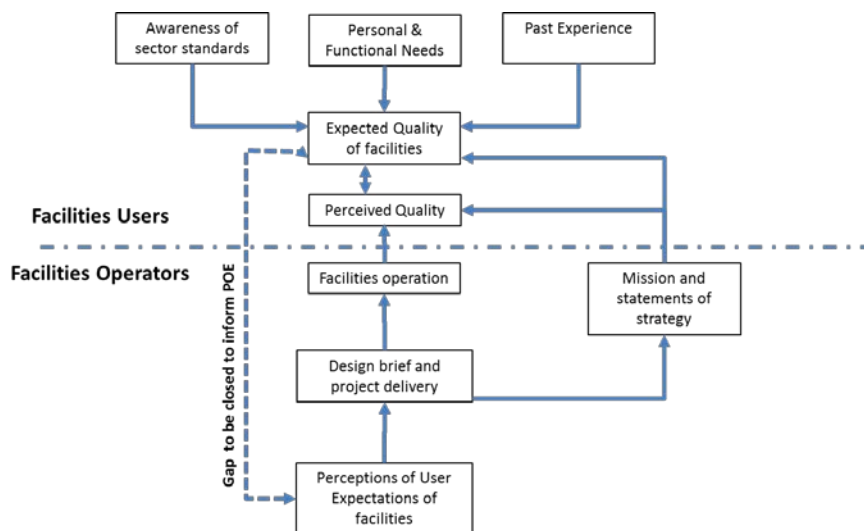


Figure 2.2 interaction between users' and operators' perception of quality take from Riley (2013)

An increased number of studies are stating that the managers of HEIs are starting to pay attention to the improvement of their facilities for many reasons, most notably in aiming for more competitive advantage (Amaratunga, 2000). Although research is undoubtedly proposing that HEIs should focus on the quality of their institutions, research is not succeeding in supplying information about how to improve the quality in the institution. This is the position supported by (Hill, 1995) who suggests that one



## Literature review

of the problems facing HEI's aiming to improve the quality of the institution is that there is not a meaningful body of literature on performance of HEIs. Consequently, it is difficult to pinpoint what does and does not work.

So what is quality? Oakland (2014) suggested that quality was often used to signify excellence. It can also mean fitness for purpose (Oakland, 2014) and also quality has been defined as meeting a user's need (Bevan, 1999). However, what does this essentially mean, how do we break down quality into component parts. Specifically, for education, quality has been found to be a difficult factor to define. Langstrand et al. (2015) noted that our understanding of quality is contingent on the definition and that many definitions are based on the customers' perceptions, therefore it will differ vastly between different customer groups. Furthermore, Quinn et al. (2009) posited that defining quality in education is a difficult undertaking. This is due to two phenomena, one, defining who the consumer in education buildings is and secondly the use of industry techniques in HE does not work. This suggests that first of all the consumer needs to be identified specifically in order to understand who will be asked about their perceptions of quality. Therefore, are the main consumers/users in education buildings undergraduate students, postgraduate students, PhD students, lecturers or general staff? Also, quality needs to be defined in terms of its setting and should not be confused with other institutions. Therefore, what sectors of the educational space should be considered in affecting perceptions of quality, the teaching rooms, the cafe space or library spaces?

Quality can have many different meanings to different people, this is why it is so difficult to identify what quality actually means. Furthermore, the definition of Quality, however, poses a difficulty as it not only intends different things but there are numerous broad characteristics associated with quality (Ghobadian et al. (1994). Ghobadian et al. (1994, p. 47.) suggested that this is why the ability to define quality is the first step in "quality improvement". This is why defining quality is often the first step in most quality improvement journeys.

## Literature review

They suggested five current definitions for quality;

1. Transcendent - innate excellence, the service or product will have unrivalled properties
2. Product led - the units of goodness packed into a service or product
3. Process or supply led - conformance to requirements
4. Customer led - satisfying customers' requirements
5. Value led - meeting the customers' requirements in terms of quality, price and availability

(Ghobadian et al., 1994, p.47.)

This work portrays how quality is a difficult term to define, however in terms of satisfaction can we make sure quality meets the satisfaction of the end user.

*"The first determinant of overall customer satisfaction is perceived quality... the second determinant of overall customer satisfaction is perceived value"* (Fornell, 1992, p. 9).

Dabholkar et al. (2000) found that Customer satisfaction was a far better predictor of behavioural intentions than service quality, as service quality was more closely linked to specific evaluators. If this is applied to students' satisfaction, subsequently the students' satisfaction with the PLE is determined by their perception of the quality and the value the HEI provides.

This, however, does not explain what quality consists of, what factors are identified by users which define quality. Currently there are phrases used for the description of forms of quality used by authorities. Therefore, a specific definition of quality within the built environment of HEIs needs to draw on the broad characteristics to assist in outlining a definition that can encapsulate and identify the significant aspects of Quality in HEIs.

### **2.6.1. Facilities management**

*“Facilities management is the integration of processes within an organisation to maintain and develop the agreed services which support and improve the effectiveness of its primary activities and user comforts”* (Sindhu & Gidado, 2014, p.3). Facilities management (FM) has been extensively developed over the last decade (Lepkova & Uselis, 2013). Outsourced services, such as, cleaning and catering and in-house services, such as, human resources and estate management (Lepkova & Uselis, 2013) are considered some of the roles in FM. An important facet of facilities management is customer satisfaction. Customer satisfaction is a construct that is documented in many different ways. In terms of the design of HEIs this research will focus on the satisfaction of the University institution. It has been suggested that perceived service quality and satisfaction are very similar constructs (Spreng & Mackoy, 1996). Perceived service quality is essentially what level of quality does a consumer feel they receive from the service given by the service provider. Research has also suggested that quality is not one-dimensional, it is multi-dimensional, built up of many facets (Ghobadian et al., 1994). Therefore, you cannot ensure service or quality without considering all aspects.

Considering service quality is important in the exploration of a quality definition for people; is it the same for students' perceptions? Rajab et al. (2012) found from their empirical research that more focus needed to be paid to service quality in HEIs to achieve better student satisfaction. Additionally, it was highlighted that the management of quality in HEIs is integral to attracting students to the university (Rajab et al., 2012). Therefore, not only is a focus on service quality important for when students are attending the university it is important in attracting students. Additionally research conducted by Nadiri et al. (2009) noted that students are likely to become more demanding in terms of the service they receive. Therefore, research should be conducted and HEIs should pay attention to the possibility of improving the standards of quality, to keep up with the demands of students. This an important theme that should be highlighted as increasing student numbers, as noted previously is important for the growth of universities (Tickle, 2015).

Service quality literature has increased between 2009 and 2011 and although it has dropped a little there are still a large number of citations on the topic (Wang et al., 2015). Although service quality is a regularly discussed topic in literature for producing improved facilities, Rathmell (1966) described a service to be “a deed, a performance, or an effort” (p.33). Service quality therefore does not provide a full explanation of the environmental quality of the PLE. Additionally, the research conducted by Wang et al. (2015) shows that the research of service quality in educational instances is limited compared to other industries. Therefore describing service quality as a whole and applying it to the PLE is insufficient to encapsulate what is meant by the quality of the PLE. However, understanding the research that currently explores service quality may be advantageous in identifying quality in the HE PLE.

### **2.6.2. Quality guidelines**

There is an abundance of performance improvement guidelines, including Baldrige TQM model SIX SIGMA and ISO 9001 (Oakland, 2014). These however are more focused on manufacturing quality. Lehtinen and Lehtinen (1991) identified a three dimensional construct of service quality,

1. Physical Quality - the quality of the physical materials and facilities
2. Interactive Quality - the quality of the interaction between the consumer and the service provider
3. Corporate Quality - the quality developed in the history of the service provider

As can be seen the first three-dimensional construct specifically identifies the physical environment as being integral to the service quality process. This multi-dimensional theory of quality demonstrates how the physical attribute of the service is an important consideration in the measurement and the pursuit of perceived service quality.

#### *2.6.2.1. SERVQUAL*

The quality of products and services has become progressively documented as an integral factor in a business's effectiveness and efficiency (Anderson & Zeithaml, 1984; Babakus & Boller, 1992). A measure of Service Quality that has developed is SERVQUAL (Parasuraman et al., 2002). SERVQUAL measures several dimensions

## Literature review

that are associated with service quality. People's perception of Service Quality can be measured by SERVQUAL by using a gap analysis; it compares users expected levels of Service Quality with their Perceived Service Quality.

Ten criteria which have been identified by Parasuraman et al. (1985), however it has been suggested that these may be overlapping (Babakus & Boller, 1992).. These dimensions are described by Chatterjee et al. (2009) below;

- Tangibility - the appearance of physical environment, equipment, personnel etc.
- Reliability - the ability to provide a promised service
- Responsiveness - willingness to support and help customers and to be prompt
- Competence - have the required skills and knowledge to perform the service
- Courtesy - politeness, consideration and friendliness of service
- Security - freedom from danger, risk or doubt
- Access - approachability and ease of contact
- Communication - listening to customers and acknowledging feedback
- Understanding - making efforts to know the needs of customers

Applying this description of quality into factors of the PLE suggest quality could be useful in the construction a definition. For example, the tangibility, this is obvious as it applies to the appearance of the physical environment. Reliability, the physical environment should be reliable, it should work efficiently. Security, the environment should provide students with a safe and secure environment to work within. Access, the space should be accessible to students and easy to way find. Understanding, the PLE should be designed with the understanding of students' needs, it should offer the space students require.

Babakus and Boller (1992) suggested that SERVQUAL is unidimensional and therefore they suggested would not be a good measure of Service Quality as consumers construct a multidimensional idea of Service Quality. Furthermore, it has been suggested that SERVQUAL is not suitable for all businesses (Babakus & Boller,

## Literature review

1992), for example a consumer from an electricity company has very little contact with the company as long as the services are uninterrupted. Therefore, it was suggested that Service Quality would be relatively simple in this domain compared to other more complex situations. This is furthermore support by Crane and Clarke (1988) who found that consumers were able to identify which criteria were most important to them when selecting services. For example, for the doctors and dentists, courtesy and competence were most important whereas for banks it was access and responsive service. This suggests that there are unique factors in each service type that consumers consider most important. Therefore, in the HE environment, the definition of quality, service individually or the environment as a whole should be defined in regards to the specific environment.

Not only does SERVQUAL not appear to be efficient at measuring service quality in a variety of businesses, it appears to overlook some important areas of discussion. Wakefield and Blodgett (1999) suggested that the effects of the physical surroundings such as colour and cleanliness are overlooked in service quality literature. Therefore, SERVQUAL focuses on aspects of the service that are intangible and only touches on the tangible side of service quality, with the aesthetic quality of the environment. Research conducted by Nadiri et al. (2009) noted that both tangible, (e.g. 'modern looking equipment' and 'facilities are visually appealing') and intangible (e.g. 'employees understand specific needs' and 'gives you individual attention') are predictors of student satisfaction. Therefore, more work needs to focus on the tangible side of quality; this is therefore supporting further work being conducted identifying students' perceptions of quality in the PLE. Research overlooking the tangible dimension on Service Quality may be due to the past position of institutions. Wakefield and Blodgett (1999) stated that it appears that a lot of resources are spent on improving the intangible side of service quality, how the service is delivered, rather than the tangible side. For example, the delivery of lectures and seminars and developing new teaching practices. This is because long term fixed investments, are overlooked in preference to the short term improvement of the intangible services (Wakefield & Blodgett, 1999). So features of the physical environment that are considered to improve quality may be overlooked in literature. The physical

environment however has been underlined in the literature as an important direction for the improvement for HEIs (CABE, 2005; JISC, 2006). Wakefield and Blodgett (1999) recognised that empirical research in the leisure industry demonstrated that the physical environment and the perceived service quality combined, influences the excitement felt by consumers and therefore affects their behavioural intentions. Specifically one of the main findings of research conducted by Nadiri et al. (2009) suggested that managers need to pay more attention to the physical environment of the HEIs as students expect the surroundings to be appealing. Therefore, to define quality in HE a total view appears to be important, to consider both the requirements of the service quality and the physical environment.

### *2.6.2.2. Total Quality Management*

A method that may be useful to consider when taking a totalitarian approach to a definition of quality in the PLE may be Total Quality Management. Total Quality Management (TQM) has been described as “*The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs*” (ISO, 1986 cited by Owlia, 1996, p.163). Owlia (1996) highlighted that the terms ‘categories’ and ‘satisfies needs’ suggest two themes that are present in TQM.

1. Quality is what satisfies users’ requirements
2. Quality is features that can be measured

These two points advocate the need to establish a student centred understanding of what quality is in HEIs through research to increase satisfaction. Although TQM is a management tool and is therefore applied in the running of an organisation (Oakland, 2011), its principle and ideas could be a useful source of information in the development of an effective definition of quality. As outlined previously quality has many different facets, therefore exploring current knowledge is important to identify a reliable definition.

Total quality management has been found to influence organisational learning (Aminbeidokhti et al., 2016). Organisational learning is the actions an organisation performs such as acquiring knowledge, interpreting and distributing knowledge (Templeton et al., 2002) This then influences organisational innovation which is when

## Literature review

organisations' behaviour and operations develop an idea new to the whole organisation (Aminbeidokhti et al., 2016). Therefore, TQM can have a large impact on the practice and the understanding of organisations, and consequently help in supporting improvements in the environment.

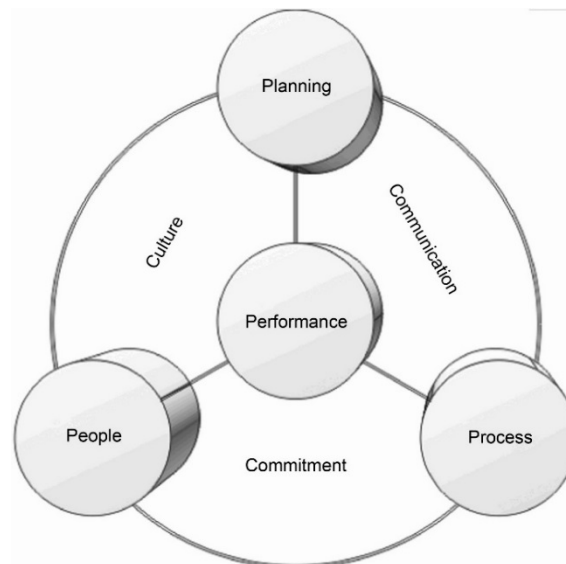


Figure 2.3 Oakland TQM model (Oakland, 2011)

Figure 2.3 displays the quality approach of TQM, the four 'P's' and the three 'C's' as noted by Oakland (2011) is Planning, People, Performance (Customer, which sits in performance), and Process and Culture, Communication, Commitment. These items are said to be critical in the aim of delivering excellence. If this is applied to the delivery of a quality PLE the four 'P's' could be helpful in the investigation of a definition.

- Planning - developing a vision of the PLE by identifying the purpose of the space. Employing updated knowledge into strategies and policy and aligning the organisation with this.
- Performance - Identify critical areas in the PLE that are crucial for the performance of the environment. Develop measures of current performance and measure the achievement of quality in the current PLE.
- Process - ensure the correct processes are implemented to achieve the quality outcome in the PLE.



## Literature review

- People - empowering people to influence quality is highly important in TQM; making sure people are working as a team to improve the PLE and ensuring they participate.
- Customer - making sure students' needs are understood and met by involving them in the PLE
- Commitment - be actively involved in the improvement of quality in the PLE
- Culture - ensure innovation for the quality of the PLE is developed and implemented
- Communication - encourage the communication of a quality PLE that is accessible

Reviewing the Oakland (2011) model of TQM and applying this to developing a definition of quality in the PLE provides some interesting insight into the direction this research should take. For example, from the four 'P's' (including customer) the PLE should be a quality environment for people, both the people who work there and the stakeholder, in this case the students. Developing this however, requires the identification of the specific element of quality; therefore, an outline of quality is required for the PLE. Implementing this requires a simple process and planning, therefore providing a definition of quality in the PLE should be process driven and readily organised. Furthermore, the three 'C's' support this assertion highlighting that the communication of a quality should be accessible and ensuring the culture of the HEI is implicit and committed in the development of this. It has been noted that "the quality of the outcome is reflective of the quality of the process." (Rullman & Kieboom, 2012). Therefore, there should be a simple process in which to design a quality PLE.

### **2.6.3. Conclusion**

The research has identified that there is no one definition for quality; Quality is used in different ways for different reasons and interchangeably with other phrases, such as, service quality and management quality with measurements such as TQM and SERVQUAL. However quality has been found to be the only consistent predictor of student satisfaction in the HEI PLE (Riley et al., 2010; Riley, 2013; Riley et al., 2015). Consequently, identifying specifically students' definition of the PLE is important to design the space appropriately for the students.

Furthermore, as identified in the first section of this literature having suitable environments is crucial for the place-human behaviour interaction. Identifying specific factors of the PLE that students require for their positive student experiences could support in the interaction between human and place. Therefore, a proposal of this research is to identify factors that make up quality to build up a definition of quality in terms of the built learning environment. This will allow for the evaluation of a design of space to be assessed suitably and reliably.

## **2.7. Community**

*'Physical facilities set the stage for community to be performed'*

*(Rullman & Kieboom, 2012, p. 7)*

Communities are powerful places for creating cooperation and reliable independence (Burroughs & Eby, 1998). People must try to discover a sense of community in their workplace or school because it is where they spend most of their time. As has already been established in this review a large body of students attend University (Hassanain & Mudhei, 2006) with this large body of students the PLE may help support students develop learning communities. The psychological experience of places has been described in many ways; sense of belonging (Baskin et al., 2010), sense of community (McMillan & Chavis, 1986) and place attachment (Sime, 1986; Moghisi et al., 2015).

Community is the sharing of certain attitudes or interests. Community has been defined as;

*"a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members' needs will be met through their commitment to be together"* (McMillan & Chavis, 1986, p.9).

Understanding a sense of community entails consideration of the elements to appreciate the development of a community for people. Psychological sense of community conceptualises the psychology behind the development of a community. As has been established in this literature review the person environment relationship is very important (Sime, 1986). A psychological sense of community has been stated

to be realised with perceptions of similarities to others, inter-dependence with others and feelings that you are part of a dependable structure (Burroughs & Eby, 1998).

McMillan and Chavis (1986) the leaders in the field of psychological sense of community, proposed a model of psychological sense of community; the four components represent the elements that must appear to develop a sense of community.

- Membership - is the sense of belonging that one has invested themselves in the group and therefore feel a right to belong
- Influence - the ability of the group member to influence the group but also of the group to influence the group members
- Integration and fulfilment of needs - reinforcement by integrating and having needs fulfilled
- Shared emotional connection - a shared history

For a person to feel, psychologically, a sense of community, these four factors need to be provided. Bickford and Wright (2006) documented this sense of community exists when members of that community interact in a way that deepens understanding of one another, which leads to learning. Therefore, encouraging this sense of community in HEIs may be beneficial for students' overall learning experiences.

### **2.7.1. Community in Higher Education Institutions**

With the shift in pedagogic theory focusing on the construction of knowledge, the role of community has come to the forefront of attention (Dawson et al., 2006). This attention has been devoted to a sense of community within the literature. This illustrates the belief that the concept of community may be used to enhance the student learning experience (Shapiro & Levine, 1999), attract more students (Shapiro & Levine, 1999) and reduce attrition rates (Tinto, 1998; Dueber & Misanchuk, 2001). This reduction in attrition rates is interesting as one of the most common reasons for students dropping out was a 'sense of isolation' (Morgan & Tam, 1999). Therefore developing this sense of community within the HEI can help to reduce this sense of isolation and therefore attrition, which has a large impact on university profits

## Literature review

(Raisman, 2013). Additionally Trigwell (2005) found a significant correlation between satisfaction and learning particularly when students felt they were part of a community.

Sense of belonging is an important element of community (Kasarda & Janowitz, 1974). Chen and Chiou (2014) highlighted that people need to feel connected to others and a sensation of belonging to feel a community. Developing a sense of belonging is important in the PLE as it been found that belonging potentially acts as a buffer to a high degree of loneliness and low peer acceptance (Baskin et al., 2010). In regards to being accepted by one's peers Ames (1992) noted that sense of belonging is not only the acceptance but is also the belief that you are an important and active member of the group. Therefore, to ensure people feel actively involved in the PLE, and in control of their own environment, it is important to develop a sense of community.

The built environment of a school plays a role in how students enact citizenship (Tupper et al., 2008) as a result it can be seen that the physical structure of a building can affect how students interact with each other. The physical structure of the buildings that students occupy can also have an effect on their perceptions. Grellier (2013) conducted research on a group of science students and found that many of the science students have no specific home building and move from one end of the campus to the other between classes. He consequently found that they did not have a strong educational community and they were much slower to feel like they belonged. Therefore, the layout and structure of the physical environment affected the students' perceptions of their learning experience and perhaps their actual learning. By providing places for students to interact and facilitate meetings students have been found to create friendships very early on in their academic career (Holley & Dobson, 2008). This suggests that factors such as campus placement and structure also need to be addressed and understood to identify factors that affect the students' learning experience. There is little research on the impact of a community and group identity on the students' learning experience within a university, however, the research that does exist suggests that it may be an important area for discussion.

Literature has highlighted that developing a sense of community on campus is important for students. A report (Rullman & Kieboom, 2012) identified two aspects of community on a university campus;

1. When a campus community exists in its strongest form, it is connected with learning and a sense of belonging
2. Places of outstanding community are ones that display high levels of human engagement and... a strong sense of individual and group ownership.

The research identifies the importance of community and individual and group identity, however literature tends to explore this development of community through activities and engagement (Rovai, 2002a). Although it has been suggested a community should be built through the programme first, the design of space should also be considered after (Rullman & Kieboom, 2012) The importance of the physical environment in the development of a sense of community is undisputed (Bickford & Wright, 2006; Massi et al., 2012). A community is a network on campus, it is the whole campus joining together (Rullman & Kieboom, 2012). By providing, a PLE that supports a HEI community the campus can work together as a whole.

### **2.7.2. Place attachment**

Every year students move from their homes to come to university and for many, this means moving miles away from home to a completely new place. Creating relationships with others when entering university, plays an important a role in the development of place attachment (Moghisi et al., 2015) this is why it is so different from school to so many, and why HE is different. Moghisi et al. (2015) found that social interaction significantly predicted place attachment, therefore by increasing students' social interaction they are more likely to feel attached to the environment of the university. Additionally, Rollero and De Piccoli (2010) found that both place attachment and identification lead to positive ideas about the place and people. Therefore, Place attachment can support in the development of relationships and relationships with others can support in developing place attachment. By providing environments where students can develop these relationships, students will be able to form lasting friendships and attachment to the place, and will therefore be less likely to drop out.

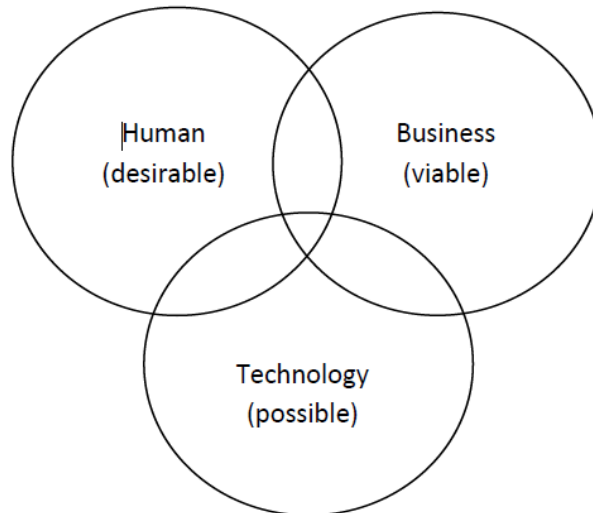
In addition to increasing social relations Moghisi et al. (2015) found that place attachment predicted higher motivation for learning, providing more understanding in how PLE supports students in their learning activities.

Place attachment appears to be an important factor in students' learning experience so how can the PLE be improved to enhance this? Williams and Roggenbuck (1989) describe how attachment to place is split into two groups. One of which is 'resource dependence', so how important the place is to conduct an activity in; how important is the university in conducting learning activities. To increase this element of place attachment the university could offer access to computer programmes not accessible at home, and also the space for both group and individual learning. Secondly Williams and Roggenbuck (1989) highlighted 'resource identity', how much of an emotional or symbolic attachment one has to a place. This resource attachment can either be functional, how well the place works for the intended activities or symbolic, how important the place is. For the functional aspects of the place the physical characteristics are more likely to enhance the value of the place whereas for the symbolic it will more likely be the people. To enhance the element of place attachment it is important therefore, to design the space to students' requirements to improve their sense of functional attachment and that the space is a nice place to learn. Also, to improve the symbolic attachment by introducing social spaces to increase students' sense of community with others.

### **2.7.3. Factors of the learning environment**

Rullman and Kieboom (2012) discussed the outcomes of a summit on the design of space to promote a sense of community and socialisation between students. They demonstrated how current design of space is constructed (p.6) Design> Structure> Activity, which ends up being facility centred, however space should be conceived by Activity> Design> Structure which is user centred. Therefore, by identifying what students require from their environment the structure of the physical space can be manufactured from a user centred basis.

## Literature review



*Figure 2.4 Architectural Design Process (Rullman & Kieboom, 2012)*

Rullman and Kieboom (2012) highlighted the three elements (see Figure 2.4) in the architectural design process; what we want, what we could have and what we can have. They noted that what we want is, desirable, this is a human need, what we want out of the environment, in this case community. What we could have, the viability from the business perspective, how to develop a sense of community. What we can have is the possibility that the technology provides us, in this case what is available to produce this sense of community.

If we look at other areas of human life, research into a sense of community has identified many factors that may be influential in the HEI's sense of community. The structure of public spaces influences people's sense of community (Francis et al., 2012). However, rather little is said about the precise nature of the new spaces (Temple, 2008). People living in neighbourhoods that they see to be safe and interesting have a stronger sense of community (Lund, 2002). Additionally people living in areas that encourage leisurely walking, therefore places with lower levels of land use mix, have a stronger sense of community (Wood et al., 2010). The physical form of the university as a result supports community formation similar to original layouts of human settlements, which are attempts to manage encounters between locals and strangers safely and efficiently (Temple, 2008). Initiating these meetings between people within the PLE are beneficial. Tinto (1998) suggests that connected learning should be promoted amongst students. It was found that a group of students

## Literature review

rated their locker space as their favourite place on campus, it was suggested that this might be because students find identity and ownership important (Tupper et al., 2008). Developing group learning should therefore be beneficial in creating community learning. Dawson et al. (2006) suggested that the integration of computer mediated communication for peer interactions can facilitate in building a sense of community. However, such research appears to miss out how the physical environment can enable this socialisation and encourage a sense of community.

Developing this group PLE may be influenced by many factors. Barker and Gump (1964) found that students in a small school are more actively engaged with the school socially and emotionally as opposed to their counterparts in large schools. Students in a small school setting therefore feel more attached to the school. However some universities are getting bigger (AUDE, 2015) so how do we engage students to feel this small school sense of attachment? Barker and Gump (1964) suggested that this engagement was due to under staffing, so students in small schools took more responsibility. Could this be applied into the university space design? Perhaps this demonstrates that students would prefer have more control over their environment?

A summit of practitioners identified several features of the PLE that should be considered when developing a sense of community (Rullman & Kieboom, 2012), such as the ability for programmes to mix and different levels using the space. There should be the ability to control the environmental features as well as the physical. There would be comfortable space, with a mix of natural lighting as sustainable features. This is supported by Damerest (2004) who stated that students can be drawn to comfortable spaces for social meetings both planned and spontaneously. Although practitioners have suggested these factors, this research has identified the importance of identifying requirements from the stakeholders' perception, in this case the students. This research is however very limited and does not provide a suitable framework to practitioners to utilise to develop spaces that develop a sense of community. Consequently, further work is required to establish a simple framework.



#### **2.7.4. Conclusion**

This concept of sense of community is a good measure of the people-place relationship (Mannarini et al., 2006) and is therefore interesting to explore what students require from the PLE to support this. A conference on the design of universities for communities (Rullman & Kieboom, 2012) noted several barriers to achieving the design of space that encourages a sense of community. Some points that were highlighted were;

- we assume we can already get the problem right
- there is not a clear understanding of community in HE
- there is not a framework of how space can be designed to foster community research; this is needed
- some are against the idea of integrating spaces for community into universities

Therefore, by identifying, from students' point of view, that there is a problem in HEIs' environments for the development of a community and how to actually develop this would help develop suitable PLEs. Furthermore, highlighting this will help identify the problem and the requirement for PLEs to develop this sense of community by providing the required environment and understanding of how this supports students' learning experiences. Finally developing a framework for practitioners to utilise to develop PLEs identifying students' specific requirements. This will therefore make the process of developing PLE easier and more specific to students' requirements. Lewicka (2011) noted that the research in the field of place and people rarely measures theoretical constructs by using both qualitative and quantitative methods of analysis, which they note makes the accumulation of knowledge tenuous, as it lacks the robustness that mixed methodology allows. As it does not provide a clear picture on processes, therefore research that takes into consideration both of the approaches would add to the field.

## 2.8. The Gap in the literature

A summit on the design of HE space concluded that although literature does exist on designing physical learning environments, this rarely informs actual planning and design processes (Rullman & Kieboom, 2012). Furthermore understanding how the space can enhance students' experiences (Bickford & Wright, 2006) it is important that the literature try to move forwards in a way that could inform on the design conception. The Horizon report (Johnson et al., 2016) noted that the implementation of personalized learning was going to be a difficult task, one way to begin to tackle this problem is through designing environments specifically for the students who use them, this will allow for a more personalised learning experience for the students.

The literature review established that designing space for many people and many activities is problematic (Haugen & Fianchini, 2007) and additionally, that some environments may suit some people but not others (Luketic & Dolan, 2013). Therefore this research will close this gap in knowledge by aiming to understand the variance in personality, educational community and quality requirements of students from different subject areas thereby identifying a specific framework of design from students in their PLE.

Designing spaces is a practice given to designers who, whilst trying to concentrate on the properties of the space, fall into the trap of not paying enough attention to the experiences of the users of the intended space (Sime, 1986). Quality testing such as POE is conducted post building completion and although it can instigate discussions for the improvement of the environment (Haugen & Fianchini, 2007), this discussion occurs after building completion when a lot of money has already been spent. Therefore current research has suggested the occupancy evaluations should begin before the completion of the building, at building conception (Riley, 2013). Therefore it is important to know the specific requirements of the users. Although this is always going to be a beneficial and useful source for building performance monitoring, gaining a better understanding of building requirements in the design phase could help in identifying specific requirements from the outset. This can be done by;

## Literature review

- understanding what quality is in the PLE, therefore the environment can be developed to meet quality requirements
- understanding the specific requirements of the end users of the prospective building this should be done in two ways
  - by identifying students individual needs
  - by identifying the requirements in the community of the building

By understanding these factors the PLE can be developed specifically with the end user in mind, ensuring that their requirements are understood. The end users in this case are the students who are often overlooked within the literature, as more focus is placed upon buildings such as offices (Kim & de Dear, 2013) and neighbourhoods (García-Mira et al., 1997). This research will aim to understand what students identify as quality in their PLE as no research has conceptualised this specifically for students in HE PLEs (Riley, 2013). Therefore, this research will aim to close the gap between practitioners' expectations of users' quality perceptions and the actual quality perceptions of the students. Consequently, this research offers the opportunity to identify specifically what students require from their PLE.

### **2.9. Summary and themes drawn from the literature review**

The literature review identified important themes that were used in the identification of the framework of the research. Several themes were drawn from the extensive review of the current literature. Firstly, it was noted consistently that the physical environment influences human behaviour day-to-day, The physical space can influence human behaviour (Vartanian et al., 2015), wellbeing (Burge, 2004) and cognitive ability (Stone, 2001) to name a few. Specifically, the learning environment is an important consideration as this influences the students' satisfaction of not only the taught learning environment (Teater, 2011; Vinales, 2015) but also the physical environment (Chism, 2006; Riley et al., 2015). Although a large body of pedagogic research exists that encompasses the improvement of students' learning experiences, this research currently tends to surround teaching practices. However, a limited body of research exists exploring the design of the PLE, even though this influences the capacity of

## Literature review

teaching practices. The body of literature that does occur in research regarding the PLE focuses on specific features or one specific area, it does not consider the University as a whole. Therefore, emergent research in this field should aim to consider the university space in its entirety.

Currently a lot of research exists in the area of the lower and middle levels of education. In HE sectors however there is a lack of understanding and research in learning spaces (Temple, 2008). However, HE is very distinct, as it must provide a different environment from the lower levels of education. Students attending HE have usually moved away from home to a new place with new people and therefore large changes occur in students' lives. Universities must support student independent development, not only educationally, where the level of education changes drastically, but also socially. Therefore, the development of HEI buildings are an important area in the development of the Physical space.

Although building developments can be expensive and large undertakings, if the standards of the design do not meet the requirements of the end users, in the end attaining suitable PLEs can save more on refurbishment. Identifying features of quality in HE PLE can therefore support in appropriate developments being identified and established in the initial design process. Achieving this will consequently increase the satisfaction of the students and enhance their learning experiences.

Overwhelmingly the literature identified the influence of individual differences on many factors of human behaviour, such as, preference and achievement. A large body of students attend university with a large number of individual needs. The research appears to suggest that the influence of personality trait on choice may affect the space that students will learn in (Ackerman et al., 2011). By identifying these differences, through personality measurements, students' specific requirements can be identified.

Developing 'place' creates an emotional tie between the person and the physical space, when this sense of 'place' is developed it provides an environment that is positive and produces satisfactory experiences (Sime, 1986). Developing a psychological sense of community for students within the PLE could support students'

## Literature review

sense of 'place'. This can benefit students in many ways in their university life such as, learning, sense of belonging and lowering attrition. Therefore, identifying features of the PLE that support a sense of community would be advantageous for students.

Together these elements will allow the development of a framework to inform on the specific design of the HEI. Identifying a framework which is simple, specific and applicable, with students' requirements laid out, can help those involved in the design process design PLEs.

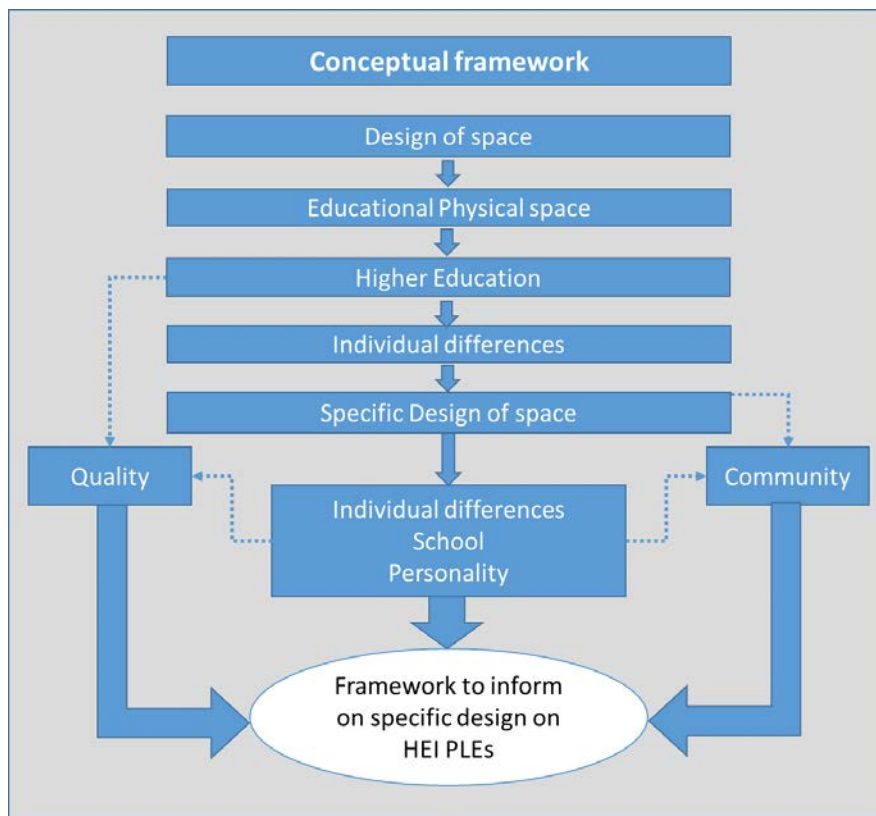


Figure 2.5 conceptual framework developed from literature review themes

The above figure (Figure 2.5) outlines the conceptual framework modelled from the themes drawn from the literature review.

### 3. Methodology

Introduction	
Methodology and research design	
Research philosophy	
Overview of potential methodologies	
Data collection and analysis	
Selected approach- mixed methodology	
Overview of conceptual framework	
Overview of research	
Summary	

### 3.1. Introduction

This chapter will review potential research methodologies and the research design that was considered in the design of this research project. The reasoning behind the final methodological choice is discussed and the justification of the selected approach is explored. The selected approach was mixed methodology, which features both qualitative and quantitative techniques at different stages of the research project.

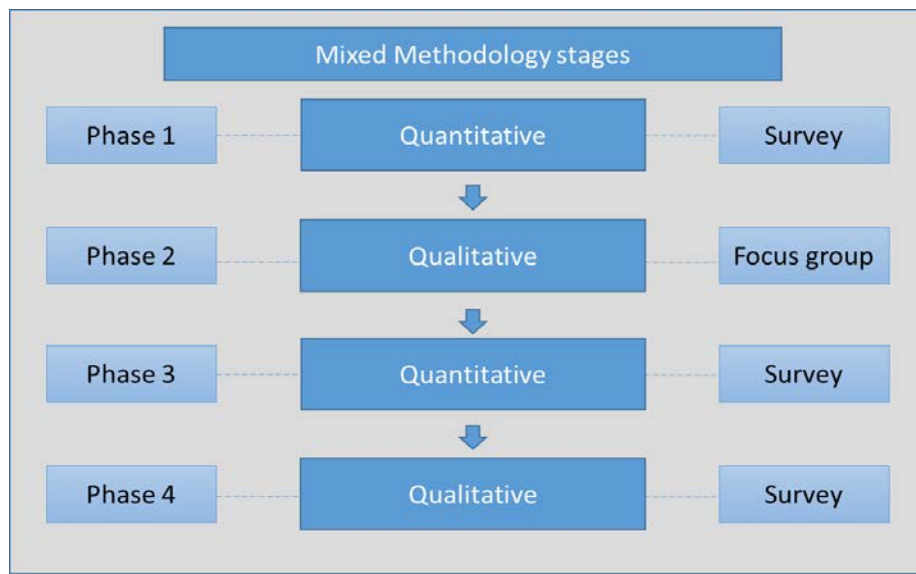


Figure 3.1 Mixed Method design

The first and principal aim in this research was to identify suitable PLEs in HEI's focusing on students' requirements for learning and to develop a valid framework that reflects this. This literature review was conducted with the aim of identifying the current knowledge of how the physical space influences human behaviour to identify features that are important and then the exploration of current knowledge of designing buildings.

From the literature review a set of research questions were presented;

- What are the expectations of students in a quality PLE?
- What are the elements of the PLE that students need to develop a sense of community?
- Are there key features in the PLE that are most important in affecting students' satisfaction of the PLE?
- Do personality traits influence requirements of the PLE?
- Does the subject that students study influence PLE requirements?

Although the literature review identified some understanding and answers to the questions, very little is understood about the design of the environment from the students' perspective. Furthermore, how this influences students' perceptions and the actual features that students identify as important for their learning experiences in HE PLEs. The literature review did provide understanding of the importance of designing appropriate PLEs as spaces that have a substantial impact on human behaviour and therefore for students' learning behaviours. Further consideration is however needed for the design process of learning spaces, specifically in the HE sector. Consequently, a research project exploring students' requirements of the PLE was considered necessary to positively impact students' learning experiences.

### **3.2. Methodology and research design**

Understanding research philosophy is imperative because it acts as the foundation for the research. It is also important as it provides a rationale for the research being undertaken (Bryman, 2012). Denscombe (2010) noted that several foundations support these assumptions; they underpin the adopted research perspective, they shape the nature of the investigation, they specify what qualifies as evidence and they mark conclusions that can or cannot be drawn. To identify the foundations for this research two main questions will be discussed. Firstly what methodologies shall be used and secondly how can these be justified (Crotty, 1998). To answer these questions Crotty proposed four elements to satisfy in order for research to commence.

- Methods - the procedures to collect and analyse data
- Methodology - the strategy underlying the choice of method to obtain desired outcomes
- Theoretical perspective - the philosophical stance that informs the chosen methodology
- Epistemology - the theory of knowledge

The identification of a theoretical research framework has however been noted as being implicit in the designing of a research methodology (Green, 2014). This includes the elements discussed by Crotty (1998) but develops the four elements into a whole framework.



Figure 3.2 identifies the aspects of the theoretical research framework. This is the research onion (Saunders et al., 2012) and represent the layers of a theoretical framework. These layers influence each other, however it emphasises how each layer cannot be reached until the layer before it is considered. Due to this, the structure of the following chapter will follow the layers of the theoretical framework to provide a critical analysis of the framework for this research. Figure 3.2 also highlights the research philosophy and it components that have been identified for this research and will be discussed in depth throughout this chapter.

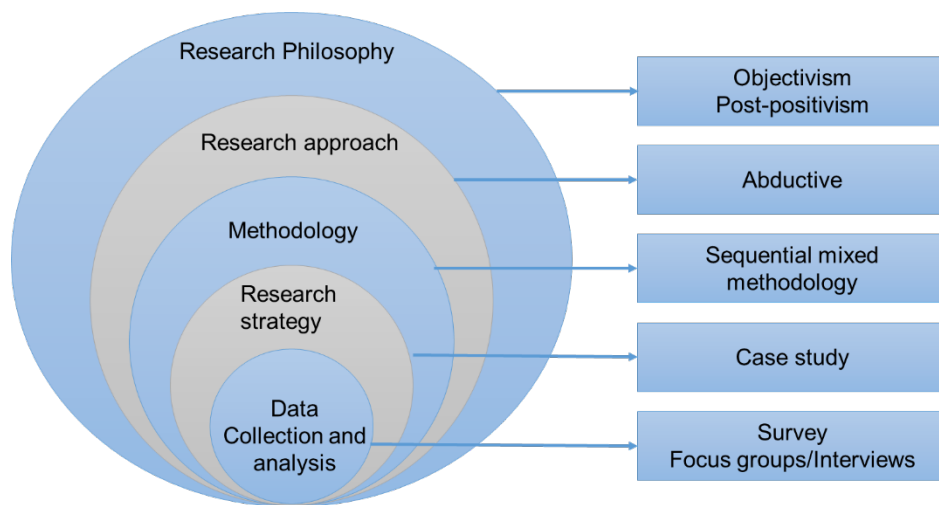


Figure 3.2 The research onion Simplified from Saunders et al. (2011)

The process of exploring the theoretical framework must begin with the research philosophy; this is the epistemological and ontological perspective of the research. The next stage is to identify the research logic, which identifies the differences between inductive and deductive research. It is the important to consider the methodological choice of the research, which is the identification of qualitative and quantitative research strategies. The final stage of the conceptual framework is to identify and consider the different research approaches that could be utilised for the project.

### 3.3. Research philosophy

The first stage to consider in the conceptual framework of the research is the research philosophy. When finally deciding on the research methodology it is important that you have good research philosophical underpinnings (Clark, 1998). The research

## Methodology

philosophy is related to the development of knowledge in a particular field and the nature of the knowledge (Saunders et al., 2012). Simply this is what you are going to do when conducting research and how are you going to develop the knowledge within a field of research. The understanding of philosophical issues is very important for three reasons;

- It helps to clarify the research design
- Understanding of the research philosophy helps in the identification of designs which will or will not work
- It can help in the identification of designs that are outside of previous experiences (Easterby-Smith et al., 2012, p. 17).

There are two major consideration in the understanding of research philosophy; these are Ontology and Epistemology. Each is important as they influence the way in which the research process is considered (Saunders et al., 2012).

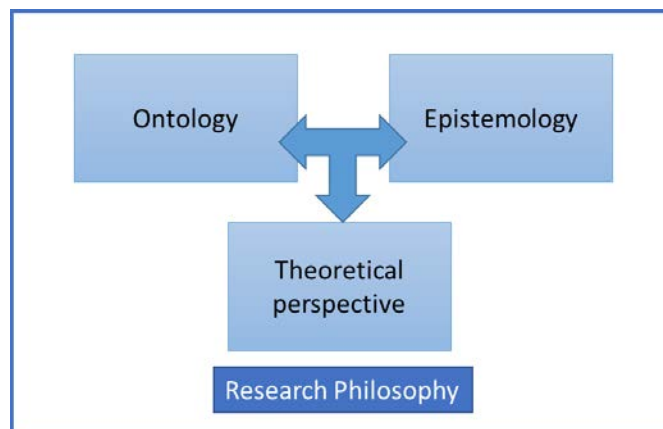


Figure 3.3 research philosophy

### 3.3.1.1. Ontology

Ontology is the study of being and existence, and their relationships. It is concerned with the nature of reality and its characteristics (Creswell, 2013). Ontology is an important consideration as it questions whether social reality exists separately of human interpretations and whether social behaviour is ruled by laws that are generalizable (Snape & Spencer, 2003). Although there is some debate over the theory of ontology there are two outstanding positions, objectivism and subjectivism

(Saunders et al., 2012). Objectivism is the position in which social beings exist externally independent of social actors (Saunders et al. 2012). The social world is seen to be able to be measured as there are structures and relationships that are consistent (Denscombe, 2010). Subjectivism is the position in which it is ascertained that social phenomena are created due to the action of social beings (Saunders, 2012). Subjectivism is associated with constructionism, which understands the world to be socially constructed. It was also noted that although ontology and epistemology are often thought of as separate, they are complementary and work together with each other (Crotty, 1998).

### *3.3.1.2. Epistemology*

Epistemology is concerned with theories of knowledge (Knight & Turnbull, 2008), it is the 'way of explaining how we know what we know' (Crotty, 1998, p. 3). Epistemology is important to recognise as it is concerned with what is 'acceptable knowledge' in any field of study (Saunders et al., 2012) therefore how knowledge can be furthered. The assumptions and views of an epistemological standpoint will therefore influence the research process (Bryman, 2016).

Three different epistemological positions are discussed (Saunders et al., 2012), Positivism, realism and interpretivism. Interpretivism is a perspective critical of positivism, the interpretivists have the view that the social sciences are different from the natural sciences (Bryman, 2016). They believe that it is necessary for researchers to understand the differences in humans' roles in the social world (Saunders et al. 2012). Therefore, interpretivists believe that knowledge we have obtained is something produced, not discovered, and only by interpreting the world can we fully gain this knowledge (Denscombe, 2010).

The realist standpoint has been argued as a very similar construct to positivism (Bryman, 2016) as realism regards the social world to have structures and relationships that can be measured, that exist independently of other beliefs (Denscombe, 2010). There are two main types of realism, empirical realism and critical realism. Empirical realism notes that what we experience through our senses is an

accurate portrayal of the world and critical realism notes that what we experience are pictures of things in the reality but are not directly the things (Bryman, 2016).

From the positivism standpoint, the adoption of the philosophical stance of the natural scientist is a marker for their research (Saunders et al. 2012). Positivism respects the following principles; only observable phenomena can lead to the production of knowledge, the purpose is to develop hypotheses that can be tested, science must be conducted objectively and there is a distinction between scientific and normative statements and the former is the truer domain (Bryman, 2016, p. 24). This perspective however has some shortcomings as the researcher has to stay value free, which could be a truly impossible notion (Saunders et al. 2012).

Post positivism was a response to the criticisms of the positivist standpoint (O'Reilly & Kiyimba, 2015). Similar to positivism the physical aspects were outside the scientific area, but like realism science was encouraged as the unobservable could exist and have the ability to explain observable phenomena (Clark, 1998). In the way that positivism understands quantitative precision and evidence based research, post positivism is understanding of the qualitative 'truths' (Clark, 1998), this acceptance is critical in the rejection of the split between qualitative and quantitative methods. In fact post positivism is noted as being in the first phase of a paradigm shift in supporting the mixed methodology approach (Tashakkori & Teddlie, 2003).

There are differences in the epistemological and ontological commitments in qualitative and quantitative research, although it is important to remember that these are not deterministic, they may differ (Bryman, 2016).

### *3.3.1.3. Theoretical perspectives*

Ontology and epistemology have been discussed above. To bring these together as outlined in Figure 3.3 a discussion of research paradigms is required. Positivism and interpretivism are considered the two main research paradigms (Collis & Hussey, 2009). It is important to highlight that these two paradigms are considered as two ends of the research spectrum, they are the two extremes.

## Methodology

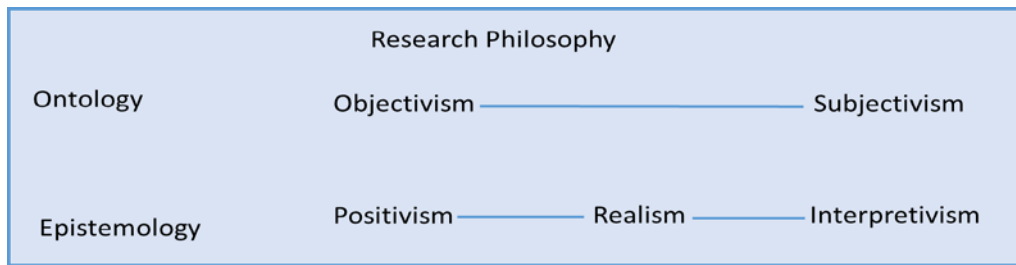


Figure 3.4 theoretical perspectives

The theoretical perspectives that this research will adopt should be identified to understand the development of the research philosophy. The ontological stance is the objectivist standpoint, this view emphasises the objective nature of research and that social phenomena can be measured. With the aim of this research to examine relationships and identify specific features of the PLE, this standpoint allows for this examination. The epistemological stance of this research is post positivism, this stances identified that there are limitations in merely viewing the world a scientific way by responding to the ability to view the unobservable. This standpoint recognises the importance of both, which is in line with the aims and objectives of this research.

### 3.3.2. Research approach

In the previous section, the use of theory was discussed in the research project and how it is necessary to construct and design the project. It is also important to discuss the approach of your research. The approach that is chosen in the research project is a bridge between the theory and the research itself (Bryman, 2016). There are often thought to be two approaches, deduction and induction, however there is also an increasingly commonly used approach - abduction (Saunders et al., 2012). Why is it important to understand the research approach adopted in the project? Saunders et al., 2012, p.143) highlighted three factors;

- It enables the researcher to make an informed decision on the research project
- It helps identify which strategies and methodologies will work for the research and which will not
- It enables the researcher to adapt the design of the research to allow for any constraints

### 3.3.2.1. *Deductive*

Deductive theory is the most commonly used view of the relationship between theory and social research (Bryman, 2012). A deductive approach is utilised when a conclusion is developed through the logical deduction of what is known of a domain in relation to another. In deductive research, there is an exploration of literature to explain relationships (Saunders et al., 2012), data collection is then used to test the hypothesis drawn, that is founded in existing theory (Saunders et al. 2012). It has been stated that the deductive approach is a 'top down' approach it begins with theory then creates a hypothesis to the data to add to existing theory (Creswell & Plano- Clark, 2007). The aim therefore in regards to the theory, of the deductive approach is either falsification or verification (Saunders, 2012, p.144). Characteristics of this approach, however, have been highlighted as limiting to the research. As an approach, deduction is reductionist; it can reduce behaviours and actions down to the simplest features. This has been highlighted as simplifying behaviours too much, as they are far more complex (Saunders et al., 2012).

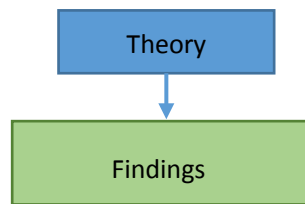


Figure 3.5 Deductive approach

### 3.3.2.2. *Inductive*

Inductive theory is the development of a conceptual or theoretical structure and then the subsequent testing by observation (Collis & Hussey, 2009). Researchers utilising the inductive approach tend to be concerned with the context of behaviours (Saunders et al., 2012). With the inductive approach the outcome of the research is the theory, drawing generalisations out of what has been observed (Bryman, 2012). The inductive approach works from the 'bottom up' by building patterns categories and themes, organizing this into more abstract pieces of information (Creswell, 2013). A limitation of this approach is that consequently researchers end up making empirical generalizations rather than developing actual theory (Bryman, 2012). As highlighted previously the deductive approach aims to find cause and effect through variables, however this was criticised by social scientists. They argued that without an

understanding of how people interpret the social environment conclusions could not be drawn (Saunders et al. 2012). This also is the strength of the inductive approach, the idea of developing understanding.

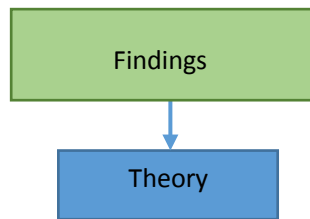


Figure 3.6 Inductive approach

### 3.3.2.3. Abductive

As has been discussed the deductive approach moves from theory to findings and the inductive approach moves from findings to theory. Abduction however, moves back and forth between findings and theory (Saunders et al., 2012). It is a combination of both the inductive and deductive approaches, which moves between them. The abductive approach 'is a creative inference, which involves integration and justification of ideas to develop new knowledge' (Mirza et al., 2014, p.1982). The crucial component in abduction is the understanding the perspectives and meanings of the people studied population; from this the researcher must come to a social scientific account of the views (Bryman, 2016). Abductive reasoning allows for development of hypothesis, theories or explanations, which proceeds inductive and deductive approaches (Mirza et al., 2014). This can therefore lead to a deeper understanding of research.

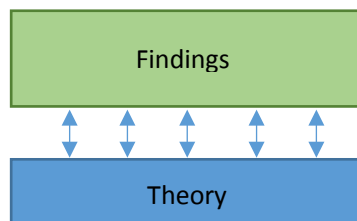
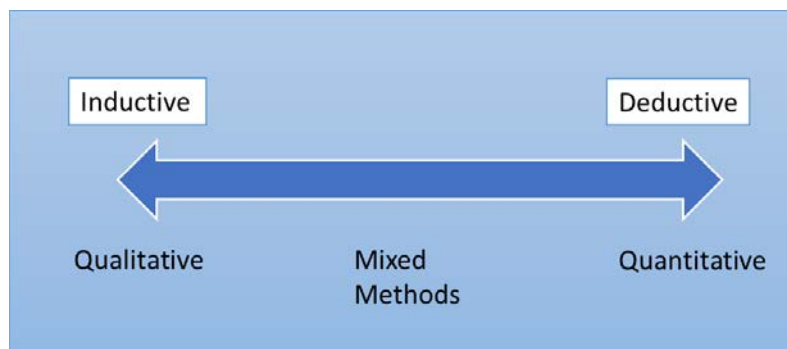


Figure 3.7 Abductive approach

The research approach adopted was the abductive approach as the data collected will allow for the exploration of phenomena and the generation of themes, which will then be explored throughout the research. Where data is collected to identify themes, explain pattern and to generate and develop or modify theory an abductive approach is used (Saunders et al., 2012).

### 3.4. Overview of potential methodologies

The three forms of methodology are: qualitative, quantitative and mixed methodology. Although there are these three approaches to the enquiry, they may not be as separate as we think. Creswell (2009) noted that qualitative, quantitative and mixed methods research lie within the same continuum, namely along a qualitative-quantitative continuum, with mixed methods lying in the middle (Ramlo & Newman, 2011). Therefore, recognising where on this continuum this research sits would help to identify a suitable methodology.



*Figure 3.8 The methodology continuum*

Figure 3.8 depicts the Qualitative-Quantitative methodology continuum where qualitative and quantitative lie at the two ends of the continuum with mixed methods in the middle. This noted that mixed methodology encapsulates elements from both of the other two methodological approaches, which integrate themselves together. As is shown in Table 3.1 below, mixed methodology research has elements of research methodology from both qualitative and quantitative research methods.

These three methods will be discussed further below highlighting avocations for their use in research.



## Methodology

*Table 3.1 Quantitative, Qualitative and Mixed Methods Procedures (Creswell et al., 2009)*

Quantitative Research Methods	Qualitative Research Methods	Mixed Methods Research Methods
Predetermined Instrument based questions Performance data, attitude data, observational data, and census data Statistical analysis	Emerging methods Open-ended questions Interview data, observation data, document data, and audio-visual data Text and image analysis	Both predetermined and emerging methods Both open- and closed-ended questions Multiple forms of data drawing on all possibilities Statistical and text analysis

### 3.4.1. Qualitative approaches

Qualitative research explores the meaning given, by groups or individuals, to situations (Creswell, 2009). Dey (1993) describes qualitative analysis as describing phenomena then classifying it to ultimately see how concepts may interconnect. In terms of conducting research, qualitative methodology is described by Roberts and Povee (2014), as the description and interpretation of research. Therefore, this method of data collection is rooted in the interpretivist research paradigm (Dainty, 2008). The features that highlight qualitative research as being distinctive in character to other methodologies are outlined by (Snape & Spencer, 2003, p. 3)

- Aims which are directed at providing an in-depth and interpreted understanding of the social world of participants by learning about social and material circumstance, experiences, perspective and histories
- Samples that are small in scale and purposively selected on the basis of salient criteria
- Data collection methods which usually involve close contact between the researcher and the participants, which are interactive and developmental and allow for emergent issues to be explored
- Data which are very detailed, information rich and extensive
- Analysis which is open to emergent concepts and ideas and which may produce detailed description and classification, identify patterns of association, or develop typologies and explanations

## Methodology

- Outputs which tend to focus on the interpretation of social meaning through mapping and re-presenting the social world of the participant

As with any research there are many different perspectives of qualitative analysis, some may be concerned with the social processes, some may be occupied with evaluating the results and some may try and explain them, but there is a basic core (Dey, 1993).

There are six main stages to qualitative research analysis;

- (1) organising the data for analysis
- (2) initial read through and memoing
- (3) coding data by organising into chunks or segments
- (4) describing and categorising the information
- (5) representing the descriptions and themes into a narrative
- (6) the interpretation of the meaning of the data

(Creswell, 2009)

Although this is set out as a linear progression Creswell (2009) noted that this should be an interactive process where stages are interrelated and can be revisited. In the analysis process, the categorising data is crucial to evaluate any connections between these categories. To find these categories, qualitative data collection looks inductively for meanings through language and actions. Conceptual data is then taken from this and categorised in order to analyse findings. This methodology primarily involves an inductive approach where the focus is placed on the generation of theory (Bryman, 2012). This enquiry technique uses the ontological position of constructionism and therefore engages the researcher to interpret the meaning of the data (Creswell, 2009). This is in opposition to using statistics to assess if assumptions are met. This methodology allows for the participants to explore their ideas and opinions focusing on learning the meaning of participant problems or issues (Creswell, 2009). However it does contain certain issues such as participants feeling uncomfortable discussing

## Methodology

issues, meaning it may be difficult to interpret in certain situations, especially in case studies, or research bias may occur (Creswell, 2009).

There are many methods that are used in a qualitative methodology to generate data. including techniques such as focus groups, interviews document analysis or case studies (Creswell, 2013). However, for the purpose of this intended research to explore opinions, discussion methods, such as interviews, or focus groups would be most appropriate. Qualitative research has become popular in social science research (Curtis & Curtis, 2011) as it allows for the understanding of problems associated with social policy and appraisal of implementation (Ritchie, 2003). Specifically for built environment research, qualitative methodology has been identified as having many strengths (Amaratunga et al., 2002)

- Focus on 'real life'
- Richness and holism which can reveal complex theory
- The flexibility can allow for real understanding of life happenings
- Well suited to understanding the meaning people give to processes and structures and connecting this to the place around them
- Good to explore new theory and area of study
- Useful to supplement, explain, validate and reinterpret quantitative data from the same setting

However, some areas such as construction management have noted qualitative research has become over reliant on one specific method and does not allow for diversity (Dainty, 2008), therefore triangulation of methods should be considered. It has been noted that qualitative research should aim to regain the reliability and validity of the research methodology to claim back the rigour of a scientific approach (Morse et al., 2002). This has been undermined by the use of criteria to evaluate the significance and impact of completed research (Morse et al., 2002). Although data that is collected qualitatively and quantitative is commonly understood to be different, there need to be specific criteria for the assessment of the validity of qualitative data. In qualitative methodology this has been defined by Guba and Lincoln (cited by, Morse et al., 2002) as transferability, dependability, confirmability and credibility. Additionally

the analysis from qualitative collection tends to be considered a basic form of analysis, however methods such as grounded theory, which employs systematic steps, or phenomenological research, using the generation of meaning units, has developed the field into an analytical process (Creswell, 2009).

### *3.4.1.1. Phenomenological research*

Phenomenological research is concerned with capturing the 'essence' of human experiences concerning a particular occurrence which the participants have discussed (Creswell et al., 2003). This approach concentrates on human behaviours that are 'pure, basic and raw' (Denscombe, 2010, p. 94) and have not been analysed and theorised about. The aim of the researcher conducting phenomenological research is not to interpret what is said by the participant but to present experiences originally, searing for perceptions, meaning, attitudes, beliefs, feelings and emotions (Denscombe, 2010). The researcher is therefore detached from the data holding back their own assumptions and beliefs to enable participants' narrative to speak (O'Reilly & Kiyimba, 2015). However this form of research collects data from people to describe their individual experiences, otherwise known as their 'lived experience' (Ashworth, 2003; Banister, 2011). Therefore this form of research is idiographic and is therefore ideal to explore areas such as the lived experiences of illness (Lopez & Willis, 2004) and nursing practice (Annells, 1996).

### *3.4.1.1. Thematic analysis*

Thematic analysis is a widely used qualitative form of analysis (Braun & Clarke, 2006). Thematic analysis uses the process of both descriptions and interpretation to identify a thematic map (Vaismoradi et al., 2013). Thematic analysis is a method for identifying patterns within the data, themes are therefore groups of codes which are similar (Clarke & Braun, 2013). This is a highly flexible form of qualitative analysis as it can be used in many theoretical frameworks and is therefore useful for the description of data (Braun & Clarke, 2006). Thematic analysis consists of six different phases, familiarisation, coding, searching for themes, reviewing themes, defining and naming themes and writing up (Braun & Clarke, 2006). Thematic analysis consequently allows for the capturing of the important themes from a data set (Braun & Clarke, 2006).

### 3.4.1.2. *Grounded theory*

Grounded theory is a qualitative form of analysis where the researcher aims to ascertain a general and abstract theory of processes, actions or interactions, which is, grounded in the participants' views (Creswell, 2003). Generating this theory that is grounded in interviews, focus groups, document analysis and other forms of material is one of the most used principles in modern qualitative research (Pidgeon, 1997).

Grounded theory is appropriate when

- Little is known about the area of study
- The generation of theory with explanatory power is a desired outcome
- An inherent process is imbedded in the research situation that is likely to be explicated by grounded theory methods

(Birks & Mills, 2015, p. 16)

There are four main tools used in grounded theory (Bryman, 2016)

- Theoretical sampling - the data collection process is controlled by the emerging theory. This is an ongoing process where the researcher simultaneously collects, codes and analyses the data to develop the emergent theory.
- Coding - data is broken down into parts which are then named, within this different types and levels of coding are recognised
- Theoretical saturation - this encapsulates both the coding and collection of data, through this there is a point that new data does not add any additional information to the theory
- Constant comparison - is the continual process of connecting the data and conceptualisation so that concepts and categories always correspond to each other. This ensures the research constantly compares the phenomena being explored to the coding process so that theory can emerge

This allows for the researcher systematically to explore the emergent theory from the collected data. Although there is a systematic process it is a complex process that requires 'procedural precision' (Birks & Mills, 2015). As shown in Figure 3.9 the analysis process is comprised of elements that always need to be managed, this is

where memoing is an imperative part of grounded theory (Birks & Mills, 2015). This is where the researcher notes their thoughts and their feelings about the coding and emergent theory (Birks & Mills, 2015).

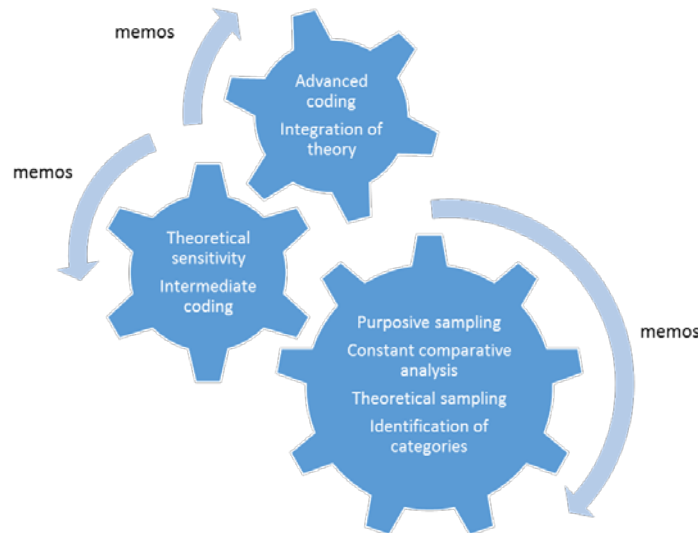


Figure 3.9 essential grounded theory methods adapted from (Birks & Mills, 2015)

Memoing allows the researcher to extract meaning from the data through interpretation. It is also important for the management of data to ensure that the systematic procedure can be a logical process (Birks & Mills, 2015). This systematic approach to qualitative data analysis has many benefits such as, it is pragmatic, adaptable, theory driven, grounded in reality and good for exploration of a new field (Denscombe, 2010).

### 3.4.2. Quantitative approaches

In broad terms quantitative research is the collection of numerical data with a preference for the natural scientific approach to research (Bryman, 2016). The quantitative methodology has been said to endeavour to quantify findings in analysis and data collection (Bryman, 2016). This methodology follows the deductive approach primarily, where focus is placed on the testing of theories (Bryman, 2012) as opposed to qualitative methodologies, which focus on the development theory. The epistemological stance of quantitative research is positivism (Bryman, 2012), although there is a new body which is stretching out into post-positivism. This being said quantitative research is not tied to this positivist standpoint and can use other

## Methodology

philosophies such as realism (Saunders et al., 2012). It is therefore a flexible methodology.

This strategy uses concepts of cause and effect thinking, and use of measurement (Creswell et al., 2003), and is interested in the testing of hypotheses to be able to generalize theory (Amaratunga et al., 2002). Quantitative methodology is also concerned with causality, to be explanatory, and the replicability of the research (Bryman, 2016). Therefore, it employs data collection strategies such as experimentation and surveys. Quantitative data collection techniques utilise predetermined methods of collection to gather statistical data (Bryman, 2016). However, this method of data collection has been posited as being reductionist as it distances the respondent from the social context, and therefore undermines the ecological validity (Dainty, 2008). It is important to note however that survey approaches are not restricted to closed, numerical questions only, they may include open ended questions where participants answer with words (Saunders et al., 2012). Quantitative analysis is conducted using descriptive and inferential statistics, which explores the data and examines relationships (Field, 2013). This data is examined using statistical analysis that is highly robust in its methodology.

Some of the strengths of quantitative research are that; findings can be easily replicated and compared. It also allows large scale studies to be conducted cheaply and reasonably easily. Quantitative research is also fairly objective as set data collection methods are employed (Riley et al., 2015). In the past quantitative research has been used as the epicentre of built environment research (Fellows and Lui, 1997 cited by Dainty, 2008). This is because there are many benefits to the use of quantitative methodologies in Built Environment research;

- comparison and replication can be employed
- independence of the observer from the participant, can reduce researcher bias
- participants' analysis is objective
- reliability and validity may be determined more objectively than qualitative techniques;
- strong measurement of descriptive aspects of the built environment

## Methodology

- emphasises the need to formulate hypothesis for subsequent verification
- generally reduces the whole to the simplest possible elements in order to facilitate analysis to identify causal explanations

(adapted from Amaratunga et al., 2002)

Although there are obviously many strengths to the use of quantitative methodologies there are some significant weaknesses to consider. Amaratunga et al. (2002) noted that the main failure of quantitative research is in its inability to understand deeper meaning and explanations of findings. Therefore, you may be able to measure and quantify a theory but cannot understand why it may occur or what the finding means. Bryman (2016) outlined the main critique for this;

- quantitative research does not see the social world as different from the natural world and therefore overlooks people's interpretation of the world
- The measurement techniques are artificial when aiming to be precise and accurate, they do not allow for different interpretations by participants
- Relying on procedure and instruments cuts off the connection between the research and real life and therefore lacks ecological validity
- By analysing variables for relationships it creates a stationary view of the social world and therefore can explore where these relationships come from and why they may exist

Therefore, whilst quantitative analysis may be able to explore relationships and examine hypotheses it does not allow for the influence of human behaviour and differences in interpretation. Specifically, Amaratunga et al. (2002) noted that within built environment research it only identifies a brief picture of a situation when measuring tangible variables however it fails in the understanding and explanation of the meaning and experiences of the environment.

### **3.4.3. Mixed method approaches**

There is a third research paradigm becoming recognised in literature (Johnson et al., 2007). Mixed methods strategies are less well documented than quantitative or qualitative methodologies (Creswell, 2013). Mixed methods involves both qualitative



## Methodology

and quantitative methodologies (Creswell & Clark, 2007). The encouragement of a 'multimethod matrix' implored people to observe multiple approaches together (ibid). Recognising that all methods have their own limitations, it was considered that the biases in the use of a single method could be cancelled out if incorporated together into a mixed method approach (Creswell, 2013). Therefore the results from the two opposite methods provided on the same issue provides the researcher with a deeper understanding of the issue or study (Johnson & Lomas, 2005). Hammersley (1996) noted that many qualitative researchers see their work as exploratory and quantitative researchers see their work as hypothesis testing to confirm or test theory, and therefore take on a single model research process. However Hammersley (1996) highlighted that this is too simplistic and it should be more accurate to think of mixed methodology as an 'iterative cycle of exploration and testing' (p. 174).

The mixed methods approach of inquiry involves the collection of data either simultaneously or sequentially to understand research problems (Creswell et al., 2003). Creswell (2013) developed this and identified three forms of mixed methodologies;

- Sequential mixed methods - the researcher pursues the elaboration of findings of one of the methods with the other, either beginning with qualitative focus groups for example and expanding findings using quantitative survey or vice versa
- Concurrent mixed methods - this is where the researcher merges quantitative and qualitative methodologies to provide a comprehensive analysis. Both forms of data are collected concurrently and the information integrated for interpretation
- Transformative mixed methods - the researcher uses a theoretical lens as an overarching theme encapsulating both qualitative and quantitative methodologies which can occur both concurrently and sequentially

The differences in strategies for a mixed methodology report has an impact on the structure of the report that follows, as it is not simply just quantitative or qualitative. If the study began with quantitative methodology, the work may lean towards the quantitative style. Equally if the qualitative stance was applied first the report may following this form of writing (Creswell, 2013).

## Methodology

The criticisms of this methodology centre around the application of the methodologies to identify findings. Can mixed methods really be more than the totality of the individual qualitative and quantitative parts (Bryman, 2007). Does conducting mixed methodology design add something to the project over and above carrying out the individual studies. It has been highlighted that it is important when conducting mixed methodology research that the research be explicit in its rationale for using such method (Bryman, 2016). This provides the reader a better understanding of the relationship between the research question and the intended methodology to be used. It is also important to not think of mixed methods of separate, individual components but consider how they are related from the outset (Bryman, 2016). It is important that findings are integrated together to make sure it is clear how one is related to the other.

It is also important to remember no matter how many methods are employed, poorly conducted research will yield poor results. It is therefore important to competently consider the design of the mixed methods research (Bryman, 2016). Likewise, this strategy must be coherent to the research question and must provide the desired data findings, simply assuming more is better should not be considered in a mixed methodological approach (Bryman, 2016). Therefore, it is important to consider the implication of using a mixed methodology research design for the research question, will it provide you with your desired outcome and how will the method be employed to allow this?

Within social sciences mixed methods is becoming a more common research strategy. Dainty (2008) suggested through the review of research in the field of the Built Environment that those partaking in social science research should engage more in a multi methodology approach to better understand the complexity of interactions. Furthermore Amaratunga et al. (2002) noted that the combination of the mixed methodology strategy can focus in on the strengths of either methodology in Built Environment research. Amaratunga et al. (2002) noted a series of strengths using a mixed method approach in Built Environment research;

## Methodology

- Qualitative methods allow for the research to develop an overall picture of the research whereas quantitative methods are appropriate for the measurement of behavioural or descriptive entities of the Built Environment
- Quantitative analysis may allow for an appropriate sample to be drawn for the qualitative analysis
- Built Environment research involves both affective and behavioural aspects therefore mixed methods allows both to be investigated
- Much of Built Environment research is still exploratory therefore qualitative methods are useful, however quantitative analysis is useful in indicating the extent
- Quantitative research can confirm or reject any emergent relationships, but if relationships do occur then qualitative research is useful in understanding the underlying explanations

Mixed methodology research strategies are therefore highly effective in this area of research.

### **3.4.4. Selected methodology - Mixed methodology**

Based on the preceding and the review of methodological understanding a mixed methodological approach is the recommended approach to take. This appears to be the right strategy for the research design as the object of the research topic is to understand students' views of the PLE but also to understand the relationship between factors of the environment and personality/school and to develop specific frameworks of design. Specifically a sequential mixed methodology approach will be taken as it will allow for each phase of the research to develop from the previous in a sequential manor. Additionally, research in the area of the built environment and that of the person, supports the use of both qualitative and quantitative methodologies (Amaratunga et al., 2002; Lewicka, 2011).

### **3.4.5. Research Strategy**

A research strategy is the plan that enables the researcher to reach their goal (Saunders et al., 2012). There are many forms of research strategy, experimental, action research or the one that will be discussed for this research a case study (Saunders et al., 2012).

## Methodology

Case studies enable the exploration within its context a research topic of phenomena (Saunders et al., 2012). They can focus upon cases such as, organisations institutions, processes or events (Yin, 2014). When the aim of the research is to explain a present circumstance or your research requires an extensive in depth look at a phenomena a case study is an appropriate methodology (Yin, 2014). Case studies frequently employ both qualitative and quantitative research methodologies as this allows and detailed and intensive exploration of the research topic (Saunders et al., 2012). There are many types of case study (Saunders et al., 2012);

- Critical case- a case is chosen with the aim of achieving better understanding or a circumstance already noted in theory
- Extreme case- this is the examination of a unique case
- Representative case- this case may be chose to exemplify a broader category with which it is already a member
- Revelatory case- examination of previously inaccessible phenomena
- Longitudinal case- can be studies over time with junctions examined

It is also important to consider the strategies of the case study Yin (2014) distinguishes these as single vs multiple case, which is the number of cases included in the research. And the holistic case vs embedded case, which refers to where the case is split or is a whole. When designing a case study it is also important to consider time available, availability of information, access to persons, aim of investigation and number of case (Proverbs, 2008). By considering these factors, a researcher is then able to determine the scope for the case study and how the aim will be achieved.

For this research a case study design has been chosen as it allows for the in-depth exploration of the preferences of students within a HEI. The type of case study that will be utilised for this research is the representative single holistic case. Therefore, one single case will be examined that is representative of the HE landscape in the United Kingdom. This will therefore allow for the findings of this research to be generalizable across the student population in other HEIs.

### **3.5. Data collection and analysis**

In order to conduct the research, it was a requirement to choose the correct methodology for the proposed outcomes. Firstly, it was important to review the findings from the findings of the literature review to identify what requirements are needed. The findings revealed that it is important to develop a specific framework of design for the environment, incorporating the understanding of the relationship between personality and the PLE. Therefore, quantitative research is required to measure relationships and identify specific factors of the PLE. The literature reviews also highlighted the need for understanding about student perceptions of the environment and their thoughts and feeling towards the design of the PLE. Therefore, qualitative research would allow this investigation. Additionally, the research area itself is exploratory, not much is known about students' specific requirements, and consequently qualitative research would allow this exploration into new theory about designing PLEs. To meet this requirement a grounded theory approach will be utilised as it will allow for the exploration or phenomena to generate theory regarding the design of the PLE from a student's perspective.

For the validation phase of this research, qualitative interviews will be utilised, as it would allow for the exploration of practitioners' thoughts and feelings about the use of the outcomes of this research. To allow for a large sample of practitioners to be sampled a pragmatic survey utilising rating scales and open questions will be operated. The analysis technique for this would be a thematic analysis, as the aim of this phase of research is to establish agreement disagreement or areas for development for the framework developed. Therefore, theatrical analysis will allow for the identification of themes for the progress of the validation.

#### **3.5.1. Phase one analysis**

##### *3.5.1.1. Descriptive statistics*

This is the describing of the data by exploring its distributions and patterns. The process also looks to summarise the characteristics of the data (Easterby-Smith et al., 2012). Using SPSS, descriptive analysis of mean and standard deviation were used along with the use of frequency analysis.

### 3.5.1.2. *Inferential statistics*

This is the statistical analysis that enables the researcher to draw inferences about the data, for example the relationships between variables. This can either be completed through bivariate or multivariate analysis (Bryman, 2016). For this research, a variety of analysis was used with the level of statistical significance of 0.05. The significance level of 0.05 was chosen as this is the standard level of significance used within scientific research (Field, 2013).

To identify which statistical analysis could be used Kolmogorov-Smirnov test for normality of the data (Field, 2013). If the data is normally distributed parametric tests can be conducted. However if the data is not normally distributed non-parametric tests should be considered. To examine differences between group's two analysis techniques were utilised. A Kruskal-Wallis analysis was utilised when the data was non-parametric. ANOVA analysis was utilised when the data was normally distributed. To ensure there is an appropriate sample size to conduct either an ANOVA or Kruskal-Wallis a large enough sample size must be collected to ensure a type 2 error is not found (Field, 2013). To calculate this is important to consider the power of the test assumptions.

Although factor analysis is most accurate when conducted on a sample of 200+, Field (2013) suggests that for sample sizes of 100 to 200 participants if communalities of .5 and above are considered significant, rather than the lower level for larger sample then this can be considered an acceptable sample size. Factor analysis was utilised to identify if different measures are driven by the same latent variable (Field, 2013). A latent variable is one that is extracted from a measured or manifest variable when measurement error has been pulled out, and is based on the inter-correlations between the items thereby examining if many factors can be reduced into fewer factors. It is important to consider the rotation of the factors for interpretation there are two options;

- Oblique - Factors are allowed to inter correlate
- Orthogonal - Constrained to be uncorrelated

## Methodology

At this phase on the analysis orthogonal rotation (Varimax) was utilised as it was assumed that the items would be uncorrelated. Maximum likelihood is a widely used method of extraction in EFA, with the advantage that it allows for evaluation statistically of how well the factor solution can reproduce the relationships among the variables (Brown, 2015). However if the data is not normally distributed then an important component of the maximum likelihood estimation can be distorted and therefore cannot make a trustworthy estimation of the data, for example goodness of fit (Brown, 2015). Maximum likelihood estimation also has a tendency to produce 'improper solutions' (Brown, 2015, p. 19). Principal axis factoring is another common method of extraction and this method is the preference for data sets where non-normality is found (Brown, 2015). To ensure that the factor analysis is suitable it is important to consider the Kaiser-Meyer-Olkin measure for sampling adequacy, with above 0.8 being good. And for the analysis The Bartlett's Test of sphericity also presented a significant result which must be  $p < 0.05$  (Field, 2013).

### **3.5.2. Phase two analysis**

This phase of data analysis requires the analysis of qualitative data. To meet the requirement a grounded theory approach will be utilised as it will allow for the exploration of phenomena to generate theory regarding the design of the PLE from a student's perspective.

### **3.5.3. Phase three analysis**

Similar analysis will be conducted as in phase one; however there are additional analysis to discuss. At this phase of the analysis, it was identified that the factors should be allowed to correlated, therefore an oblique rotation (Promax) was utilised with a maximum likelihood extraction.

Structural equation modelling (SEM) was utilised to examine the relationships with personality and the PLE. SEM is a more rigorous test of the relationships between variables as you must have many fit indices assumptions met to have a significant model (Hooper et al., 2008). Pearl (2010, cited by Kline, 2015) defined SEM as a method of drawing inferences that requires three inputs and generates three outputs:

## Methodology

### Inputs

- A set of qualitative causal hypotheses based on theories or results that a represents in a SEM
- A set of queries about causal relationships among variables of interest
- Most data is not experimental

### Outputs

- Numerical estimates of model parameter for effects e.g.  $x \rightarrow y$
- A set of implications of the model that may not directly correspond to a parameter but can still be tested
- The degree testable inferences are supported by the data

The use of SEM has grown in popularity in psychology and social sciences and across many other disciplines (MacCallum & Austin, 2000; Hooper et al., 2008). The consideration of theory in SEM is highly important as it is a method to test a theory by specifying a model that represents the theory (Kline, 2015). SEM allows the researcher to test a theoretical proposal in terms of how constructs are theoretically linked, and additionally it examines the direction of these relationships (Schreiber et al., 2006). Therefore, if the model that is constructed is not specified then the theory is refuted. Therefore, SEM has been chosen for this research to examine the theory behind the relationship between personality and feature of the PLE by examining how they interact and the directionality of the relationships.

The sample size for SEM analysis is very important for statistical significance (Fan et al., 1999; Kline, 2015) In typical research a sample size of 200 is expected when conducting SEM (Kline, 2015). Therefore obtaining a sample of over 200 cases was highly important for this research so SEM could be conducted.

To test for the validity of the model, measures to determine the 'goodness of fit' between the data and the hypothesised model were applied (Marsh et al., 2004).

- Chi-squared ( $\chi^2$ ), this assumes the model fits into the population but this however can be affected by how large the sample size is. The larger sample size may increase the likelihood of a significant result, therefore individually it provides little



## Methodology

information but when used in combination with others can be useful . However it can easily reject the model as the sample size gets larger, so may function best with smaller to medium samples

- CFI - the comparative fit indices (Marsh et al., 2004), this assumes that the baseline model is correct (Rigdon, 1996)
- RMSEA - root mean square error of approximation is less sensitive to the sample size (Rigdon, 1996) therefore is good to use in conjunction with  $\chi^2$

These measures will be used to determine the goodness of fit however to fully represent the fit of the model all parameters will be shown and reviewed.

### **3.5.4. Phase four analysis**

This phase of data collection will proceed by collecting qualitative data. The analysis technique utilised will be a thematic analysis, as the aim of this phase of research is to establish agreement disagreement or areas for development for the framework developed. Therefore, thematic analysis will allow for the identification of themes for the progress of the validation.

The structure of the research is to be discussed in the following sections of the thesis, however to provide clarity on the structure the phases are outlines below in The table summarises the phase, the method of data collection, the analysis technique and the purpose of each phase.

## Methodology

Table 3.2 Project phases; method and data analysis (qualitative aspects in grey)

	Data collection	Analysis	Purpose
Stage 1	Literature review	Review of literature examining areas of interest to identify the gap in the literature.	To identify gap in literature. Identify existing factor of the PLE
Stage 2	Pilot of survey developed from literature review <ul style="list-style-type: none"> <li>• Learning environment</li> <li>• Quality</li> <li>• Personality</li> </ul>	Statistical analysis using SPSS. Descriptive statistical analysis and inferential statistical analysis identifying if relationships exist and features of the PLE and personality. Factors analysis to community. identify factors of the PLE.	Identify if relationship exists between personality school
	Free text open questions	Thematic analysis of factors students identify.	Identify students additional thoughts about the PLE.
Stage 3	Focus groups of students	Qualitative analysis using NVIVO to identify themes, to develop theory regarding students' perceptions of the PLE and factors that how it should be designed and how it makes them feel. NVIVO query analysis.	Explore student thoughts and feeling towards the PLE, affect satisfaction from the PLE. Comparison of schools through Identify additional feature of the PLE.
Stage 4	Final questionnaire developed from phase 1-3	Statistical analysis using SPSS. Descriptive statistical analysis. Inferential statistics, factor analysis, test of differences and both community and quality. relationship testing. Amos analysis for structural equation modelling to identify relationships.	Identify factors of the PLE that should be considered for individual differences in requirements. Amos provides a rigorous test of relationships.
Stage 5	Validation interviews and free text open questions	Thematic analysis using NVIVO	To validate the proposed framework
	Validation rating scale	Statistical analysis	To validate the proposed framework

### 3.6. Overview of conceptual framework of research

This section outlines the framework in which the design of this research will be assumed. The discussion of the research methodologies commenced to provide a justification for the development of the intended research design. This was then used to construct a four phase research methodology design that exercised the mixed methodology approach. The research was conducted in a sequential manner with each phase being undertaken one after another. This is to allow each piece of research to guide the following therefore, the progressing data and analysis informed the next.

When establishing the scope for this research several factors were highlighted in the literature review, the variation of individual difference explored in this research through personality traits, the quality of the PLE and developing a sense of community.



*Figure 3.10 theoretical model of design of higher education learning environments*

This research proposes to develop a framework of the design of learning space by using the constructs identified. To do this a series of research phases will be undertaken, see Table 3.3 for an overview of the justification of the chosen methodologies.

## Methodology

Table 3.3 Overview of the justification of selected methods

<b>Selected method</b>	<b>Justification for selected method</b>
Literature review	A literature review is important as it provides the scope of the research and is an important first step in the research process (Vom Brocke et al., 2009). The literature review aims to uncover the relevant sources to the studied topic, therefore is vital to the relevance and rigour of the conducted research (Vom Brocke et al., 2009). The literature review is important in this research for the development of the initial questionnaire.
Survey	The survey was chosen to explore the relationships between variables and to identify significant factors of the PLE. Surveys are good for the collection of standardised data from a large population (Saunders et al., 2012). Surveys are beneficial as they are economical, they allow simple comparison and are easy to explain and complete by the chosen population (Saunders et al., 2012). They also allow the collection of quantifiable data to explore patterns in association (Bryman, 2016). A pragmatic survey was also chosen to validate the intended frameworks, to expand the research sample.
Focus group	Focus groups were chosen to explore students' perceptions feelings and experiences of the PLE. Focus groups are useful for this exploration of concepts, experiences, attitudes or views as clarification would be less easily accomplished through surveys or other methods (Kitzinger, 1995).
Individual interviews	Interviews were chosen to validate the development of the intended frameworks to examine the effectiveness and usefulness. Interviews allow for the valid and reliable collection of data on a specific set of questions to identify the desired outcome (Saunders et al., 2012).

This research takes the form of five stages with four phases of data collection encapsulated within the research process. Figure 3.11 demonstrates the structure and components of the research project.

## Methodology

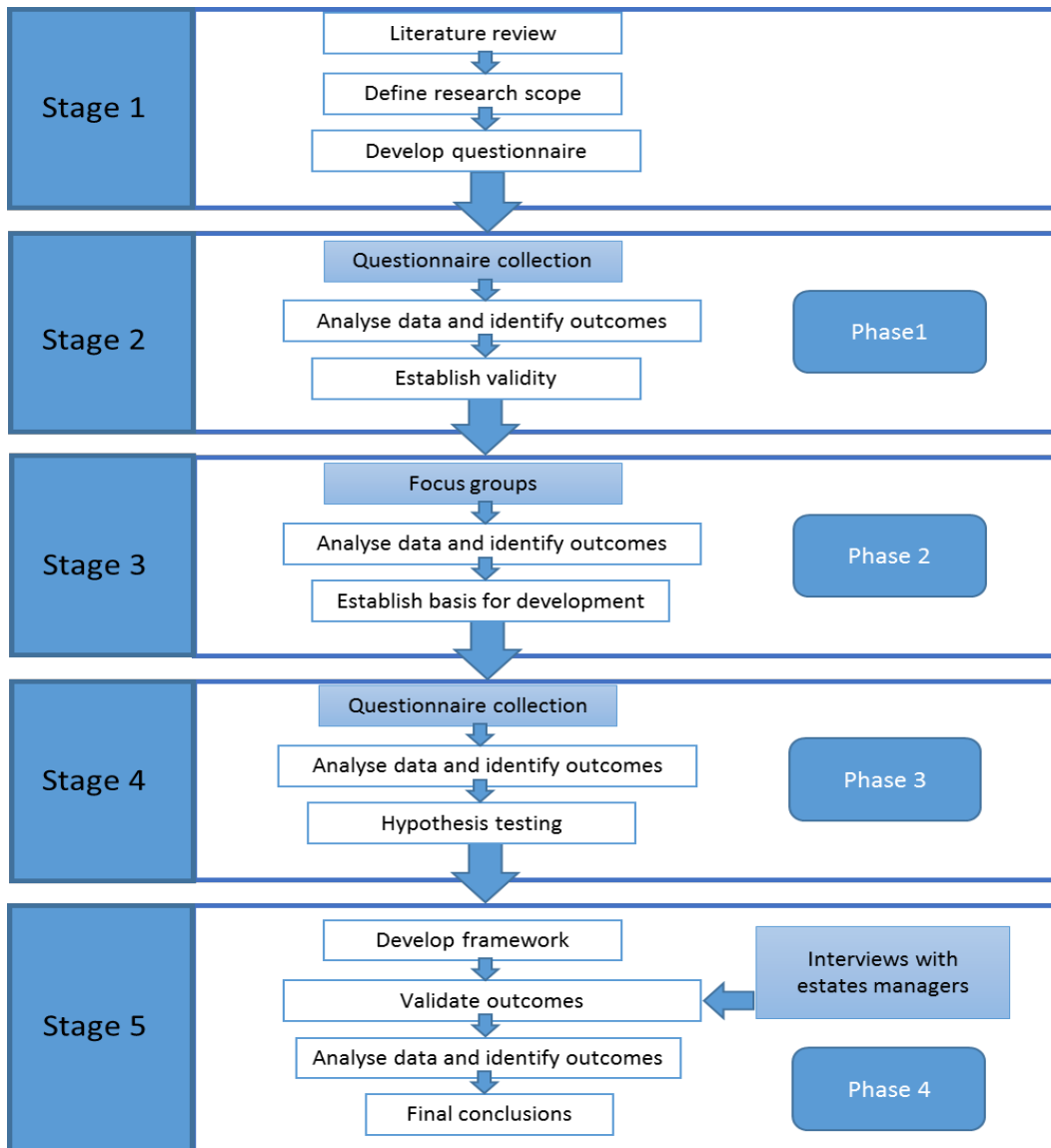


Figure 3.11 structure of research project

The current research will be broken down into three main phases of data collection with an additional fourth phase for the validation of the outcomes of the research.

The first stage of research consisted of the literature review, which defined the scope of the research and developed the first questionnaire. In phase one of data collection there was a pilot study of the developed questionnaire based around the main areas of research; personality, community and quality and how they relate to the design of the HE PLE. This phase of research was to establish the validity of the research project. Phase two consisted of focus group data collection exploring students' thoughts and feelings in regards to their PLE. This phase allowed for the establishment of features

of the PLE that students perceive as affecting their satisfaction with their PLE. Phase three data collection was the final questionnaire, this established the relationships between individual differences and how this affects preferences for features within the PLE. It also identified the features of the PLE that students regard as affecting their satisfaction.

Finally, stage five of the work was the development of the frameworks, this phase utilised the findings from phase one through three of data collection to develop the frameworks. Within this phase four of data collection was commenced which was the validation of the frameworks. The frameworks developed were then subject to discussion and validation through individual interviews and a pragmatic questionnaire with directors of estates.

### *3.6.1.1. Sampling*

At all levels of the research the sample of the research population was necessary to identify. Sampling is the method of selecting a representative body of the population with the aim of determining characteristics of the population as a whole (Emerson, 2015). Even if the research is quantitative, qualitative or mixed methodology in design some form of sampling is required (Ritchie, 2003). Although there are differences in the way they are addressed, specifically in terms of sample size and sampling approach (Creswell & Clark, 2011).

Within qualitative research Creswell and Clark (2011) note that purposive sampling is often used. This is that participants are selected intentionally as they have experiences of the central phenomenon or concept, and can therefore contribute their understanding to the research issue (Creswell & Clark, 2011). Purposive sampling does not allow the results to be generalised as it is a non-probability method therefore this non-random basis selects organisations, people, documents and departments who will help to answer the proposed research question (Bryman, 2016). This approach uses a number of sampling techniques such as (Bryman, 2016);

- Snowball sampling - the researcher makes initial contact with a small group of people who have relevant knowledge of the research issue and then uses this to make contact with subsequent participants

## Methodology

- Theoretical sampling - participants are selected due to their position to guarantee that questions are answered to the degree the research requires. The emerging theoretical consideration leads the selection of research participants, this continues until theoretical saturation is reached
- Quota sampling - participants are non-randomly sampled for the target population in terms of the relative proportions of people in different categories

On the other hand (Creswell & Clark, 2011), noted that quantitative research utilises probabilistic sampling. This is the sampling of a large body of participants who represent the target population (Creswell & Clark, 2011), with the aim to enable generalizability (Bryman, 2016). The aim of this sampling method is to avoid sampling error in which the sample is different to the target population (Bryman, 2016). Ideally the participants are chosen randomly, through a systematic procedure (Creswell & Clark, 2011). This approach also uses a number of sampling techniques;

- Simple random sampling - this is the most simple sampling technique, each unit in the target population has an equal probability of being selected
- Systematic sampling - this variation on random sampling selects individuals by using regular intervals randomly in a given target population or sample group
- Stratified random sampling - individuals are chosen from a target population that has been divided into non overlapping categories
- Cluster sampling - in an initial stage of the research clusters are selected from within the target population based on defined areas, such as location

Based on the requirements of the different methods, qualitative and quantitative research and the benefits and limitations of the approaches a sampling procedure was identified that reflected the different phases of research. The samples for each of these stages were selected to represent the population and sampling frame. To identify the sampling method for each phase the aim and the approach taken was considered. The following section contains further explanation of the sampling method chosen and the specific requirements of each.

### **3.7. Overview of research**

Students were chosen within this research to identify their specific preferences within the PLE, as they were identified as being good source of information about their own requirements. As identified within the literature review, academics and designer have aimed to develop PLEs, considering students requirements, however have failed to identify students specific requirements. Furthermore through developing the scope of this research it was identified that the University sampled, LJMU have previously aimed to use staff perceptions of students requirements to design suitable learning spaces, however have been unsuccessful with their efforts.

The study began by identifying the samples of students within the research project to identify if there were differences in preferences for features of the PLE that consequently affects their satisfaction. The intention was to identify overall factors of the PLE that should be considered in the design of the PLE and then the individual factors of the PLE that students prefer, influenced by individual differences in their personality traits. It was then important to validate the usefulness of the outcomes to evaluate the usefulness and applicability. To do these two sets of research participants were chosen:

- Phase one, two and three: students (building users)
- Phase four: Estates managers (building operators)

The case that has been chosen for this research is Liverpool John Moores University. By reviewing the design of the case study it was important that the research be representative of the HE sector, with a diverse range of students and subjects the universities allow for a representative case study to be conducted. In terms of conducting the research, it also allows for issues such as accessibility to information and access to respondents to be reduced. This is because the research can be conducted in close proximity allowing for a detailed insight of students specific requirements. Furthermore conducting the research within LJMU is advantageous as there has been historical issues with the design of the PLEs and furthermore has a large range of buildings and varying levels of suitability and cost. Additionally there is scope within the estates strategy for a huge development profile.



### 3.7.1. Data collection- phase one to three

As different PLEs have been found to affect the perceptions, satisfaction and behaviour of the students, it was important the research was conducted in many different types of buildings. Initially in phase one three schools were identified to take part within this research the School of Engineering, the School of the Built Environment and the School of Art and Design. However, in the data analysis of phase one it was noted that the School of Engineering and the School of the Built Environment were very similar in their preferences so for the next phases of research to really explore any differences it was decided to include an additional school. The business school was chosen as this helped to diversity the sample of schools.

To ensure that the research encapsulated this diverse range of buildings and the people who reside within them four buildings across Liverpool John Moores University were selected; James Parsons building (Byrom Street Campus), the John Lennon Art and Design building, Henry Cotton building and Redmond's Building. Four schools that use these buildings were chosen to represent this faculty and to enable the comparison between schools for preference factors. These schools were the Built Environment, Engineering, Art and Design and Business.

#### 3.7.1.1. *Byrom Street Campus*

The James Parsons Building (Byrom street campus) is the largest building within the LJMU site and was built in the 1960s for Liverpool Polytechnic. This building contains a variety of teaching classrooms, computer suites, laboratories and lecture halls. The building also comprises of two cafes, including one new social zone. This building houses the School of Engineering.

#### 3.7.1.2. *Art and Design Building*

The Art and Design School within LJMU was designed with the intention to meet the needs for the new school. As part of the process of design, a detailed consultation with the users was undertaken. The vision for the design was;

*“A strategy to deliver a new purpose built facility that would support a distinctive brand, an enterprise culture, and a robust academic structure.”*

(Brickwood, 2004, cited by Riley, 2013, p. 118)

## Methodology

The building has been open since 2008/09 and provides an environment spread across three floors. There is a cafe, a large glassed entrance hall, meeting rooms, a lecture hall, staff offices, workshops and display areas. This building was developed with the users of the space, both faculty and students, in mind. It contains accommodation for the School of Art and Design.

### *3.7.1.3. Henry Cotton*

This Building is a converted multi store car park, therefore changed from its original purpose. This building was opened in 1998 and is the main accommodation for the school of the Built Environment. This building contains a range of teaching rooms and labs set over four floors.

### *3.7.1.4. Redmond's Building*

The Redmond's building is a 'state of the art' building developed for the Faculties of Business and Law and the Liverpool Screen School. This building was developed as a 'gateway' for students to the Mount Pleasant campus of LJMU. The building is set out over six floors and houses several large lecture halls, IT suites and teaching and seminar rooms. This building allows integrated learning and social spaces on all floors of the building and has a named coffee shop at the entrance. The concept of the design was to create a range of spaces to allow students to stay and work within the building (ADP, 2012). This building houses the Business school.

## **3.7.2. Data collection- phase four**

Phase four data collection as seen in Figure 3.11 was the validation of the outcomes of the main research projects. This final phase of research aimed to evaluate and discuss the proposed frameworks with practitioners. The practitioners chosen to evaluate this research were from the estate management team. This was for many reasons, estates managers are the commissioners and stakeholders of building projects in HE. Estates managers were chosen in part due to their position within the organisational structure of a university (see appendix 1), they sit in a team, which report to the University executive board, however they also have the opportunity to speak to staff and students. They therefore have all the information available to them regarding the construct of the university but have more specific knowledge about the

university campus and estates, in comparison to the chancellors of a university. Their knowledge base is also important to the validation of this research. They have both the knowledge of the form of the building and the function; they have also knowledge regarding how the form of the building can influence upon the functionality of the building. Estates managers are experienced in evaluations such as POE and therefore understand the consequences of both good and bad design on satisfaction. They also have a broader understanding of all aspects of building design, such as, procedures, operators, budgeting and the institutional plan as a whole. It was additionally concluded, that the perspective of a building designer would also be useful for the evaluation of this research. Therefore, an architect, with a specialism in the design of learning spaces was sampled to participate in the research.

The data collection technique for this phase of research was chosen as face-to-face individual interviews. To gather contact details of estates managers university websites were used. Emails for participation were sent out to universities across the north west of England, to allow face-to-face interviews to be conducted. However, out of this attempt only two estates managers agreed to participate, with the addition of the interview with an architect. To ensure a wide range of people participated within the validation of this research it was decided that a pragmatic survey would also be useful for the validation. The survey was developed as a pragmatic rating scale, with the same questions as the interviews, including open questions for further comments.

### **3.7.3. Development of a framework/ model**

There are two key concepts to consider in the development of this research, Model or framework. This is will this research develop a model or a framework. A model is something that is used to represent or explain the operations and mechanism of something else (Admin, 2013, p.1) for example temperament (Evans & Rothbart, 2007). A model presents in a schematic, often simplified, form a situation or process (Verbrugge, 2016). A framework is between a method and a model (Verbrugge, 2016) it is “an organised structure of ideas, concepts and other things involved to describe the coherence and to be easily communicated to others” (Admin, 2013, p.1). It describes the general direction of the work and often based on best practices

(Verbrugge, 2016) for example how to design physical space suitable for walking and cycling (Pikora et al., 2003).

With the aim of this research to support in the development of PLEs a framework would allow for a simple guide on the best practice guidelines for the design of PLEs, according to students specific requirements. The type of framework that will be utilised for this research is a practical one, the use of such a framework outlines the practical implantation of the framework, and has been utilised in many instances (Jin et al., 2013; Springer & Evans, 2016; Clare, 2017). A practical framework allows the user to utilise the framework as a guide in the practical application of its purpose. In this case the framework of the design of HEI PLEs would allow the estates team to utilise the aspects of the framework that are most suitable to guide them in their own strategies.

### 3.7.4. Ethics

Prior to the beginning of the research, ethical approval was sought via the appropriate university Ethics board. The research successfully received Ethical approval from the Research Ethics Committee of Liverpool John Moores University.

Table 3.4 Ethical activities

Activity	Phase 1	Phase 2	Phase 3	Phase 4
Written consent		X		X
Participant information sheet	X	X	X	X
Right to withdraw	X	X	X	X
Research confidentiality	X	X	X	X
Contact details provided	X	X	X	X
Debrief of study	X	X	X	X

### **3.8. Summary**

This chapter has introduced and established the philosophy of the proposed research. The ontology of this research is objectivism, whilst the epistemology is the post-positivist stance, these make up the research philosophy of this research. The research approach of this research is the abductive approach as this allows for the identification of themes, the explanation of patterns and the developing or modifying theory. The methodology of this research is a sequential mixed methodology, as the research will use both qualitative and quantitative methods moving sequentially from each allowing each phase to inform the next. This research has also been identified as a case study design specifically a representative single holistic case as the research will take place in one university, LJMU to understand student's specific requirements aiming to be able to generalise to other university campuses. The data collection through surveys, focus groups and interview have been discussed with analysis at each phase identified and explained.

#### 4. Phase one



## 4.1. Introduction

This chapter discusses the first phase of the study, which was undertaken using the quantitative approach. This section will firstly outline and justify the chosen methodology. It will the outline the development of the survey and the method of data collection and analysis. Finally, the section will report the findings and outline how this influences the next stage of research.

Stage 1 of the research seen in Figure 4.1 was to conduct the literature review, which is shown in the Literature review chapter. From this, it was possible to define the scope of the research which has been previously discussed.

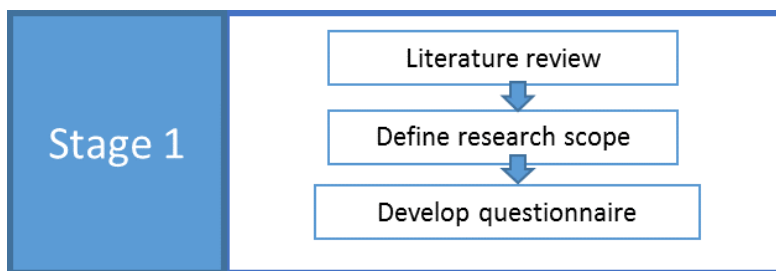


Figure 4.1 stage 1 research focus

Consequently, from defining the scope of the literature review three objectives were identified for the first phase of research;

- To identify if there are factors that students consider more important in their learning environment
- To gain insight into whether there may be differences in personality traits between students from different schools and whether a difference in personality or subject choice may affect preferences for factors in the physical learning environment
- To establish whether there are factors of the physical learning environment that could contribute to a sense of community and could define quality

To address the objective of this phase of research a questionnaire was established through an extensive literature review. The questionnaire was broken down into four sections, a personality section, a physical learning environment section, a community section and a quality section.

## Phase one

The aim of this phase was to investigate the foundations of the research, whether the research is valid and will produce sought after results. This stage of the research is essentially a pilot phase for the rest of the research to be developed and expanded from. Adopting this phase of work allowed for the validity of a currently limited area of study to be explored. It will also allow the scope of the study to be explored and refined for the main stage of the research.

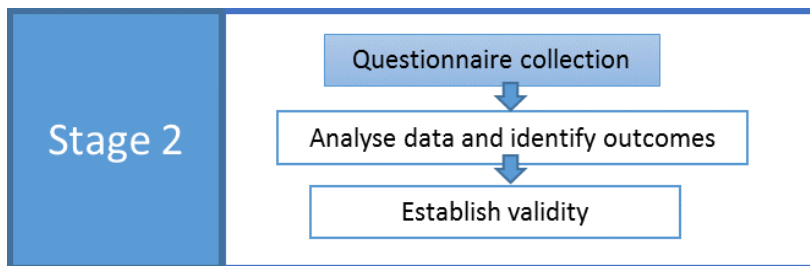


Figure 4.2 stage three phase 1 data collection

### 4.2. Research approach and design

Within this phase of the research the objective was to identify factors of the PLE that are most important to students in terms of quality and the community, and to identify if this had a relationship with personality. As a result, self-report surveys were chosen.

The first phase of the data collection utilises a quantitative method of surveys. Survey research constitutes of a cross sectional design, either by structured interviews or questionnaires on a sample of the target population (Bryman, 2016). They are collected at a single point in time with the aim of collecting quantifiable data from many variables to explore patterns in association (Bryman, 2016). Surveys can pursue factual data, actual or likely behaviour or can explore the knowledge attitudes or attributes of respondents (Hoxley, 2008). In this form, they can contain both open and closed ended questions. Open ended are useful for exploratory research where suggestions can be made from participants (Hoxley, 2008), closed ended questions contain forced responses. It has been said that the weakness of surveys is in the design, which is often not found until results are interpreted (Oppenheim, 1992); therefore, conducting a pilot study of the survey could help to diminish any weaknesses in the design. Questionnaires can be administered face to face in interview style, over the phone, by post or more commonly by email or web based



## Phase one

platform (Hoxley, 2008). Due to this questionnaires also allow for large samples to be sought at a relatively lost cost (Oppenheim, 2000).

Survey data has many advantages and although they can be time intensive for respondents (Amaratunga et al., 2002), data collection and analysis is fairly efficient (Hoxley, 2008). However, surveys are used extensively in built environment research (Amaratunga et al., 2002), and are therefore a valid form of research in the intended area. Using a questionnaire design will also allow for the investigation of the possible relationships between variables and to identify factors of the PLE. Additionally with the use of open-ended questions, further views and suggestions from students will be considered.

The use of questionnaires in research requires careful consideration of the design and pre-planning (Hoxley, 2008). When constructing the survey several steps were taken to develop a suitable survey (Oppenheim, 2000, p.101) and five main considerations have been suggested;

- The type of data collection instruments - postal, web based etc.
- The method of approach to respondents - length, duration, anonymity and ethics
- The developments of question sequences - ordering of scales and questions within a general framework
- The order of the questions
- The type of question - closed ended, open-ended etc.

With consideration of the above guidelines for the construction of the questionnaire, the development of the tool was commenced.

### **4.2.1. Type of data collection instrument**

The development of a questionnaire first relies on the type of questionnaire. The choice between the types of questionnaire can be seen below in Table 4.1.

## Phase one

Table 4.1 Types of questionnaire adapted from (Saunders et al., 2012)

Self-completed	Interviewer completed
Web-based questionnaire Postal questionnaire Delivery and collection questionnaire	Telephone questionnaire Structured interview

To choose which questionnaire would be suitable it was first important to consider the following (Saunders et al., 2012);

- Number of questions
- Types of questions
- Sample size
- Importance of respondents' answers not being distorted
- Importance of reaching particular respondents
- Characteristics of respondents

By reviewing each of the attributes of the questionnaire type a web based questionnaire was chosen due to the sample of a student population. This was chosen for the following reasons;

- Students are a population of computer literates
- Sample size can be large and confidence can be placed in the sample sought
- The choice of proposed questions (simple closed and open ended questions) suits this question type
- Low likelihood of respondents answering being distorted by peers

(Saunders et al., 2012)

### 4.2.2. The method of approach

Prior to beginning, the research ethical approval was sought and granted. Within this phase of research a participant information sheet and consent form were used along with a debrief for the end of the research (see appendix 2). The use of a web-based questionnaire allows for confidentiality of the respondents, they will also be given the right to withdraw at any phase of the research by either dropping out of the survey or by emailing the research to withdraw their completed response.

## Phase one

### *The development of the questionnaire, the order of questions and question type*

Firstly, the aims of the questionnaire were identified. The main aim of this survey was to investigate personality traits therefore a personality questionnaire was chosen. Through the literature review, several factors were identified that should be considered when designing HE learning environments. The second aim of the questionnaire was to identify factors of the learning environment that students may rate as important. The third aim was to identify factors of the design that students may regard as quality. In addition, the final aim of the survey was to identify factors of the environment design that could develop and support a sense of community. For this research it was important to understand the features of the PLE that students regard as being important in their satisfaction with the PLE, quality and community. As the literature does not currently identify what these are, surveys needed to be developed to explore the requirements of the environment. Elements that have been identified through current literature, however require bringing together to form one framework. These aims function as the framework for which the questions will be constructed to ensure that the essential data is collected (Saunders et al., 2012). Therefore, the next stage of the survey development was undertaken.

#### **4.2.3. Development of questionnaire**

When developing the questions in a survey it is important to understand the principle of designing effective questionnaires. The five principles that Easterby-Smith et al. (2012, p. 239), note as important considerations are;

- Each item should express only one idea
- Avoid jargon and colloquialisms
- Use simple expressions
- Avoid the use of negatives
- Avoid leading questions
- Avoid cultural nuances

In addition to considering the questions that are asked it is also important to consider how the respondent will answer each question. To do this consideration of the types

## Phase one

of data variable is central. There are three types of data variable (Saunders et al., 2012):

- Opinion variable - how the respondents feel about something
- Behavioural variable - what people did or will do
- Attribute variable - what the respondent possesses in terms of the characteristics

The types of data that are required from this research set out from the aims of this research are as shown in Table 4.2.

*Table 4.2 Data variable for this research*

Question type	Data variable
Personality	Behavioural
Learning environment	Opinion
Community	Opinion
Quality	Opinion

These data variables then need a measurement scale to record the responses (Easterby-Smith et al., 2012). The following describe the type of measurement that can be applied to closed questioning types.

- Ratio scale - has a true zero (height)
- Interval scale - not true zero (temperature)
- Nominal scale - no natural ordering (ethnic origin)
- Ordinal scale - natural ordering (socio-economic status)
- Likert scale - has a natural midpoint allowing for individuals to have no opinion (used for measurement of opinion and attitudes)

(Easterby-Smith et al., 2012).

As this research aims to identify students' preferences of features within the PLE, a Likert scale was chosen to enable students to express their opinion about the importance of individual features of the PLE.

### *4.2.3.1. Reliability and validity*

When developing the questionnaire it is also important to consider the reliability and validity of the data to be collected.

## Phase one

Reliability is 'the consistency of a measure of a concept' (Bryman, 2016. p. 157). Therefore the reliability of the questionnaire concerns itself with how robust the questionnaire is and whether it will produce consistent findings at different time points and in different conditions (Saunders et al., 2012). There are three ways of assessing reliability in questionnaires (Saunders et al., 2012):

- Test retest - this checks that there is stability of the questions over time
- Internal consistency - this checks for internal reliability, that all of the components of a multiple measure, measure the same thing and Cronbach's alpha is commonly used (Bryman, 2016)
- alternative form - these are checking questions that are asked in a different way within the questionnaire to check for the same response, however this is rarely used

Validity is concerned with whether the indicator actually measures the intended concept (Bryman, 2016). Four important aspects of validity highlighted by Saunders et al. (2012):

- Internal validity - the questionnaire's ability to measure the intended concept
- Content validity - the ability of the questionnaire to cover the required investigative areas
- Criterion validity - the ability of the questions to make accurate predictions
- Construct validity - the extent the questions measure the presence of the intended concepts

However in much research it is considered that face validity is an additional way of testing validity (Bryman, 2016). Face validity is established by asking other people if the measure is exploring the concept that it intends to, and most certainly asking those with knowledge and experience in the field (Bryman, 2016). Therefore, for this research face validity was employed by the researcher asking the supervisors for their expert opinion on the validity of the questionnaire.

#### **4.2.4. Research tools**

There is a large body of literature as has been identified in the literature review that identified factors of the environment that are important to consider in the design process of building, from educational to residential structures (Rivlin & Weinstein, 1984; Heaven & Goulding, 2002; Evans & Wener, 2007; Winterbottom & Wilkins, 2009). Therefore, it was important to review this literature to identify the appropriate sections and research for the proposed research objectives.

##### *4.2.4.1. Learning environment*

To expand on current findings demonstrated in the literature review by identifying factors that students most prefer in their PLEs and to explore the relationship between feature of the PLE and personality, a questionnaire section was constructed. To do this an extensive review of current understanding in the field of building design was undertaken. This review explored all facets of built environment design from urban developments (Lindal & Hartig, 2013) to residential and community works (Kasarda & Janowitz, 1974), into the environment of hospitals (Mourshed & Zhao, 2012), offices (Yildirim et al., 2007) and business, (Hidayetoglu et al., 2012). This questionnaire was developed around three features of the environment that were modified from the design quality indicator (Gann et al., 2003); functionality, build and environment. By doing this, elements of the environment were identified that students possibly find important in the PLEs. The research used for the development of the research is displayed in the table below (Table 4.3).

## Phase one

*Table 4.3 Development of questionnaire- learning environments*

<b>Questionnaire item</b>	<b>Reference</b>
Formal learning spaces	(Thomas, 2010; Brooks, 2011)
Informal learning spaces	(Thomas, 2010)
Lecture halls	(Thomas, 2010)
Specialist teaching rooms (e.g. labs)	(Thomas, 2010)
Access to libraries	(Bryant et al., 2009)
Access to suitable and clean toilets	(Durán-Narucki, 2008)
Open social areas	(Damerest, 2004; Beichner, 2008)
Private social areas	(Augustin, 2009)
Access to refreshments	(JISC, 2006)
Spaciousness to avoid overcrowding	(Evans & Wener, 2007; Yildirim et al., 2007)
Room layout allowing for easy visibility of teacher	(Montello, 1988)
Layout of room allowing for both group and independent learning	(Harrop & Turpin, 2013)
Ability to adjust furniture to meet your needs	(Thomas, 2010; Holm, 2011; Harrop & Turpin, 2013)
Clear signs in buildings	(Ford & Torok, 2008)
Colour and textures of flooring furniture and surface finishes	(Hawkins & Lilley, 1998)
Motivating environment e.g. Bright colours	(Reiss, 2004; Ford & Torok, 2008)
Creating a natural environment	(Berman et al., 2008)
Comfortable furniture	(Hawkins & Lilley, 1998)
View out of windows	(Aries et al., 2010)
Up to date technology	(Lomas & Oblinger, 2006; Radcliffe et al., 2008)
Access to technology (e.g. plugs, computers etc.)	(JISC, 2006; Sutherland & Fischer, 2014)
Control of environmental factors e.g. Noise, lighting	(Gurung, 2005; Winterbottom & Wilkins, 2009)
Comfortable temperature	(Douglas & Gifford, 2001)
Natural lighting	(Winterbottom & Wilkins, 2009; Shemirani et al., 2011)

The question that was asked for this section was 'how important are the following to you in your University Learning Environment? Score how important the following are in your university environment?' It was decided that to answer the questions a five point Likert scale would be used as this would allow students rate the importance of each feature to identify the most important feature, but to also identify features that are not that important. The rating scale was 1- unimportant to 5 very important.

An open question was also included in this section which asked, 'what are your priorities for University learning spaces?'. This inclusion of the open question allowed for students' suggestions additional to the current knowledge found through the literature review thereby allowing the research to identify if there are further features

## Phase one

that students regard as being important in their learning environment, over and above the current knowledge of the literature.

### 4.2.4.2. Community

To identify features in the PLE that students feel are important in improving their sense of community a questionnaire for this section was constructed. Literature was reviewed regarding psychological sense of community, including literature on place attachment and sense of belonging. Although there is little investigation into specific factors of the built environment that can enhance this sense of community some initial features were identified as shown below in Table 4.4.

Table 4.4 Development of questionnaire- community features

Questionnaire item	Reference
Welcoming environment	(Francis et al., 2012)
Plenty of social space on campus for both studying and socialising	(Moghisi et al., 2015)
Group workspace	(Tinto, 1998; Temple, 2008)
Feeling part of the school you are from	(Tupper et al., 2008; Rollero & De Piccoli, 2010)
Inside space to socialise	(Damerest, 2004)
Outside space to socialise	(Damerest, 2004)
A hub where students from your school can go to work or socialise	(Williams & Roggenbuck, 1989; Moghisi et al., 2015)
Feeling part of the whole university	(McMillan & Chavis, 1986; Lund, 2002; Chen & Chiou, 2014)
Don't have to travel far from home building to sessions	(Grellier, 2013)
Clear signs to define space on campus	(Cross, 2007)
Variety of social spaces	(Rullman & Van den Kieboom, 2012; Moghisi et al., 2015)
A clearly named home building for your school	(Grellier, 2013)

The question chosen for this section was 'part of being in University is being able to identify with the university you are in and feeling that sense of community, how important are the following factors in building a feeling of community in your university?' It was decided that to answer the questions a five point Likert scale would be used as this would allow students to rate the importance of each feature to identify the most important feature, but also to identify features that are not that important. The rating scale was 1- unimportant to 5 very important.

An open question was also included in this section which was, 'using the ideas above, in a couple of sentences, explain how the design of the university buildings could boost your feeling of identity and your sense of community?' This question was asked to



## Phase one

allow students to explore their feeling towards the PLE and how and if they thought it could develop a sense of community. It also allowed students to make suggestions about additional features not identified through the literature review that could be used in the PLE to increase their sense of community.

### *4.2.4.3. Quality*

To begin the investigation to outline a definition of quality another section of the questionnaire was constructed. The literature reviewing already developed definitions of quality such as SERVQUAL and TQM were reviewed, additionally research that has explored factors, such as, indoor environmental quality were examined to develop a framework for this questionnaire. The features were identified by examining the literature regarding current understanding in designing space for students and how this influences behaviour and cross-examining this with understanding of quality literature. Initial features of the PLE that were identified in the literature, used to develop the questionnaire, are show in Table 4.5.

The question that was chosen for this section was, 'what do you think quality is? If you were thinking about features of your University building that impact your decision on the quality, which factors are most important?'. It was decided that to answer the questions a five point Likert scale would be used as this would allow students to rate the importance of each feature to identify the most important feature, but to also identify features that are not that important. The rating scale was 1- unimportant to 5 very important.

## Phase one

*Table 4.5 Development of questionnaire- quality features*

<b>Questionnaire item</b>	<b>Reference</b>
Up to date technology	(Radcliffe et al., 2008; Temple, 2008)
Access to resources	(Temple, 2008)
Access to building	(Heaven & Goulding, 2002)
Cleanliness of buildings	(Gann et al., 2003)
Comfortable temperature	(Douglas & Gifford, 2001; Haverinen-Shaughnessy et al., 2015)
Fresh air	(Haverinen-Shaughnessy et al., 2015)
Control of environmental conditions	(Gann et al., 2003)
Plenty of suitable learning spaces	(Chism, 2006)
General maintenance	(Gann et al., 2003)
Natural lighting	(Gann et al., 2003; Shemirani et al., 2011)
Refreshment facilities	(JISC, 2006)
Comfort of seating	(Hawkins & Lilley, 1998; Damerest, 2004)
Open space to avoid overcrowding	(JISC, 2006)
Well-designed space	(Bennett, 2007)
Adaptable learning space to suit lessons	(Evans & McCoy, 1998)
Noise	(Gurung, 2005)
Easy to find your way around	(Bennett, 2007)
Environmentally friendly	(LaFee, 2008)
Adaptable space to changing needs	(Evans & McCoy, 1998)
Durability	(Gann et al., 2003; Durán-Narucki, 2008)
Clearly defined space	(Bennett, 2007)
Plenty of social space always available	(Matthews et al., 2011)
Outside space	(Evans & McCoy, 1998)
Spacious halls and entrances	(Evans & McCoy, 1998)
Local space around campus	(Ozdemir & Yilmaz, 2008; Beute & de Kort, 2014)
Plenty of social areas	(Bennett, 2007)
Simple layout	(Evans & McCoy, 1998)
View	(Evans & McCoy, 1998; Aries et al., 2010)
Up to date aesthetics	(Wong et al., 1992; Hawkins & Lilley, 1998)
Spacious entrance hall	(JISC, 2006)
Finish of flooring and surfaces	(Gann et al., 2003; Durán-Narucki, 2008)
Decor	(Bluyssen et al., 2011)
Colour schemes	(Hawkins & Lilley, 1998)

An open question was also included in this section, which was, ‘in the space below describe a quality university environment’. This question was included to allow students to suggest additional features of the PLE, not identified through the literature review that they regard as a feature that means quality to them. Also, to disregard any features identified in the questionnaire that were considered through the literature review to be important. This was done to allow an investigation into the student’s actual definition of the PLE as opposed to practitioners’ interpretations.

#### *4.2.4.4. Personality*

As has been identified in the literature review there are many valid personality theories and measures. The one identified through the interview as being best for this form of research is the Big Five measure of personality, and the specific measure chosen was the Five Factor Model (FFM) (Goldberg et al., 2006). This survey is constructed of statements about oneself which measure using a five point Likert scale scored from very inaccurate to very accurate. Statements such as, 'I start conversations', 'I am interested in people' and 'I follow a schedule'. The statements reflect the FFM of personality measuring the traits, openness, conscientiousness, extraversion, agreeableness and neuroticism.

This section of the questionnaire was important as it allowed the measurement of the personality profiles of the students from different school to identify if there are any significant differences between schools. It also allowed the investigation of relationships between features of the PLE and personality.

#### *4.2.4.5. Bio demographics*

A section of the questionnaire was developed to identify the students' bio demographics; this is to explore the attributes of the respondents. These were chosen to identify if these factors may also be influential in student preference in the PLE. The questions chosen were

- Age
- Year of study
- Gender
- School
- Studies course
- Projected grade
- University groups
- Growing up in an area with a strong sense of community
- Sense of community in the university

## Phase one

### *4.2.4.6. Sampling strategy- phase one*

To collect a diverse population to investigate students' perceptions of the PLE, students from three schools were originally sampled for this survey. The sample method chosen for this phase of data collection was stratified random sampling. The students were selected because they reside in different buildings within the University as discussed previously. For this phase of research three schools were originally chosen as these were assessed to have a diverse range in subject types to allow for large samples to be recruited from each school. Students from the schools of engineering, built environment and art and design. This phase of the research obtained a sample of 140 participants through an online survey.

The students were sampled using a stratified random sampling technique and a link to the questionnaire was sent out to all students within the school by lecturers and tutors.

### *4.2.4.7. Online survey*

The method of data collection from the questionnaire was an online survey tool, Qualtrics. The method of collecting survey data through web based platforms is a widely recognised approach (Hoxley, 2008). Online surveys have been found to have many advantages over other data collection techniques (Evans & Mathur, 2005). Advantages include attributes such as convenience, flexibility, question diversity, speed, ease of analysis, controlled sampling, ease of obtaining respondents (Evans & Mathur, 2005). Therefore, online surveys can be a good source for sampling and collection of data. There are weaknesses to the use of online surveys however, such as, low response rate, unclear answering instructions, technology variations, and skewed attributes of respondents (Evans & Mathur, 2005). However, there are techniques that can be used to overcome these, to achieve a good response with a good population variation, having a specific emailing list is important. For this research emailing lists of students in each school were selected. Also using a simple structure in the online survey allows for the simple completion by respondents. Also as noted students are computer literate and are working in what has become part of their natural habit.

#### **4.2.5. Pilot testing of the questionnaire**

Prior to conducting the questionnaire research, a pilot test was conducted. Conducting a pilot test is important as it allows refinement of the questionnaire, if required, to ensure respondents will have no issues completing the questionnaire (Saunders et al., 2012). First of all the questionnaire was reviewed by an expert, the researcher's supervisor, to comment on the items (Saunders et al., 2012). Secondly, the questionnaire was handed out to a small sample for a 'trial run' (Saunders et al., 2012). A question was included at the end of the questionnaire for respondents to provide feedback:

*"Thank you for completing the survey. Could you let me know how long it took you to complete the survey? If you have any other feedback for me it would be greatly appreciated if you could leave it below."*

The respondents estimated that the completion time was about 20 minutes, therefore this was useful to inform the respondent sample of the time it would take to complete the questionnaire. There were also additional topics that were suggested for inclusion on the questionnaire; however, these were reviewed and deemed to be out of the scope of this research project.

#### **4.3. Analysis and discussion of data**

Quantitative data in their unanalysed form provide very little meaning, therefore it is important to undertake data analysis (Saunders et al., 2012). First of all consideration of the data form is required, for example the number of cases, the scales, the impact of the coding and the checking of data errors, e.g. missing cases (Saunders et al., 2012). Therefore, the data were reviewed, missing cases removed and missing data analysis conducted when required.

##### **4.3.1. Learning Environments**

The Learning Environments section of the questionnaire was analysed. Firstly, factors of the environment that were rated most important were identified. Analysis was then conducted to identify if preferences for factors in the learning environment differed

## Phase one

between the three schools sampled. The table below outlines the descriptive statistics for the survey.

### 4.3.1.1. Descriptive statistics- preferences of Learning Environments

*Table 4.6 Descriptive statistics Learning Environments preferences*

<b>Learning environment factors</b>	<b>Mean</b>	<b>SD</b>
Access to technology	4.65	0.71
Access to suitable clean toilets	4.61	0.65
Up to date technology	4.61	0.72
Access to libraries	4.44	0.89
Spaciousness to avoid overcrowding	4.40	0.82
Comfortable temperature	4.38	0.78
Natural lighting	4.31	0.85
Room layout allowing for easy visibility of teacher	4.21	0.93
Specialist teaching rooms	4.21	0.95
Comfortable furniture	4.21	0.80
Access to refreshments	4.19	0.85
Control of environmental conditions	4.19	0.98
Clear signs in building	4.07	0.94
Layout of room allowing for both group and independent learning	4.05	0.92
Informal learning spaces	3.95	0.92
Ability to adjust furniture to meet your needs	3.84	1.03
Lecture halls	3.83	1.07
Creating a natural environment	3.81	1.12
Open social areas	3.81	1.07
Formal learning spaces	3.76	0.99
View out of window	3.63	1.24
Private social areas	3.57	1.18
Motivating environment	3.26	1.17
Colour and textures of flooring, furniture and surface finishes	3.12	1.20

*Table 4.7 Likert scale scoring*

Unimportant	Of little importance	Moderately important	Important	Very Important
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

Table 4.6 presents the descriptive statistics for all the students surveyed and their preferences for their Learning Environments. Generally there is a low standard deviation (SD), however, the standard deviation increases as the preference decreases suggesting that there is more consensus in importance for the item at the top of the list, whereas this consensus drops and there is more variation around the mean for items lower down on the list of importance (range= 0.65-1.24). From the table items such as ‘access to technology’ (m=4.65) and ‘Access to suitable clean toilets’

## Phase one

( $m=4.61$ ) seem to be overall the most important factors in preferences in how learning environments are designed and built. The factors 'Motivating environment' ( $m= 3.26$ ) and 'colour and textures of flooring, furniture and surface finishes' ( $m=3.12$ ) appear at the bottom of the list, therefore suggesting that these factors are not that important when understanding the preferences of students to their Learning Environments. The frequency of the importance is discussed below.

*Table 4.8 Frequency of descriptive statistics for Learning Environments*

<b>Feature of the PLE</b>	<b>Unimportant</b>	<b>Of little importance</b>	<b>Moderately important</b>	<b>Important</b>	<b>Very important</b>
Formal learning spaces	3	14	29	62	32
Informal learning spaces	3	8	21	69	39
Lecture halls	6	10	28	54	42
Specialist teaching rooms (e.g. labs)	3	6	15	50	66
Access to libraries	2	5	11	34	88
Access to suitable and clean toilets	0	1	10	31	98
Open social areas	6	11	26	58	39
Private social areas	7	22	31	44	36
Access to refreshments	1	5	18	58	58
Spaciousness to avoid overcrowding	2	3	9	49	77
Room layout allowing for easy visibility of teacher	1	9	15	49	66
Layout of room allowing for both group and independent learning	2	8	19	63	48
Ability to adjust furniture to meet your needs	5	8	33	52	42
Clear signs in buildings	3	7	18	61	51
Colour and textures of flooring furniture and surface finishes	13	33	38	36	20
Motivating environment e.g. Bright colours	12	23	44	38	23
Creating a natural environment e.g. Plants, plenty of windows	6	14	25	50	45
Comfortable furniture	1	5	12	67	55
View out of windows	12	13	31	43	41
Up to date technology	0	4	7	29	100
Access to technology (e.g. plugs, computers etc.)	2	2	1	33	102
Control of environmental factors e.g. Noise, lighting	2	8	20	42	68
Comfortable temperature	1	2	14	49	74
Natural lighting	2	2	17	48	71

Table 4.8 depicts the frequency of scores given to each item on the Preferences of Learning Environments questionnaire on the scale Unimportant to Very Important. Within this analysis, features of the PLE were identified over all the three schools.

## Phase one

From the table it can be seen that factors 1, Access to technology (n=102), 2, up to date technology (n=100) and 3, access to suitable clean toilets (n=98) were the top items to be rated very important.

Analysis was then conducted on the preferences of the three schools sampled; Built Environment, Engineering and Art, and Design. From this analysis, several items were seen to have a divergence in rating of importance, between the three schools. Analysis was conducted on the preference for factors in Learning Environments for the three schools sampled. This was to identify if there were differing preferences for the three schools Engineering (E,) Built Environment (BUE) and Art and Design (A&D).

### *4.3.1.2. Foremost preferences for the three different schools*

Further analysis was conducted to evaluate the top preferences in the learning environments. The top ten items were chosen to identify what preferences were foremost in importance and if there was a difference in these top factors. The highlighted sections are the factors that appeared in the top 10 for the students from each of the schools.

Table 4.9 displays the spread of the top 10 preferences for each school. From the table 6 items are in the top 10 of all three schools, 'Access to libraries', 'Access to suitable clean toilets', 'Spaciousness to avoid overcrowding', 'Up to date technology', 'Comfortable temperature' and 'Access to technology'. There are however items that only appear in the top 10 on one school for example in Art & Design the 'layout of the room allowing for both group and independent learning', the 'Ability to adjust furniture to meet your needs and 'Control of environmental factors'. In addition, for Engineering 'Access to refreshments is in the top 10 for them but not the other schools. From this table we can understand that although there is a consensus on some of the preferences there are differences in requirements for different schools. Specifically you can see that although students from the school of the Built Environment and the school of Engineering are very similar in their preferences for factors in the learning environment. It can be seen that students from Art and Design differ a lot from the other two schools.



## Phase one

Table 4.9 Top 10 means for Art & design, Built Environment and Engineering

	Art and design	Built Environment	Engineering
Features of the PLE	Mean	Mean	Mean
Formal learning spaces	3.64	3.92	3.73
Informal learning spaces	4.15	3.71	3.94
Lecture halls	3.58	4.06	3.94
Specialist teaching rooms (e.g. labs)	4.15	4.10	4.48
Access to libraries	4.54	4.35	4.36
Access to suitable and clean toilets	4.75	4.48	4.58
Open social areas	3.98	3.77	3.55
Private social areas	3.58	3.56	3.58
Access to refreshments	4.32	4.00	4.24
Spaciousness to avoid overcrowding	4.59	4.21	4.33
Room layout allowing for easy visibility of teacher	4.15	4.15	4.42
Layout of room allowing for both group and independent learning	4.32	3.85	3.85
Ability to adjust furniture to meet your needs	4.34	3.35	3.67
Clear signs in buildings	4.17	4.06	3.91
Colour and textures of flooring furniture and surface finishes	3.41	3.04	2.73
Motivating environment e.g. Bright colours	3.47	3.21	2.97
Creating a natural environment e.g. Plants, plenty of windows	4.07	3.73	3.48
Comfortable furniture	4.25	4.10	4.30
View out of windows	4.14	3.27	3.24
Up to date technology	4.69	4.33	4.85
Access to technology (e.g. plugs, computers etc.)	4.73	4.42	4.85
Control of environmental factors e.g. Noise, lighting	4.34	4.06	4.09
Comfortable temperature	4.46	4.27	4.39
Natural lighting	4.56	4.19	4.06

There were several factors that appeared, through data analysis to differ between the three schools. Below are factors of the environment that showed a large proportion of variation between one and more of the schools.

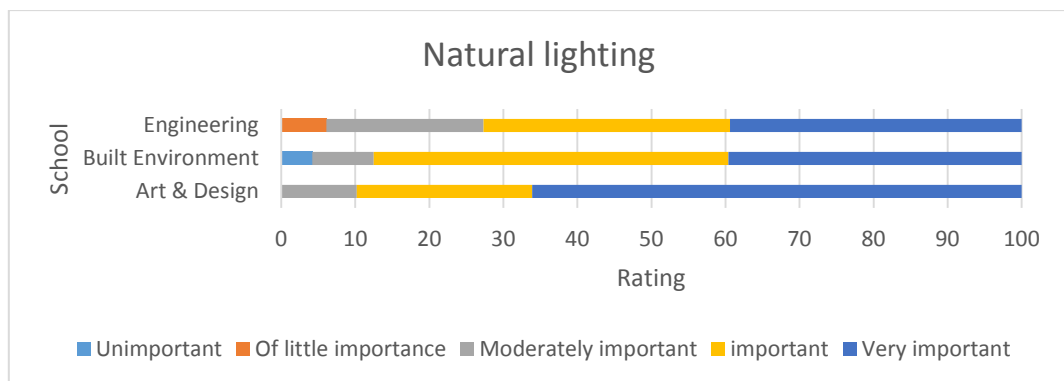


Figure 4.3 natural lighting

## Phase one

Figure 4.3 portrays the frequency of scores from the three schools and their preference for Natural lighting. This research will use Important and Very important (yellow and blue bars on figure) to be understood as the score that rates a factor as an important preference. From this it can be seen that Engineering (72.7%) scores much lower than Built Environment (87.5%) and Art & Design students (89.8%) on their preference for natural lighting, suggesting that they do not find this factor as important in their university learning environments.

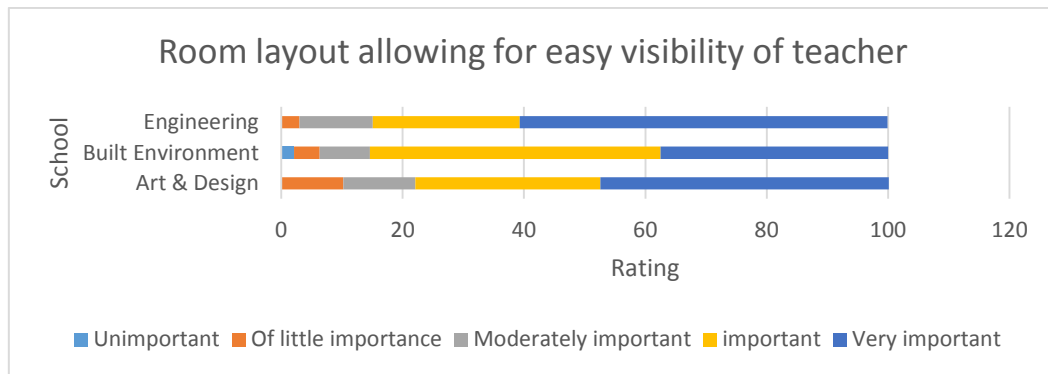


Figure 4.4 Room layout allowing for easy visibility of teacher

Figure 4.4 displays the preferences for the design of the room layout to allow for easy visibility of the teacher, it shows that Engineering (84.8%) and Built Environment (85.4%) students score very similarly on their preference however, Art & Design (78%) students rate this lower, therefore indicating that they do not find this as important when designing their learning environments.

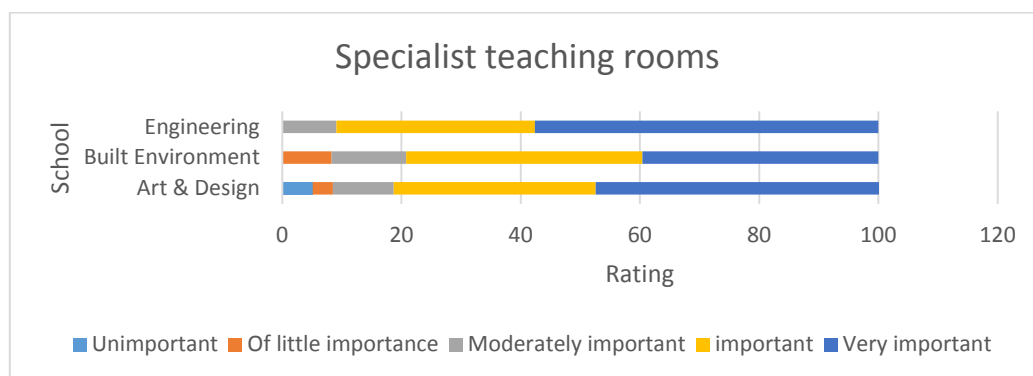


Figure 4.5 Specialist teaching rooms

Figure 4.5 depicts the preference for specialist teaching rooms. It can be seen that Engineering (90.9%) students rate this far higher in importance than Built Environment

## Phase one

(79.2%) and Art & Design (81.4%) students, suggesting that this is greatly important to engineering students.

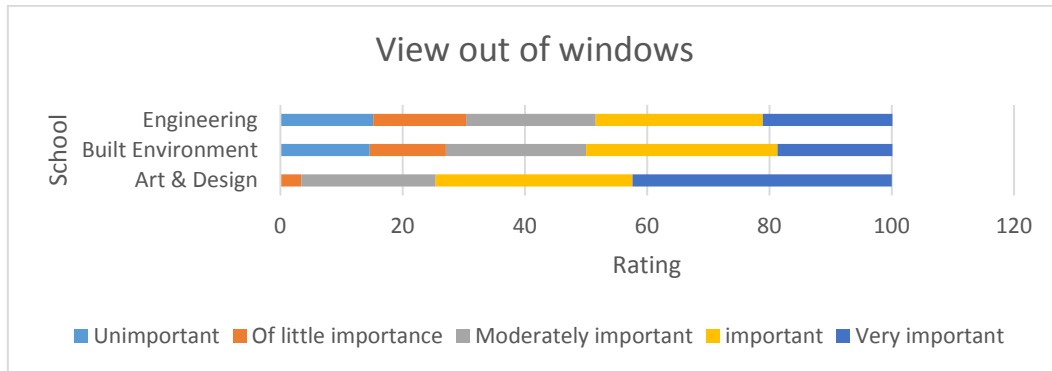


Figure 4.6 View out of windows

Figure 4.6 portrays the importance of the view out of windows, it can be seen that this factor varies significantly, students from Engineering (48.5%) and built environment (50.1%) rate this preference fairly low in importance, however, Art & Design (74.6%) students rate this factor as important.

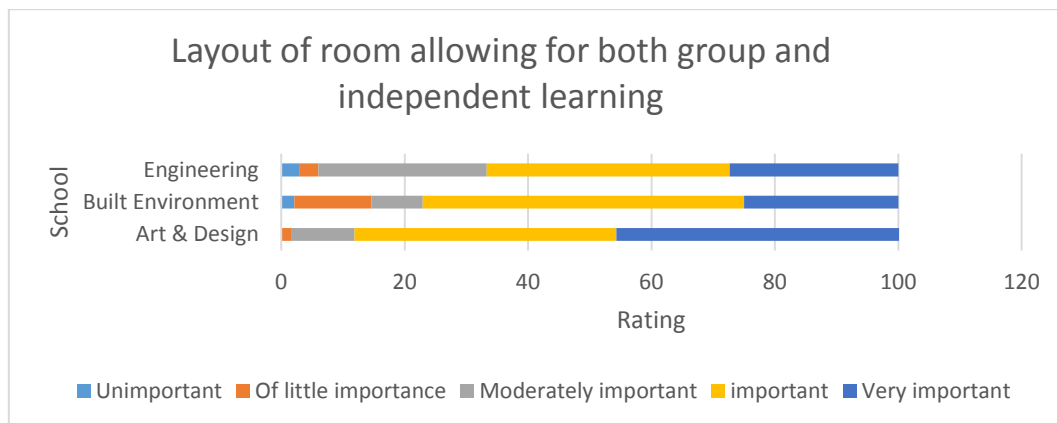


Figure 4.7 Layout of room allowing for both group and independent learning

Figure 4.7 depicts this preference for a layout of rooms to allow for both group and independent learning. It can be seen that there is some variance in importance for this factor. Students from Art & Design rate this most important (88.2%), Built Environment students rate this second (77.1%) and Engineering students score this least important (66.7%). This suggests that students from Art & Design find this factor most important out of the three schools in their preference for their learning environment.

## Phase one

From these results, it can be seen that there is a difference in preferences for several factors of the building environment between the three schools. This suggests that students from different subjects may prefer different things in their learning environments. Furthermore, this suggests that students from different schools require different things in their learning environment, therefore this must be taken into consideration when developing a framework of space design for students in difference schools.

### *4.3.1.3. Statistical differences in preferences for factors of learning environments*

A Kruskal-Wallis analysis was conducted on the variables, the three schools and the items on the Learning Environments questionnaire. Statistical differences were found between the schools on several items of the questionnaire. The table below (Table 4.10) demonstrates the feature of the PLE and the school where the difference in preference was found.

*Table 4.10 Statistical differences in preferences for features of the PLE*

Feature of the PLE	Difference found between schools	
layout of room allowing for both group and independent learning	Engineering (m=3.85) Art & Design (m= 4.32)*	Built Environment (m=3.85) Art & Design (m= 4.32)*
Ability to adjust furniture to meet your needs	Built Environment (m=3.35) Art & Design (m=4.34)***	Engineering (m=3.67) Art & Design (m=4.34)*
Colour and textures of flooring furniture and surface finishes	Engineering (m=2.73) Art & Design (m=3.41)*	
View out of windows	Engineering (m=3.24) Art & Design (m=4.14)**	Built Environment (m=3.27) Art & Design (m=4.14)**
Up to date technology	Built Environment (m=4.33) Art & Design (m=4.69)**	Built Environment (m=4.33) Engineering (m=4.85)**
Access to technology	Built Environment (m=4.42) Engineering (m=4.85)*	
Natural lighting	Engineering (m=4.06)* Art & Design (m=4.56)	

Significance level= \*P<0.05, \*\* P<0.01, \*\*\* p<0.001.

From this table, for example, it can be seen that Art & Design students prefer natural lighting to engineering students. Overall, it can be seen that students from different schools within the University do have some differing preferences in terms of their learning environments. Therefore, this research supports the idea that there will be a difference in preferences between schools.

#### 4.3.1.4. Descriptive statistics for subsections of the Learning Environment Questionnaire

The items on the preferences in learning environments questionnaire were then split into three subsections, Functionality, Build, and Environment. These subsections were recognised as large factors in the environment through the literature review that could be used to identify preferences in the Learning Environments. The subsection build includes factors such as, lecture halls and specialist teaching rooms. Functionality includes factors such as, ability to adjust furniture to meet your needs. In addition, Environment includes more traditional factors such as, temperature.

Table 4.11 Descriptive statistics- learning environments and schools

Learning environment subsections in descending order	School	Mean	SD
	Art & Design		
Functionality		35.32	3.82
Environment		32.69	4.86
Build		32.37	3.96
	Built Environment		
Functionality		32.38	6.47
Build		31.96	6.50
Environment		29.88	5.88
	Engineering		
Functionality		34.12	4.61
Build		32.15	7.44
Environment		29.27	5.89

Table 4.11 displays the preference for factors of functionality in learning environments. The midpoint of each other factor is 20 with a top score of 40, therefore it can be observed that all of the factors which have a mean over the midpoint therefore can be interpreted as being important factors in Learning Environments. Overall functionality is highest ( $m=34.03$ ), Build is second ( $m=32.18$ ) and the Environment is third ( $m=30.92$ ). However, it can be seen that for both Built Environment students and Engineering students this trend is followed, but for Art and Design students this is different. Students from the school of Art and Design rate functionality ( $m=35.32$ ) as the most important factor, however factors of the Environment (32.69) are second and factors of the Build ( $m=32.37$ ) are third. This therefore suggests that there may be a difference in preferences for the design of university learning environments.

## Phase one

A Kruskal-Wallis test was conducted on the data from the schools and the three sub sections of the learning environments questionnaire. It was found that preferences for the learning environment were significantly affected by the school that students come from. The distribution for preferences of functionality in a learning environment differed significantly ( $H(2)=8.01$ ,  $p=0.02$ ) and preferences for environmental factors differed across schools ( $H(2)=8.99$ ,  $p=0.01$ ). There was no significant difference in preferences for building factors ( $H=0.07$ ,  $p=0.97$ ).

Pairwise comparisons, conducted on preferences for factors of functionality, with adjusted p values revealed that there was no significant difference between BUE students and E students ( $p=0.68$ ) or E and A&D students ( $p=0.62$ ) But there was a significant difference in BUE and A&D students preference to factors of functionality ( $p=0.01$ ). Pairwise comparisons also revealed that for environmental factors there was no significant difference between E and BUE students ( $p=1.00$ ) and BUE and A&D students ( $p=0.7$ ) however there was a significant difference in the preference for Engineering students and Art and design students ( $p<0.05$ ). This is a further indicator that there is a difference in preference for the overall factors Build, Functionality and the Environment.

### **4.3.2. Personality**

Analysis was conducted to identify the personality in the students when combining the three groups. Table 4.12 portrays a good internal consistency for the Five Factor Model questionnaire  $\alpha>7$ , (range= 0.81-0.88) this is therefore a good indicator of quality data. It can also be seen that there are low levels of kurtosis (-0.59 to 1.53), although Openness is slightly high, it is still within the criterion for significance (1.96). The low levels of skewness also suggest that there is normal distribution within the data (-0.90 to 0.11). The mean scores on the FFM are all above the midpoint of 30, within the parameters of 30 to 40. A large SD of factors (6.15 to 7.70) infers that there is a considerable amount of individual difference within the sample.

## Phase one

*Table 4.12 Descriptive statistics FFM*

	Mean	SD	Alpha	Skewness	Kurtosis
Extraversion	32.77	7.69	.88	-.28	-.30
Agreeableness	39.23	6.84	.88	-.72	.57
Conscientiousness	33.82	7.02	.82	.11	-.59
Emotional stability	30.66	7.70	.85	-.08	-.25
Openness	36.96	6.15	.81	-.90	1.53

Personality (FFM) was analysed for students from the three schools Engineering (E) Built Environment (BUE) and Art and Design (A&D). The table below outlines the descriptive statistics for personality traits.

Table 4.13 expresses the means and standard deviations of the FFM across the three schools, the table indicates that Engineering had the highest mean for extraversion (m=33.73) however this is closely followed by BUE students (m=33.25) and A&D students (m=31.85). It can however be seen that for emotional stability BUE students had a mean (m=32.65) that was considerably higher than A&D students (m=28.97) with Engineering students sitting in the middle of these scores (m=30.79). From the table the means on the Openness scale also differ, Engineering students scored much higher (m=38.64) than BUE students (m=34.78).

*Table 4.13 Descriptive statistics FFM and Schools*

<b>FFM</b>	<b>School</b>	<b>Mean</b>	<b>SD</b>
<b>Extraversion</b>			
	E	33.73	7.09
	BUE	33.25	7.79
	A&D	31.85	7.95
<b>Agreeableness</b>			
	A&D	40.49	6.62
	E	39.64	6.03
	BUE	37.40	7.22
<b>Conscientiousness</b>			
	BUE	34.42	6.52
	E	33.82	6.67
	A&D	33.70	7.65
<b>Emotional stability</b>			
	BUE	32.65	6.66
	E	30.79	7.39
	A&D	28.97	8.37
<b>Openness</b>			
	E	38.64	4.46
	A&D	37.81	6.88
	BUE	34.78	5.66

*4.3.2.1. Inferential Analysis of personality and the three schools*

A one-way ANOVA was conducted between the FFM and the three schools, no significant variances in scores were found between Extraversion and the schools ( $F=0.77$ ,  $P=0.046$ ), Agreeableness and the schools ( $F=2.86$ ,  $p=0.06$ ) and Conscientiousness and the schools ( $F=0.73$ ,  $p=0.73$ ). The data did however suggest a variation in personality score for Emotional stability and the schools ( $F=3.12$ ,  $P<0.05$ ) and Openness and the schools ( $F=5.12$ ,  $P<0.05$ ).

A Post Hoc analysis was conducted using the Bonferroni adjustment and revealed that Art and Design students differed significantly to the Built Environment students on their emotional stability ( $p<0.05$ ). It also revealed that for openness Art and Design students differed significantly from Built Environment students ( $p<0.05$ ) and Built Environment students differed from Engineering students ( $P<0.05$ ). Therefore, we can conclude that students from the three different schools do differ significantly on certain personality traits.

In addition to the ANOVA, homogeneity of variance was identified, for this, a Levene's test was undertaken. From this the analysis identified that there was a non-significant ( $P>0.05$ ) result on all traits between Engineering, Built Environment and Art and Design. Therefore this identified that the variance between the groups is not statistically different from each other and therefore there is homogeneity of variance within this data set.

*4.3.2.2. Personality and Learning Environments*

Associations between personality factors and factors of the Learning environment were analysed. Firstly an analysis based on the subsections of the questionnaire and then on the individual items of the three learning environment factors was carried out. The results shown in Table 4.14 of the bivariate correlation suggest there is a correlation between preferences for build and functionality, and personality trait. It can be seen that there is a positive correlation between Agreeableness ( $p<0.01$ ), Conscientiousness ( $p<0.05$ ) and Openness ( $p<0.05$ ) and factors of the build. The analysis also revealed a positive correlation between Agreeableness ( $P<0.05$ ) and Openness ( $p<0.05$ ) and a negative correlation between Emotional stability ( $p<0.05$ )



## Phase one

and Factors of functionality in university learning environments. The results advocate the notion that personality is a variable that associates with preferences of learning environments.

	Build	Functionality	Environment
Extraversion	.03	-.03	-.01
Agreeableness	.25**	.26**	.16
Conscientiousness	.20*	.13	.07
Emotional stability	-.06	-.19*	-.16
Openness	.18*	.21*	0.4

*Table 4.14 Bivariate correlations learning environments subsections and personality*

\*\* Correlation is significant to 0.01 level \* Correlation is significant to 0.05 level

Table 4.15 depicts the factors of the preferences of factors in learning environment that correlate with personality traits. It can be seen that no items on the questionnaire correlated significantly with Extraversion, however factors such as open social areas and informal learning spaces correlate significantly with agreeableness ( $p < 0.05$ ). Open social areas also correlate with agreeableness ( $p < 0.05$ ) and conscientiousness ( $p < 0.05$ ).

*Table 4.15 Bivariate correlations- learning environment and personality*

	Extra	Agree	Consc	ES	Open
Informal learning spaces		.17*			
Access to libraries		.18*			
Access to suitable clean toilets		.29**	.18*		.23**
Open social areas		.23**	.20*		
Private social areas		.20*			.19*
Access to refreshments		.28**			.19*
Spaciousness to avoid overcrowding		.21*			.17*
Clear signs in building		.18*	.17*		.21*
View out of windows				-.22*	
Up to date technology		.17*		-.18*	.22**
Access to technology		.24**		-.17*	.19*
Comfortable temperature		.18*		-.20*	

Significance level correlation level= \* $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $p < 0.001$ .

In addition to examining the macro level of correlation, where significance appears for each trait, it is also important to consider the micro level associations. It is interesting to highlight that no item correlates across all personality traits. Furthermore if examined more closely each feature correlates with at least two traits with the highest loading on a trait being three for example, 'clear signs in building' having a relationship with agreeableness, conscientiousness and openness.

## Phase one

The highlighted factors are the factors that lay in the bottom half of the preferences table (see Table 4.16). For example, although informal learning spaces appears in the bottom half of the table for its mean preference, a positive correlation between students who score highly on the agreeableness trait of the FFM also score highly on their preference for Informal learning spaces ( $p < 0.05$ ). This is the same for the factors, open social areas which correlate with Agreeableness ( $p < 0.05$ ) and Conscientiousness ( $p < 0.05$ ), private social area which correlate with Agreeableness ( $p < 0.05$ ) and Openness ( $p < 0.05$ ), Clear signs in building which correlate with Agreeableness ( $p < 0.05$ ), Conscientiousness ( $p < 0.05$ ) and Openness ( $p < 0.05$ ) and View out of windows which correlate negatively with emotional stability (Neuroticism) ( $p < 0.05$ ). This consequently suggests that although factors may appear low on the list of preferences, people with certain personality traits prefer factors that the general population of students do not find as important, therefore this suggests a relationship between personality and preferences within the University learning environment.

### 4.3.3. Quality

The quality in university buildings questionnaire developed for this research, was analysed firstly using descriptive statistics to provide an understanding how the data is spread.

Table 4.16 depicts the means ( $m$ ) and standard deviations ( $SD$ ) for each factor, ordered in descending order. This table displays the descriptive statistics for all students surveyed and the importance of factors when explaining quality in a HE learning environment. The graph shows that the most important factor in a quality learning environment is 'up to date technology' ( $m=4.64$ ), factors that follow closely behind are 'Access to resources' ( $m=4.49$ ), 'Access to the Building' ( $m=4.39$ ), 'Cleanliness of building' ( $m=4.36$ ) and 'Comfortable temperature' ( $m=4.35$ ). On the other end the least important factors are 'Colour schemes' ( $m=3.24$ ), 'Decor' ( $m=3.27$ ) and 'Finish of flooring and surfaces' ( $m=3.31$ ). All of these factors have to do with the aesthetics of the finish, therefore suggesting that perhaps the least important factors when one assesses quality in the University learning environments is the aesthetic finish of the design. Highlighted are the factors that lay in the top half of the list,

## Phase one

displayed in the graph on the next page (Figure 4.8). From the table can be seen the factors of the University Learning Environments that are most important to students when they consider what quality is.

*Table 4.16 Descriptive statistics- quality factors*

<b>Features</b>	<b>Mean</b>	<b>SD</b>
<b>Up to date technology</b>	4.64	0.70
<b>Access to resources</b>	4.49	0.73
<b>Access to building</b>	4.39	0.79
<b>Cleanliness of buildings</b>	4.36	0.80
<b>Comfortable temperature</b>	4.35	0.81
<b>Fresh air</b>	4.24	0.91
<b>Control of environmental conditions</b>	4.21	0.88
<b>Plenty of suitable learning spaces</b>	4.19	0.80
<b>General maintenance</b>	4.16	0.82
<b>Natural lighting</b>	4.14	0.95
<b>Refreshment facilities</b>	4.13	0.85
<b>Comfort of seating</b>	4.13	0.84
<b>Open space to avoid overcrowding</b>	4.09	0.91
<b>Well-designed space</b>	4.08	0.85
<b>Adaptable learning space to suit lessons</b>	4.06	0.78
<b>Noise</b>	4.04	0.94
<b>Easy to find your way around</b>	4.01	0.86
<b>Environmentally friendly</b>	3.94	1.04
<b>Adaptable space to changing needs</b>	3.89	0.87
<b>Durability</b>	3.88	0.98
<b>Clearly defined space</b>	3.71	0.93
<b>Plenty of social space always available</b>	3.69	1.04
<b>Outside space</b>	3.62	1.01
<b>Spacious halls and entrances</b>	3.60	0.82
<b>Local space around campus</b>	3.59	1.07
<b>Plenty of social areas</b>	3.59	0.94
<b>Simple layout</b>	3.56	0.99
<b>View</b>	3.55	0.95
<b>Up to date aesthetics</b>	3.51	1.03
<b>Spacious entrance hall</b>	3.44	1.01
<b>Finish of flooring and surfaces</b>	3.31	1.11
<b>Decor</b>	3.27	1.11
<b>Colour schemes</b>	3.24	1.11

*Table 4.17 Likert scale scoring*

Unimportant	Of little importance	Moderately important	Important	Very Important
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

## Phase one

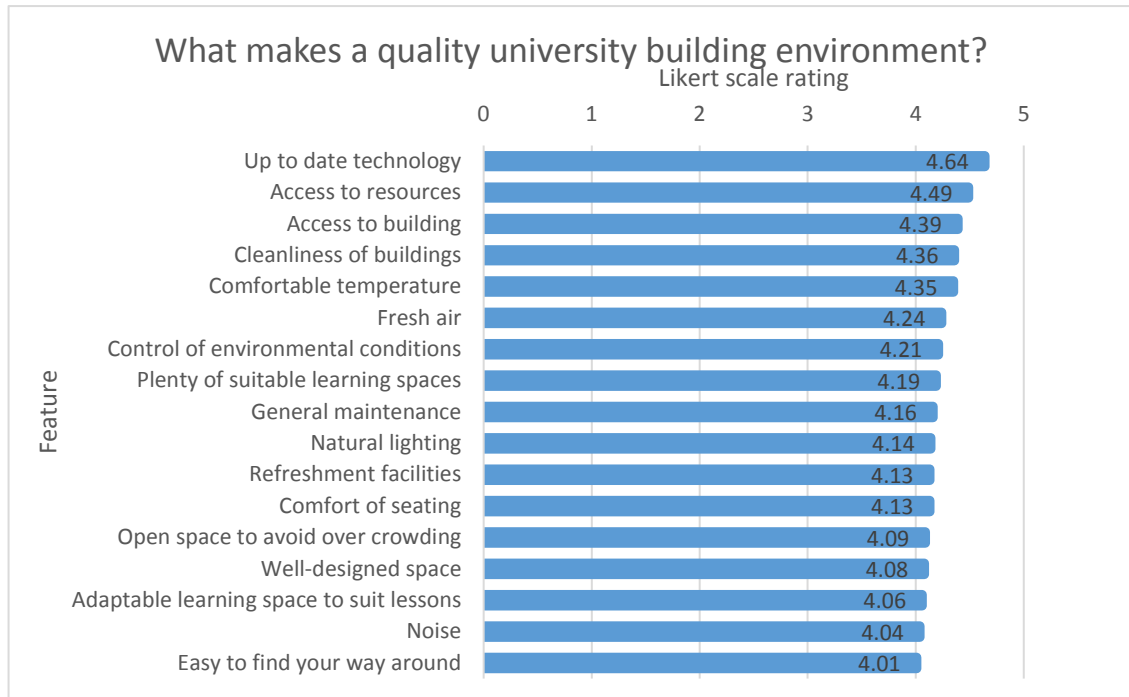


Figure 4.8 What makes a quality university building environment?

Figure 4.8 portrays the top 17 factors for the quality in a University environment questionnaire these factors are most important when considering what quality is. These factors have been taken from the overall questionnaire as the most significant factors to consider as the means all lie in the 4.00 category and above suggesting they are important to very important when considering what quality is. As can be seen from the chart, items such as 'open space to avoid overcrowding', 'comfort of seating' and 'natural lighting; are items that are considered most important when defining quality in HE Learning Environments.

### *4.3.3.1. Exploratory factor Analysis - Quality in University Learning Environments*

The aim of a factor analysis is to identify if different measures are driven by the same latent variable (Field, 2013). A factor analysis will attempt to reduce many factors into a few latent variables, with the intention of identifying a smaller number of factors that explain the most variance within the variables. The assumption of a factor analysis is that the data will adhere to the Kaiser-Meyer-Olkin criterion that a score of over .5 is acceptable. In addition, a significant result on Bartlett's test of sphericity,  $p < 0.05$  is desirable. The sample size for this research is 140, although this is lower than what

## Phase one

the assumptions advise. Field (2013) suggests that for sample sizes of 100 to 200 participants if communalities of .5 and above are considered significant, rather than the lower level for larger sample then this can be considered an acceptable sample size.

A principle axis rotation was conducted on 33 items of the Quality scale with an orthogonal rotation (Varimax). This was chosen as orthogonal rotation assumes that minimal inter-correlations between factors will occur. The Kaiser-Meyer-Olkin measure confirmed the adequacy of the sampling for the analysis (KMO=.89), The Bartlett's Test of sphericity also presented a significant result ( $p < 0.001$ ) furthermore supporting the adequacy of the data. A preliminary analysis was conducted to explore eigenvalues for each factor within the data set. It was found that 7 factors had eigenvalues over Kaiser's criterion, discussed previously, of 1. Combined, these components explained 65.24% of the variance. The scree plot suggested due to its inflexions that seven factors should be retained. As both the Kaiser criterion and the scree plot suggested that seven factors should be retained, this was explored in the rotations.

The factor analysis rotation split the items into seven components, however one of these only included one factor therefore this component was eliminated; a loading with one factor in 'natural lighting' was excluded as it loaded only on itself at a level of .56, therefore was not included in the final extraction.

Table 4.18 demonstrates the rotation of six components, as this analysis was conducted on a survey developed for this research the analysis conducted was an exploratory factor analysis (EFA). For this reason, the EFA was not to identify if the components would load onto already identified constructs but to explore how they would load onto each other therefore the components were labelled according to theory already developed within the literature.

Phase one

Table 4.18 Factor analysis for quality

Component	Factor	FL	Communalities	% Variance	Rotation Cumulative %
1 Cosmetics	Decor	.89	.85	14.56	14.56
	Finish of flooring, furniture and surfaces	.88	.84		
	Colour schemes	.85	.82		
	Up to date aesthetics	.80	.75		
	Environmentally friendly	.55	.54		
	View	.50	.53		
	Durability	.46	.58		
2 Layout	Adaptable space to changing needs	.73	.62	13.55	28.10
	Well-designed space	.73	.72		
	Adaptable learning spaces to suit lessons	.71	.64		
	Simple layout	.68	.54		
	Easy to find your way around	.62	.70		
	Plenty of suitable learning spaces	.54	.70		
3 Operations	Access to building	.81	.74	13.39	41.50
	Up to date technology	.72	.57		
	Cleanliness of buildings	.68	.75		
	Access to resources	.67	.61		
	General maintenance	.63	.69		
	Open spaces to avoid over crowding	.57	.64		
4 Social Area	Outside space	.78	.77	8.37	49.87
	Local space around the campus	.74	.77		
	Plenty of social areas	.65	.79		
	Plenty of social space so space is always available	.55	.65		
5 Environmental comfort	Comfortable temperature	.76	.83	8.32	58.19
	Noise	.69	.63		
	Control of environmental conditions	.68	.71		
	Comfort of seating	.45	.57		
	Fresh air	.41	.65		
6 Way finding	Spacious halls and entrances	.81	.85	7.05	65.24
	Spacious entrance hall	.76	.80		
	Clearly defined space	.54	.69		

Component 1 consists of factors associated with aesthetics of the design, for example, the decor and the up to date aesthetics, However, this component also included the item 'environmentally friendly'. An explanation for this could be that environmentally friendly is a fairly new concept therefore it could suggest the 'newness' of the building

## Phase one

as well as the idea that it makes the building environmentally friendly (LaFee, 2008). Therefore this component has been identified as the 'cosmetics' component. Component 2 consists of items referring to the design of the space, such as, adaptable space for changing needs and easy to find your way around therefore this component will be identified as, 'layout'. Component 3 consists of items referring to access to the building and access to resources, however, also includes the items general maintenance and cleanliness, consequently this component has been identified as the 'operations' category. Component 4 consists of items regarding space outside of the learning environments, such as, Outside space and plenty of social areas therefore this component will be identified as 'social areas'. Component 5 consists of items that denote more traditional factors of comfort, such as, noise and control of environmental conditions consequently this component will be identified as, 'Environmental comfort' Component 6 consists of items defining space and way finding, for example spacious halls and entrances and clearly defined space can be thought of as the ability to identify where you need to go effectively so this component will be identified as 'Way finding'.

### **4.3.4. Community**

For this research survey identifying features of the PLE that students may find important to their perceptions of community within the space was developed. The questionnaire was analysed to identify any notable factors that seemed important to students to boost their sense of community. Table 4.19 displays the descriptive statistics for the community factors of the Learning Environment. The means for factors of community and identity in university buildings range from 4.11- 3.39 which are all above the mid-point suggesting that these factors may all be important to consider when designing University buildings. The descriptive statistics reveal that a welcoming environment (m=4.11), plenty of social space for both studying and socialising (m=4.10) and group workspace (m=4.09) are most important. This is closely followed by feeling part of the school you are from (m=3.86). From the data it suggests that students have a lower preference for signage on buildings as a clearly named home building for your school (m=3.39) and Clear signs to define space on campus (m=3.55) have lower means. As these items were all above the mid-point of

## Phase one

3 (moderately important) a factor analysis was conducted to identify if there were any underlying themes that could be identified that may be important in establishing a feeling of community in the university.

*Table 4.19 Descriptive statistics for community factors in universities (rank ordered)*

<b>Features</b>	<b>Mean</b>	<b>Standard deviation</b>
Welcoming environment	4.11	0.82
Plenty of social space on campus for both studying and socialising	4.10	0.87
Group workspace	4.09	0.86
Feeling part of the school you are from	3.86	1.05
Inside space to socialise	3.77	1.01
Outside space to socialise	3.66	1.03
A hub where students from your school can go to work or socialise	3.62	1.04
Feeling part of the whole university	3.60	1.16
Don't have to travel far from home building to sessions	3.58	1.11
Clear signs to define space on campus	3.55	0.97
Variety of social spaces	3.45	1.06
A clearly named home building for your school	3.39	1.14

A principle axis rotation factor analysis was conducted on the community questionnaire with an orthogonal rotation (Varimax). This was chosen as orthogonal rotation assumes that minimal inter-correlations between factors will occur. The Kaiser-Meyer-Olkin measure confirmed the adequacy of the sampling for the analysis (KMO=.86), The Bartlett's Test of sphericity also presented a significant result ( $p < 0.001$ ) furthermore supporting the adequacy of the data. The factor analysis divided the factors into three components. Once again, due to the exploratory nature of this analysis there were not names for the components, therefore the names were identified through the literature. These have therefore been named 'Social space' which explains 25.92% of the variance, 'Sense of belonging' which explains 15.59% of the variance and 'Signage' which explains 14.63 % of the variance in scores. The results from this section of the analysis suggests that there may be factors that may improve a sense of community in the university environment.



## Phase one

Table 4.20 Factor analysis for community factors in the university.

Component	Factors	Factor Loading	Eigen Value	% of Variance Rotated	Rotation Cumulative %
<b>1 Social space</b>	<b>Inside space to socialise</b>	<b>.77</b>	5.22	25.92	25.92
	<b>Outside space to socialise</b>	<b>.77</b>			
	<b>Variety of social spaces</b>	<b>.68</b>			
	<b>Plenty of space available on campus for both socialising and studying</b>	<b>.63</b>			
	<b>Group workspace</b>	<b>.51</b>			
	<b>A hub where students can go to work or socialise</b>	<b>.51</b>			
	<b>Welcoming environment</b>	<b>.44</b>			
<b>2 Sense of belonging</b>	<b>Feeling a part of the school you are from</b>	<b>.74</b>	1.33	15.59	41.51
	<b>Feeling a part of the whole university</b>	<b>.66</b>			
<b>3 Identifying with the buildings</b>	<b>Clear signs to define space on campus</b>	<b>.80</b>	1.03	14.63	56.14
	<b>A clearly named 'home' building for your school</b>	<b>.68</b>			
	<b>Don't have to travel far from home building to sessions</b>	<b>.43</b>			

### 4.3.4.1. Phase one statistical analysis conclusion

Overall from the statistical analysis of the questionnaire several conclusions can be drawn. Firstly, the analysis revealed that there are differences in preferences for factors within the learning environment for the three schools; Art and Design, Built Environment and Engineering. Secondly, it can be seen that there is also a difference in personality profiles between these three schools.

The analysis also revealed that personality associates with factors of the learning environment, for example, there was a relationship between conscientiousness and open social areas and emotional stability and views out of windows. Furthermore, this analysis revealed that even though some factors of the learning environment appeared towards the end of the overall preferences table, these items had a relationship with personality factors, therefore suggesting that even though a factor may not be rated important overall, some people with certain personality traits found these items important.

The analysis also established factors that rate highly when students rate factors of the University environment in importance for establishing what quality is. Six components

were ascertained that may lead to understanding a definition of quality in the university environment and these were 'Cosmetics', 'Layout', 'Operations', 'Social Areas', 'Environmental comfort' and 'Way finding'. Likewise, a factor analysis revealed three components that may support in this development in community through the built environment, 'Social space', 'Sense of belonging' and 'Identifying with the buildings'.

#### **4.3.5. Open ended questions**

As noted previously the questionnaires also consisted of three open questionnaires to allow students to make further suggestions than the closed measured questions permitted. These open-ended questions were analysed in NVivo using a thematic analysis, which identified specific themes that students noted. The three questions were asked on the learning environment, quality and sense of community (see appendix 5).

##### *4.3.5.1. What are your priorities for University learning spaces?*

Within the open question regarding the learning spaces it was reiterated that comfort technology and spaciousness were highly important. Additional priorities were highlighted such as helpfulness of staff, and lockers were important features in their learning environment. The space should also be motivating for example; a student noted the space should have *"a good balance between a stimulating environment"*. The *"environment should be clean"* therefore the management of the space appears to be important, it also has to be kept clean.

##### *4.3.5.1. What do you think quality is, if you were thinking about features of your University building that impact your decision on the quality, which factors are most important?*

For the quality section of the open question students reiterated that technology comfort, spaciousness and variety of space were very important. This is interesting as it reflects the question regarding the learning spaces as a whole. One student also noted that community was important in their perceptions of quality in a HEI building, *"be part of a growing successful and talented community"*. Therefore developing this sense of community appears to be important for students. This supports the use of this concept

in evaluating the PLE from a student perspective because for them community is important.

*4.3.5.2. Explain how the design of the university buildings could boost your feeling of identity and your sense of community?*

Unsurprisingly social spaces was reiterated by students as being highly important in promoting their sense of community. With a student, highlighting spaces should have “*social hubs in prominent areas where students naturally converge*”. A suggestion about the interconnectedness of the university was also made; “*all university buildings including libraries could be grouped together instead of scattered throughout city*”. The spaces should be more connected therefore this should be considered in the next research phases. Additionally it was noted that the university should “*create spaces which don’t feel as though they’re on a time scale*”. This suggests that students may like spaces that they feel they can stay on campus without having to leave. Although some students noted “*the design of buildings does not influence my sense of community*”. The large majority of the students offered up additional solutions, therefore suggesting that the students do think advancements could be made in the PLE to enhance their sense of community. The open questions demonstrate that students have a good awareness of the physical space around them and how it can affect their performance, therefore moving forward it supports the use of focus groups to further explore students’ experiences and perceptions of the PLE.

#### **4.4. Summary**

The purpose of the phase one survey data collection was for the identification of the PLE that students identify as being most important in their perceptions of the PLE. Additionally, this phase of analysis provided an opportunity to examine if relationships exist between the variables. This chapter identified features of the PLE that students identify as important in their perceptions of quality and therefore what should be considered in the design process. Additionally, through the use of open questions, further features of the PLE were identified that students identify as being important to their perceptions of quality. This is additional to what the literature currently identifies as the expectations of users’ quality perceptions. Likewise, features of the PLE were

## Phase one

identified that students consider to be elements that could develop their sense of community. There is a relationship between personality variable and features of the PLE. This extends what is currently considered within the literature. This first phase of data collection therefore provides a foundation of understanding about features of the PLE that students consider important and affect their satisfaction and learning experiences.

This chapter also identified that there are personality differences between the schools sampled. Differences in preferences were found for features of the PLE and the school that students belong to therefore suggesting that there is a relationship between subject choice and requirements in the PLE. This is further supported by the finding that there is a relationship between personality traits and features of the PLE. Therefore, perhaps the differences in requirements in the PLE are due to the influences of personality traits on behaviour and choice.

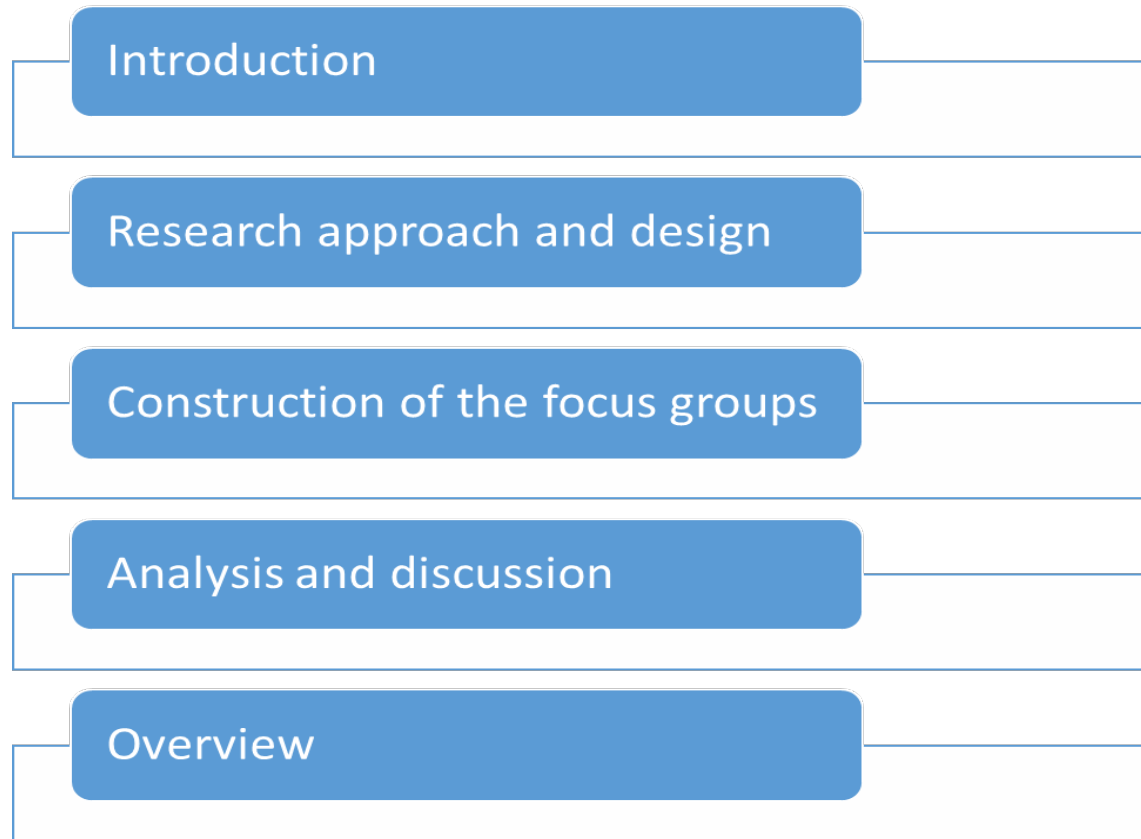
This chapter also highlighted important findings that are important to take through to the next phases of research. This chapter highlighted that the sections of the first survey learning environment and quality were very similar constructs therefore the features the students regard as quality are important in the PLE as a whole. Another reason for this reasoning is that students noted that the questionnaire was repetitive. For the next phases of research these constructs should be combined. It was also suggested when reviewing the findings of the questionnaire that it would be important to include facilities management elements into the questionnaire because additional to the PLE features, the factors have an important impact on the perceptions of the PLE. Finally, another important consideration in methodological decisions within the next phases of research is similarities between findings for the schools engineering and BUE. A difference was found between Engineering and Built Environment and Art and Design. This suggests that there is a difference but perhaps Engineering and Built Environment are quite similar with their students and subjects. Therefore, an additional school should be sampled to allow for the investigation of differences.

Overall, phase one of data collection identified features of the PLE that students consider important in their satisfaction with the PLE. The research also identified that

## Phase one

there is a relationship between features of the PLE and the school that students belong to and individual differences in personality traits. Therefore, this supports the development of this research to identify a framework to use in the design of a better PLE to satisfy students' specific requirements.

## 5. Phase two



## 5.1. Introduction

This chapter discusses the third stage of research, which is the second phase of data collection. It will explore the research approach and methodology chosen for this section, which is Focus groups. It will then report on the analysis for this phase and the discussion of the results. The section then discusses the findings in regard to the next phase of the research.

Conducting this phase, Figure 5.1, was identified through the objectives of this research and from phase one of the data collection as discussed previously. Focus groups were decided upon firstly because the objective was to identify educational community and quality definitions in the different schools to establish whether there are differing levels of environmental satisfaction and therefore differing built environment requirements. By exploring students' feelings and experiences of the PLE, an investigation into their satisfaction with the environmental features will help in the identification of specific features that are important to them. Furthermore, by exploring different schools through the focus groups, understanding of difference in preference may be uncovered.

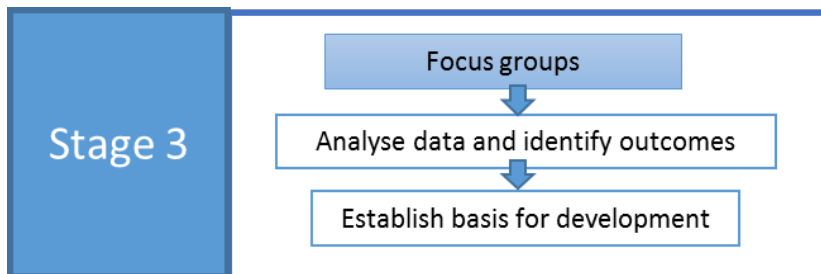


Figure 5.1 stage 3 of research

## 5.2. Research approach and design

### 5.2.1. Why focus groups

Focus groups are a data collection technique that falls within the qualitative methodology (Sim, 1998). Focus groups are used as a key tool in many research fields, commercial marketing (Silverman, 2013) Business (Saunders et al., 2012), Marketing (Saunders et al., 2012) and the Built Environment (Haigh, 2008). In fact focus groups have an extensive history in exploring people's feelings and experiences, for example

## Phase two

they were used in the second world war to investigate the effectiveness of propaganda (Merton & Kendall, 1946). It is therefore a valid data collection technique across many areas of research. Focus groups are a form of group interviews (Saunders et al., 2012), and are used when a group interview has a clearly defined topic enabling an interactive discussion between the participants (Saunders et al., 2012). Group interviews are also often used to collect data from many people concurrently but focus groups use this interactive discussion between people within its methodology (Kitzinger, 1995). Focus groups are described as 'a method for collecting data whereby participants discuss their reactions and feelings about a product, service situation or concept, under the guidance of a group leader' (Collis & Hussey, 2009, p. 155). Focus groups allow for the researcher to explore respondents' knowledge and attitudes through more than just people's 'reasoned response to direct questions' through the communication with others (Kitzinger, 1995). Therefore focus groups can access information that is often missed through other data collection techniques, by revealing interactions such as jokes, anecdotes, and arguing (Kitzinger, 1995).

When are focus groups appropriate to be used? Focus groups are useful when concepts, experiences, attitudes or views require exploration or the clarification that would be less easily accomplished through surveys or other methods (Kitzinger, 1995). Focus groups are useful for many purposes as outlined by Collis and Hussey (2009);

- seeking knowledge of new phenomena
- developing proposals from emergent issues
- developing questions for future surveys
- providing feedback on the findings of research with the respondents participated

These postulations about conducting focus groups are highly significant for this research; specifically the first three points are relevant to the purpose of this research. Firstly, this research aims to understand students' requirements from their PLE, which is an emergent area within the literature. Secondly, this research aims to develop a framework for the design of space to propose a student centred approach to the design of the PLE based on students' requirements. Finally, from the third point this research will aim to develop a final survey to develop a framework and explore relationships



between variables, therefore this research will support in the development of a future survey.

### **5.2.2. How to conduct and design**

The design of the focus group is important as it sets out an agenda for the discussion and provides structure for participants to convey their thoughts and feelings (Stewart & Shamdasani, 2015). The two main elements to consider in designing focus groups research is the sample of participants and the interview guide (Stewart & Shamdasani, 2015).

To develop an interview guide it is important to define the research agenda and to do this, problem formulation is required (Stewart & Shamdasani, 2015). For this specification of the research question is required, what information is sought and why (Stewart & Shamdasani, 2015).

Conducting focus groups is seen to have limitations due to the use of facilitators (Kitzinger & Barbour, 2001). Although there is a moderator in a focus group, they are there to act as a facilitator for group discussion, not to ask each participant a question individually (Silverman, 2013). Therefore it is important to consider how the questions are going to be asked: will they be specific, general or unstructured to allow for more discussion (Stewart & Shamdasani, 2015). The number of questions must first be considered; in general most interviews contain fewer than 12 (Stewart & Shamdasani, 2015). The structure of the questions must then be deliberated. It is important not to make the questions 'survey like' but allow respondents the opportunity for discussion (Stewart & Shamdasani, 2015). When conducting a focus group it is important to encourage an informal discussion between participants focused around the particular issue (Silverman, 2013).

Other factors that can help facilitate discussion over and above the role of the moderator is the use of stimulus materials (Kitzinger & Barbour, 2001). The use of 'exercise' to enhance discussion can be used, such as, rating and vignettes (Silverman, 2013). The use of providing pictures can help engage participants in the discussion without using words or terminology (Kitzinger & Barbour, 2001) especially when the

subject is difficult to talk about or concepts difficult to grasp (Stewart & Shamdasani, 2015).

### **5.2.3. Target size**

The other aim in developing focus groups research is identifying the characteristics of the target sample. When choosing to conduct focus groups it is done so with the aim of obtaining specific information from specific groups of individuals, it is therefore important to ensure the sample of the groups is representative of the target populations (Stewart & Shamdasani, 2015).

There are two types of sampling strategy, homogenous and heterogeneous composition (Kitzinger & Barbour, 2001). As a rule it is thought that the group can either aid or inhibit discussion so choosing the right grouping is important to the strength of the discussion (Finch & Lewis, 2003). A homogenous group can make participants feel safer and therefore facilitate discussion, using a group of students who have characteristics in common has been suggested to facilitate good group discussion in focus groups (Silverman, 2013). However, it may also inhibit it as participants may not fully explain their meaning or may feel too comfortable to discuss ideas fully (Finch & Lewis, 2003). Conversely, heterogeneous groups may feel threatening and participants may be less likely to share experiences (Kitzinger & Barbour, 2001; Finch & Lewis, 2003). Therefore, it may be most suitable for the focus groups to be balanced between both with diversity but no more than is necessary (Finch & Lewis, 2003).

An important component in the design of the focus group is the number of participants in each group. Generally six to ten participants has been noted as a suitable size for focus groups (Johnson et al., 2007), however, a sample of between 6 and 8 has been noted as the optimum for a focus group by another author (Silverman 2013). There is however a lot a variation in this as Bryman (2016) noted this number appears to be a little high as some focus group research can have as little as two participants. This number does depend however on the participants and the subject involved (Bryman, 2016). Small groups are good when participants may have a large amount to say on the topic and also when they may be emotionally preoccupied by the topic (Bryman,

2016). Furthermore large groups may be difficult to run as participants may be more nervous about talking about their feelings or experiences within a large group (Bryman, 2016) and much sociological research suggests smaller groups (Kitzinger & Barbour, 2001). Larger groups also can create unhelpful group dynamics, such as participants who say very little or for sub-groups to form (Finch & Lewis, 2003), therefore the moderator is highly important in such instances.

#### **5.2.4. Number of sessions**

Questioning how many is also important in the number of sessions required. Although there are no rules on this (Stewart & Shamdasani, 2015), depending on the groups and the results required more may be needed. In a review of focus groups by Bryman (2016), research conducted six to fifty two groups therefore there is a lot of variation, however it was noted the number tended to be around eight to fifteen. It is important to consider how many are actually likely to answer the research question. Kitzinger and Barbour (2001) stated that the number required would really be based upon the research question, time, limitations and the respondent required. Identifying the number of sessions is important in conducting the grounded theory approach. Data is collected until theoretical saturation (Bryman, 2016), that is that data is collected until no new theory emerges through analysis, which is conducted simultaneously with collection. Therefore, it may not be known from the outset when theoretical saturation may occur through the focus groups session, and therefore the number of sessions required.

#### **5.2.5. Quality control**

To ensure focus groups are conducted to a high standard it is important to consider how to control the quality. In the formation of focus groups it is important to consider inclusion and acceptance within the groups (Finch & Lewis, 2003). Effective focus groups encourage interaction to enable participants to explore their thoughts and feelings with each other (Finch & Lewis, 2003), therefore the moderator plays an important role in this.

Enabling effective focus groups is also reliant on creating a relaxed environment (Kitzinger, 1995). Providing quiet and comfortable environments that are familiar to

participants helps with this (Kitzinger & Barbour, 2001). Sitting in circular form also helps with the discussion of topics (Kitzinger, 1995), therefore enabling more interaction between respondents. Factors such as the organisation also enables effective focus groups, for example the use of discussion material, materials such as participant information sheets and the structure of conducting the focus group (Finch & Lewis, 2003). To ease the pressure on the moderator recording the focus groups is important (Kitzinger, 1995; Finch & Lewis, 2003). It is highly important for the production of transcripts that good quality recordings are captured (Kitzinger & Barbour, 2001). Additionally note taking can be important to identify big ideas or discussion points to highlight from the research (Kitzinger, 1995).

#### **5.2.6. Analysing of data**

Through conducting focus groups the consequential data can be large, complex and very rich in nature (Kitzinger & Barbour, 2001), therefore it can be difficult and time-consuming to analyse. As with any other research the analysis of focus group data should be determined by the research question and the reasoning behind the collection of the data (Stewart & Shamdasani, 2015). In reality, the analysis of focus groups should be no different to that of any other qualitative research (Kitzinger, 1995; Kitzinger & Barbour, 2001). However, it is important to consider the group context of what is said, which means analysis must start from the group perspective rather than at the individual level (Kitzinger & Barbour, 2001). Therefore, consideration of the discussion between individuals in groups should be considered rather than just the individual responses (Kitzinger, 1995).

### **5.3. How the focus groups were conducted**

The first step in this research was to outline the research agenda; this is the identification of the problem. Therefore, the following was developed to identify the research purpose;

‘To explore students’ experiences and perceptions of the physical learning environment to identify differences in requirements and understand additional requirements’

## Phase two

Considering the methodological standpoint of this research and therefore the chosen approach, this section of the research, the qualitative method, will be undertaken using a grounded theory approach. This therefore takes into consideration many factors in conducting the research, the sampling of the research, how to conduct the research and in the analysis.

### **5.3.1. Focus group guidelines**

The next step in the focus group development was to identify the research guidelines. The elements to consider identified through the review of the approach are;

- The questions or themes to discuss
- The structure of the discussion
- Type of discussion (questioning strategy)

Before attending to these three, themes of the research were identified which were once again the research topics, the learning environment, quality and community. For this personality is not going to be investigated as this requires a quantitative measurement. For this reason a more structured approach was chosen to provide 'guiding questions' (Bryman, 2016). The questions will be general to allow participants' discussion on the topic, by providing questions some comparisons will be able to be drawn between groups (Bryman, 2016). To enable free flowing discussion with a large input of ideas open-ended questions were chosen for the questioning strategy.

Eleven questions were chosen for this section of research split into three sections. The structure of the questions followed a more structured specific question to less structured questions. This was so that the structured questions defined the direction and scope of the research (Stewart & Shamdasani, 2015). It also allowed the participants to get used to talking in front of each other without missing out important questions and themes (Stewart & Shamdasani, 2015). With each change of topic a brief introduction was provided and this is where vignettes were discussed. This break down of the focus groups into sections allowed for the participants to keep interested in the topic and to guide discussion (Kitzinger & Barbour, 2001). In a couple of cases alternative questions were provided in case the questions needed to be rephrased for

## Phase two

participants (Stewart & Shamdasani, 2015). The questions that were selected for this focus groups were as follows;

*Table 5.1 Questions for focus group*

	<b>Question</b>
	<b>Introduction. Some pictures of the LJMU buildings and some discussion of the facilities. Classrooms buildings furniture design of the space. Vignettes</b>
1	What do you think of the university's buildings and learning environments?
2	What features of spaces do you like best about the learning spaces?
3	What do you like least about the learning spaces you use?
4	What are the most important aspects of the physical environment of the learning spaces? For learning in or socialising?
5	How do you think the learning environments in the university's buildings could be improved? What features or spaces could be added or changed?
	<b>Brief discussion of what we think quality is in environments that they are all familiar with eg. Home, city, gym? Vignettes.</b>
6	What aspects of the University suggests it is a quality environment? How does the condition of the university buildings effect your feelings towards them? So how good they look and how well kept they are?
7	How do you think the university environment could improve its feeling of quality? Are there any parts of the building that do not look well maintained or in good condition?
8	Overall what do you think are the most important aspects of a university campus that suggests quality to you? How do you think the university environment could improve the condition of the buildings?
	<b>Introduction to discussion topic. Vignette</b>
9	Does LJMU develop a sense of community for you? If so how?
10	How does the University campus itself develop your sense of community, does it make you feel like you belong?
11	How could the physical environment be redesigned (enhanced) to increase your feeling of community and sense of belonging within the university?

### 5.3.2. Sampling strategy –phase two

As this phase is qualitative in nature a non-probability form of sampling was applied (Bryman, 2016). From this a strategy of snowball sampling with an element of quota sampling was chosen. The group of potential participants was identified through contacting lecturers, who then identified lectures or seminars that I could attend to invite students. When in these lectures and seminars students were invited and encouraged to invite others they knew. Either the focus groups were then organised for the end of the lecture or seminar to allow students to attend straight away or follow

## Phase two

up emails were sent to interested participants to then organise focus groups at a suitable time. The strategy for recruiting participants for the focus groups is shown below in Figure 5.2;

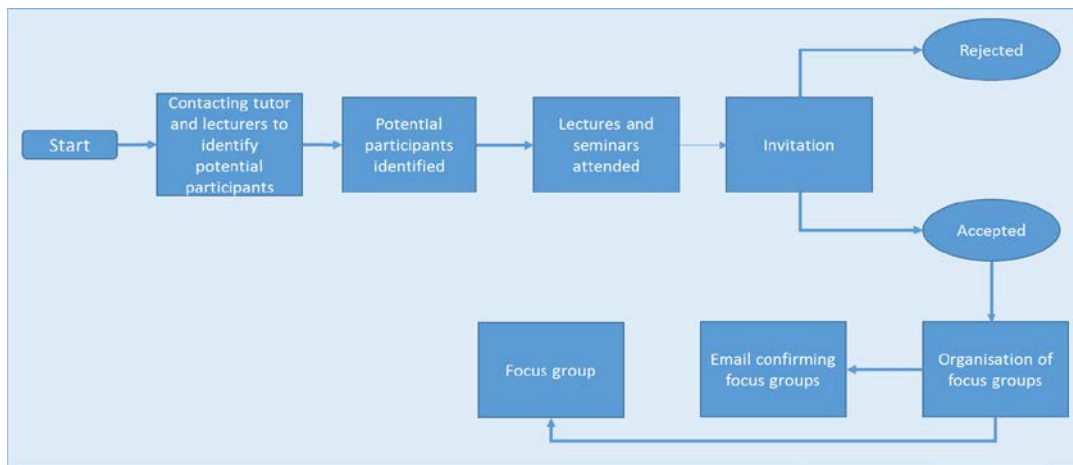


Figure 5.2 sampling strategy for focus groups

To enable students to attend the organised focus groups within a reasonable distance of their lectures, rooms in Liverpool John Moores University were booked according to requirements. These spaces worked well for the discussions as they were familiar and close (Kitzinger & Barbour, 2001). The rooms also provide quiet and comfortable environments that are flexible for the requirements of the groups (Kitzinger & Barbour, 2001). Due to this strong sampling strategy to engage students to participate, ten focus groups were conducted with a total of 63 participants.

Table 5.2 Participants in focus groups

Focus group	School	level	Number of participants	Duration
1	Architecture	6	10	20.37
2	Engineering	4	9	46.23
3	Architecture	4	8	26.17
4	Built Environment	5	10	56.35
5	Architecture	5	4	24.46
6	Business	4	5	31.12
7	Engineering	6	5	38.15
8	Engineering	5	7	53.54
9	Business	5	3	50.02
10	Built Environment	4	2	18.18

## Phase two

As highlighted, choosing the right sample is important both in general research but specifically for conducting focus group research. As has been suggested having a balance of homogenous and heterogeneous groups is important for groups dynamics (Finch & Lewis, 2003). Furthermore, identified through phase one of data collection an additional school is required to provide a good diversity to the data collected. To explore students' feelings and experiences of the PLE is important to have a diverse range of students who use the environments. Therefore, the following groups were sampled;

*Table 5.3 Sample for focus groups*

School	Level
Engineering	4, 5, 6
Built environment	4, 5
Art and design	4, 5, 6
Business	4, 5

Obtaining a sample from different levels and schools ensured that a diverse range of students took part in the focus groups. Having students from different levels meant that students who had different experiences of the buildings were sampled. In addition, sampling students once again from different schools allowed an overview of the perceptions and experiences of different buildings, and exploring students' feelings towards these.

### **5.3.3. Focus groups size and session number**

The size of the focus groups was considered based on two factors. Firstly that as the sample groups have a high level of knowledge with the research agenda, that is they have had experience with the university PLE, smaller groups would allow discussion without sub-groups or negative dynamics to form (Finch & Lewis, 2003). Additionally small groups reduce the negative influence of the moderator (Kitzinger & Barbour, 2001). Therefore, the target size of the focus groups was 5 to 10 students.

### **5.3.4. Recording and transcribing**

To ensure quality recordings of the focus groups were captured (Kitzinger & Barbour, 2001), two high quality voice recorders were used for all focus groups. To enable analysis, transcripts were required; therefore, the researcher conducted transcription



with the following process. 1. Listening to the recording, 2. Transcription, 3. Re-reading and listening, 4. Correcting (Kitzinger & Barbour, 2001). The data was transcribed as the focus groups progressed to allow for the grounded theory methods to be applied to the data collection strategy

### **5.3.5. Running the focus group**

The focus group was conducted by using the five stages of focus groups (Finch & Lewis, 2003), scene setting and ground rules, introductions, opening topic, discussion and ending the discussion.

#### *5.3.5.1. Scene setting*

Firstly, the researcher prepared the room allowing for students to sit in a circle to support discussions. Participant information sheets and consent forms were laid out for each participant. As the participants arrive they were thanked for participating and asked to read through, and if happy sign the consent form. A brief introduction was also given to outline the research. Participants were asked to switch phones off and be polite to each other throughout the discussion.

#### *5.3.5.2. Introductions*

The focus groups were recorded using two tape recorders which were switched on. The moderators then introduced themselves and explained their role.

#### *5.3.5.3. Opening topic*

The researcher then introduced the first topic of learning environments by using the vignettes and simple questions; this was to begin students' discussion. Throughout the discussion the researchers role was to encourage group interaction by allowing silences, inviting thought or drawing references to issues that have been raised (Finch & Lewis, 2003).

#### *5.3.5.4. Discussion*

During this phase, questions on the remaining two areas were posed for discussion, quality and community. The vignettes were once again used within the discussion. The role of the researcher at this point was to balance free flowing debate with the discussion on the research agenda (Finch & Lewis, 2003). Additionally, for quality

control throughout all of the discussion, notes were being taken on note sheets highlighting important discussion point.

#### *5.3.5.5. Ending the discussion*

The discussion was ended by covering any final thought or suggestions the students have and to close the session by handing out debrief sheets to explain the research agenda.

#### *5.3.5.6. Discussion aids*

Discussion aids were used in the focus groups, specifically vignettes were utilised (for example see appendix 8). As students were being asked to identify and describe quality and community in the PLE, it enabled the mediator to outline the concepts using images from other people's perceptions of quality environments and community environments generally in different environments, rather than the mediator merely vocally describing the construct that respondents were being asked to explore (Kitzinger & Barbour, 2001).

### **5.3.6. Pre-testing/ pilot phase**

Pre-testing of a focus group guideline is important in conducting the research, there is no other way to understand how respondents will interpret questions (Stewart & Shamdasani, 2015). According to Krueger (1998b) a pilot test is the first focus group, this is because it is difficult to truly pre-test a focus group. This research therefore used the first focus group as the true pilot test; additionally to this, people knowledgeable in the field of research and the Built Environment were asked to review the questions. At the end of the focus groups participants in this research phase were asked to give feedback on the structure of the focus groups. The one main theme that was noted was that the concepts quality and community are difficult to grasp within the built environment PLE context. Therefore, the use of vignettes was suggested to help with understanding these concepts.

### **5.3.7. Reflexivity**

Reflexivity is important within qualitative research as it is important to be transparent in how research is conducted (Engward & Davis, 2015). It requires the researcher to

think about how they may influence the research that is being conducted and what strategies can be employed to overcome any shortcomings (Darawsheh, 2014). Therefore, for this phase the researcher reflected upon each focus group to ensure that they did not influence the research. For example, ensuring that questions are asked well and clearly, ensuring that the researcher had a relaxed welcoming demeanour and that the researcher's comments did not interfere with the flow of the discussion.

#### **5.4. Analysis and discussion**

To analyse qualitative data involves the process of preparing the data and then moving deeper in the understanding of the data, representing the data and then making interpretation on such meaning (Creswell, 2013). For this reason Creswell (2013) identifies a number of stages that should be proceeded through in the data analysis of qualitative research.

##### Step 1- Organisation of data

It was important to ensure that data was organised and sorted efficiently. The data recordings were transcribed and re-read to produce suitable documents to analyse (Stewart & Shamdasani, 2015). The use of a qualitative computer package, NVIVO was used to organise and analyse the data. Using NVivo for analysis has been said to enhance the efficiency, multiplicity and transparency of qualitative analysis (Hoover & Koerber, 2011)

- Efficiency - using NVivo allows for the coding and retrieval of the data to be more efficient
- Multiplicity - NVivo links the nodes to the block of text, the transcripts, therefore developing codes is far simpler. It also enables the researcher to view all forms of data at once
- Transparency - the ability to access data allows the researcher to easily and efficiently show others the data and the interpretation of the data

Using Nvivo also allowed confidentiality to be kept for participants' anonymity, as the transcripts analysed were separate from the original data recordings.

## Phase two

### Step 2- Reading through the data

Reading through the data allowed the researcher to gain a general overview of the data collected (Creswell, 2013). Notes were taken to begin to identify general ideas about the theory of the data.

### Step 3- Analysis of collected data

The analysis of focus groups must start back at the intent of the research (Krueger, 1998a). The principles of analysis in focus group research is highly important comparatively in qualitative research. The discussion is evolutionary in focus groups discussion as participants learn from each other and discuss comments (Krueger, 1998a), therefore it is important to let the research agenda guide the analysis.

In focus group research it is important to consider the epistemological stance in the analysis of focus group research (Stewart & Shamdasani, 2015). As this research has taken on a post-positive position, it is important to consider this stance in the analysis of the data. Specifically the qualitative section of this research is undertaking a grounded theory approach and therefore the subsequent data analysis is undertaken using this approach (see, 3.4.1.2 Grounded theory).

Identification of significant statements is an important process, however in focus groups it needs to be fully clarified. As has been identified focus groups are different to general qualitative analysis (Kitzinger & Barbour, 2001) therefore the analysis of this data was analysed with the following considerations in mind.

- All mention of codes should be accounted for
- This is whether an individual mentions a code
- Or if the group discussion contains the code

(Morgan, 1998)

### Stage 4- Descriptions and themes

From the generation of codes through the identification of statements the description of the data is formed. From this coding themes or categories, usually between five and seven are formed though the theory developed from the data (Creswell, 2013).

## Phase two

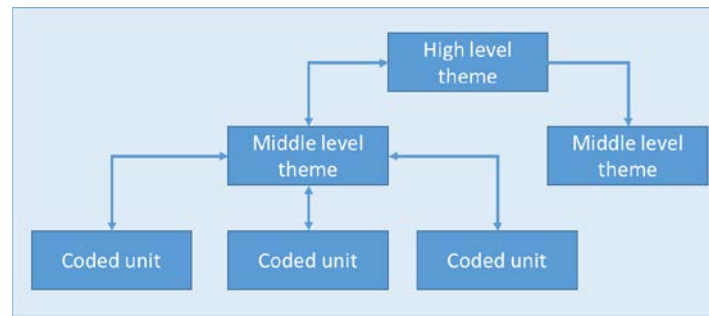


Figure 5.3 Hierarchy of themes

To identify and construct the theory, themes from the final codes were identified for the sections. As this research has also worked within the abductive research approach, the decision was made to compare these themes through the number of references made to each theme. This was also supported by the objective of the research to develop a framework of design for the HE PLE. Consequently, it was important to identify from the literature specific features of the environment that students discussed as being important. The analysis additionally provided students' experiences of the PLE and therefore why each of these factors within the PLE are important or not. Each of these themes were then explored through the references made to the code.

Stage 5 and 6- the writing up of findings and interpretation of the meaning

The themes should be represented in a qualitative narrative, which describes the evolution of the discussion. (Creswell, 2013). This often includes the use of models and tables to convey the themes, to identify the process of the grounded theory analysis (Creswell, 2013).

### **5.5. Quality and the design of the Learning Environment**

The first stage of data analysis surrounded the questions regarding the learning environment and the quality of the environment. As data collection transcriptions and analysis progressed it was noted that the learning environment as a whole was discussed interchangeably in the focus groups. Students noted therefore these separate sections of the original focus group format, which were analysed together to develop theory about the physical learning environment.

## Phase two

Six high level themes were identified that described students' preferences in the HE learning environment. These themes are Operations, Design, Facilities, Workspaces, Social areas, Environment and Cosmetics. The factor that appeared to me most discussed by students as affecting their perceptions of quality and preferences within their learning environment, with 348 references, was elements of the Environment. This was closely followed by the design with 250 references and 225 for Rooms. Facilities and operations had similar reference scores with 131 and 115 respectively. With cosmetics having the lowest reference score 82. All of these elements however were discussed by students when asked about their perceptions of the learning environment and what constituted quality, therefore appear to be important factors to consider when designing space for students.



Figure 5.4 High level themes focus group

Through the focus groups, analysis of the first theme that was discussed by the students was why having a quality learning environment was important to them. This was interesting as it supports the importance of developing a definition of quality and identifying a framework to design PLE with the understanding of students' requirements.

In the focus groups students suggested, *“if the spaces were designed in a way that facilitated a better teaching method then that would be better”* (FG 7). Therefore, students consider the design of the space to be an important tool in better teaching.

## Phase two

Furthermore, students noted that enhancing the physical environment would be better for them as well, when discussing workspaces a student noted, *“You feel good working in it because it’s nice”* (FG 2). Another student supported this saying *“If you’ve got a nice space... then definitely makes it easier”* (FG 9). The space may enhance their perceptions of well-being and ability to do work. This is supported by one student who noted, *“It’s a bit more of a working environment as well, I find the library, I go there to do work whereas at home I just don’t”* (FG 7). Overall having a quality learning environment for the students was noted as being important because *“you actually want to go to Uni because it doesn’t look bad, that’s quality”* (FG 8).

Interestingly the students also discussed the importance of understanding their requirements of the space in the design process. It is important for the students that when spaces are designed practitioners *“focus on the target market”* (FG 8) and they should *“concentrate on the students’ opinions just not go off some ideas that they have got out of the clouds”* (FG 8). When discussing developments in process within the university a student noted, *“I don’t know if the plans were already in motion but you would think that they would have actually spoken to the built environment students and seen what type of view or ideas we have that would actually help to design it”* (FG 4). Therefore suggesting they would like to be part of the design process.

## Phase two

### 5.5.1. Operations

The higher level theme 'operations' was identified through the focus groups this included the themes maintenance, management and staff.

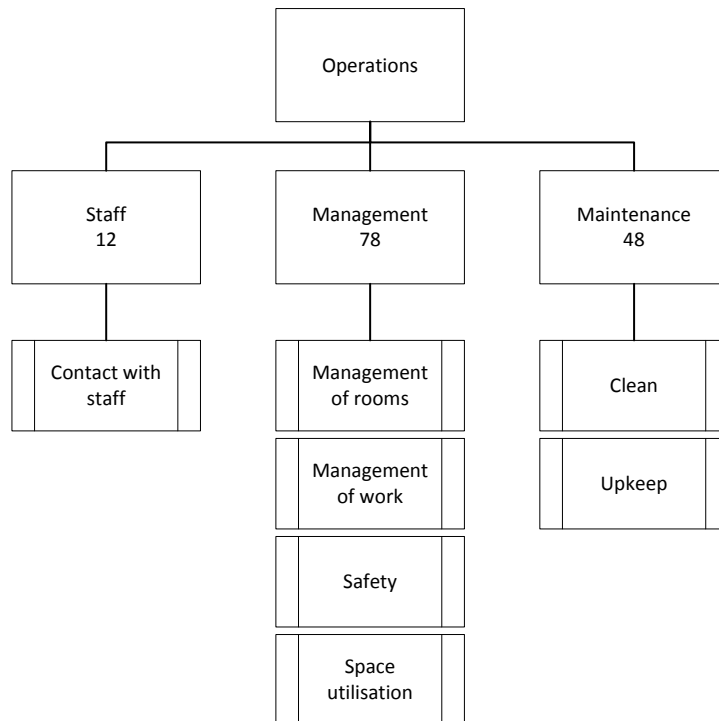


Figure 5.5 themes for the feature operations

#### 5.5.1.1. Maintenance

Maintenance was important for all students. Within the middle level theme of maintenance two lower level themes were noted, cleanliness and upkeep. When considering the maintenance of the building it is important that it is kept clean and the upkeep is considered.

When discussing what they like in the learning environments, students noted that they look for *“how clean it is, that’s the big thing”* (FG 7). This is further supported by discussing what makes a quality building; a student noted that *“I think it’s just a nice building it’s always clean”* (FG 6). Also in the other direction students appear to feel that they make perceptions of the building’s quality by the cleanliness if *“nothing had been cleaned in ages that wouldn’t be high quality to me”* (FG 8). Therefore keeping the building clean should be a priority to make sure students are satisfied with the environment.



## Phase two

Another factor in the maintenance of the environment is upkeep. Students appeared dissatisfied if their work spaces were too untidy, some students noted that they were unhappy with how untidy some workspaces could get. Therefore, keeping space tidy is important to their perceptions of the environment. Furthermore, keeping on top of other tasks appears to be important, when discussing the furniture a student stated, "*they are always broken*" (FG 6) which needed to be improved upon. Also when looking at the rooms students noted that improvements needed to be made, "*it needs painting*" (FG 7), therefore keeping on top of these maintenance issues appears to be important for students. Keeping up to date with the upkeep of the building appears to be noticed and appreciated by students, one noted that, "*They are developing it's not like they aren't doing anything it is encouraging*" (FG8).

### 5.5.1.2. Management

Specifically all students discuss the importance of the space being utilised correctly.

Within the middle level theme three lower level themes were discussed, management of rooms, management of work and safety. Students noted that "*better management*" (FG 3) was important for the learning environment to represent quality. Within this students noted that management of specific rooms was important, it was noted that having timetables outside of each classroom is useful. Therefore by better managing and identifying rooms that are not in use and are therefore available for students to use would help students. Furthermore making the rooms ready for the class was highlighted by students. When asked what would improve the environment a student said "*for the rooms to be prepared beforehand because they only turn on the heaters when we arrive*" (FG 3).

Another low level theme that was noted was the management of work within the building. Managing any work in the building was important to students "*if you need to tell someone that say the bathroom flooded or there was a leak somewhere you would be able to find someone to sort it*" (FG 6). It also appears to be important to students for any work that needs to be done, to be managed appropriately for lectures. When asked what could be improved in their learning environment a student stated "*some of the rooms are a construction site here as well they didn't finish their work over the*

## Phase two

*summer so it's just drilling and hammering away*" (FG 8). Therefore managing work appropriately appears to be an important factor to consider in the student environment.

Another low level theme students noted as important was their sense of safety. *"I think security is another big thing for the campus and we don't have any security"* (FG 4). It appears that feeling safe in their environment is important and they don't like it when *"literally anyone can walk into our building onto any floor into any room and I think that should be looked at"* (FG 4). To manage safety students think *"the barriers at reception are quite good"* (FG 6).

Finally in management students noted that the proper utilisation of space is important. This is highlighted across many parts of the university in the appropriate facilities, *"that cafe is literally not used I've never seen it being used"* (FG 2). The students feel that *"they could optimise that space because it's empty"* (FG 8). Having this space may help optimise their work space *"good use of space, because in the Aldham library some of the group rooms they are quite small. So if you've got like 3 or 4 people in there then it's a bit of a squash"* (FG 9).

### 5.5.1.3. Staff

Another middle level theme that was important to students was staff, within this was noted contact with staff, although it only had 12 references it appeared very important to some students in the way they perceived their environment. When asked what is good about their workspaces students noted, *"the tutors are always around though you are always welcome"* (FG 5).

Students from all of the different schools identified operations as an important feature in their perceptions of quality in the learning environment.

### 5.5.2. Design

The second theme that was identified that students regarded as being important in the PLE is the design.

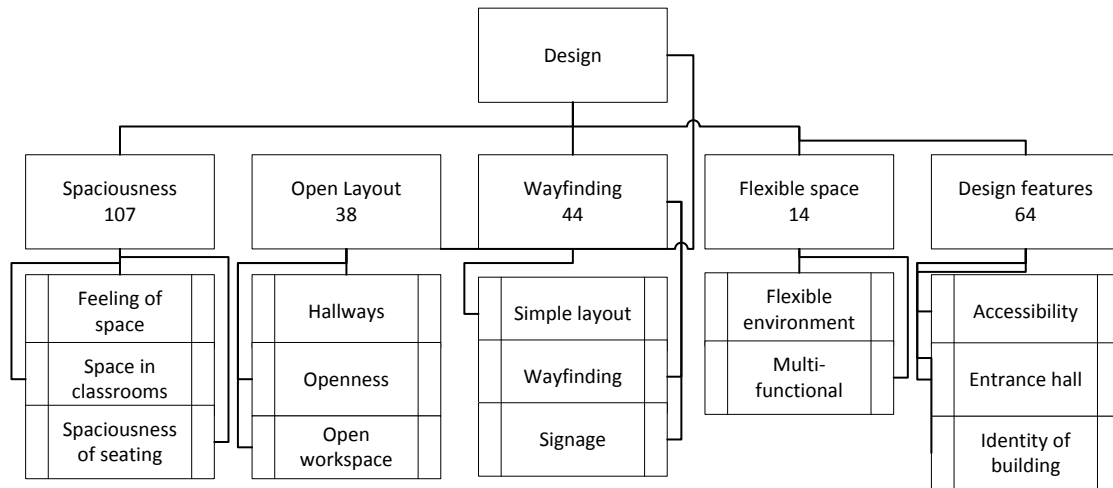


Figure 5.6 themes for the feature design

#### 5.5.2.1. Design features- Accessibility

A high level theme that was also identified from the focus group discussion was ‘design’ within this were several middle level themes; ‘Spaciousness’, ‘Open layout’, ‘Wayfinding’, ‘Flexible space’ and ‘Design features’. Students discussed these features as important for the development of a quality learning environment within the University environment.

A low level theme that students discussed within design features was accessibility. Students noted that being able to access the buildings is important to them in their perceptions of how effective the building is. *“some of the access is a little strange” (FG 4)*. Easy access to the buildings appears to be important in the consideration of the design. *“ I think accessibility as well the main entrance is off the main road, where I park there is not side access so I have to walk all the way around” (FG 4)*. Not having the appropriate and easy access to the building appears to be important for students. As well as providing access to the building itself, students discussed factors such as accessibility to the site its self, *“people want bike storage” (FG 2)*, therefore providing this allows students to get to university knowing they can store their bikes safely. Additionally, students noted that *“there could be more carparks dedicated to the Uni”*

(FG 4), allowing students who live at home or away from university to access University more easily.

#### 5.5.2.2. Design features- Entrance

Another low level theme discussed within design was the Entrance to the buildings, students discussed that when walking into the entrance they like *“a sense of arriving”* (FG 1). Students noted that in some of the buildings they use the front *“entrance is just horrible”* (FG 4). However, in some *“the foyer is big and when you walk in it’s fairly fancy”* (FG 2) and in some *“you get inside the foyer it’s quite nice as a drop off before you get into the rooms”* (FG 5). With students discussing how the entrance hall is, suggests that this is an important feature to focus on when designing a suitable building. Additionally to the entrance hall students appear to have a preference for glass frontages, *“there is more glass In the foyer in my personal opinion it’s glass that gives the feeling of quality in a space”* (FG1).

#### 5.5.2.3. Design features- Identity

Identity was also identified as a low level theme, in one group with art and design students they said they like that building because they could tell *“it is an art and design building”* (FG 3). Furthermore, the engineering students noted that they *“like the fact that we have a self-contained environment just for us”* (FG 5). This highlights that it is important for students to have an identity in their environment that they know that it is their space. Furthermore, it was discussed that the environments should be designed for the students who use them, *“I think this area provides a lot of what it just needs it’s been designed that way for a certain course with a lot of thought about who they are”* (FG 1). Students note that having the spaces designed for the people who use them will impact their satisfaction with the environment and designers should *“focus on the target market”* (FG 8). In the conception of the design of buildings the people who are actually going to be using the space is important; *“this actual campus building is the built environment so there is like architects there’s building surveyors and civil engineers so you would think that the building itself would reflect the sort students and staff within it”* (FG 4).

#### 5.5.2.4. Flexible space

Another middle level theme was flexible space with the low level themes of 'flexible environment' and 'multi-functional space'. This provides students with the opportunity to adjust the space to meet the needs of the group, individual or work type. Students discussed features such as *"a foldable wall possible so that in case you just want to close off one part of the room"* (FG 1). Therefore this multifunctional room allows the students to use the space how they need; also *"you can go and get more than one thing done in one area"* (FG 4). Furthermore having the flexibility in classrooms with moving furniture allows students to interact with each other and develop an appropriate learning environment. Students noted in some classrooms *"you can just spin your chair around and speak to every one because you are in little rows you can just turn around and talk to everyone who's there if you are struggling and then you can just wheel over and help them or someone can wheel over and help you"* (FG 7). Overall students noted that more *"multi functional"* (FG 4), *"more interactive space"* (FG 4) encourage their learning within the physical environment.

#### 5.5.2.5. Wayfinding

Another middle level theme within Design was 'wayfinding', students discussed the ability to get around the building easily as important for their perceptions of the physical environment. Within this theme three low level themes 'simple layout', 'wayfinding' and 'signage' were identified as important features. Students noted that within the university buildings *"there's not enough signage it's not that clear"* (FG 4). This had a negative effect on their perception of the physical environment because *"you have no idea where you were going and you are just walking around hoping you see someone else"* (FG 4). Students also noted that *"it's the way it's laid out"* (FG 2), so as well as appropriate signage, students feel that a simple layout would make the physical environment better. One student noted that both of these features are important. *"it doesn't make any sense the way the rooms are numbered and laid out"* (FG 2). Students noted that it would be better if it was easier to way find noting different areas would be better *"if each one had a different colour code"* (FG 9). And as a new student a *"better knowledge of where there are study places"* (FG 2), improve feelings towards the physical environment.

#### 5.5.2.6. Open layout

Another middle level theme within the theme design identified was 'Open layout'. When students were asked what could improve the sense of quality within the environment a students noted *"more open spaces"* (FG 9). Some of the spaces that students like the most were open spaces, with one student noting from the vignettes *"I like that one the best it's quite an open space"* (FG 10). This preference for open spaces may be because *"it's quite an open environment so people can interact more easily rather than a tight environment"* (FG 1). Furthermore having open workspaces appears to be important because *"it's not claustrophobic"* (FG 1). This open layout extends past the learning spaces but to hallways in some areas of the university students didn't like the small hallways *"walking down the corridors like two people passing is like too much really"* (FG 1). When comparing the buildings students noted improvements should be made; *"a better use of space in most places because the Redmond's building is quite good but then when you get into the library and the John Foster building, there are a lot of things squashed together"* (FG 9).

#### 5.5.2.7. Spaciousness

The final middle level theme identified within the design was 'Spaciousness'. 'Spaciousness' is largely discussed within all focus groups. Three low level themes identified were 'spaciousness of seating', 'space in classrooms' and 'feeling of space'. Therefore, it appears to be overwhelming in students' satisfaction with the environment and their perceptions of quality. Students noted that in classrooms there is little space *"some of the lecture rooms are too cramped"* (FG 4) and that for some people this impacts their learning; *"one of my friends, my flatmate who does mental health nursing has to arrive to her lecture early like 10 minutes early because if she is late people have to sit on the floor because there is not enough space"* (FG 2). Not only is seating lacking but desk space should be more spacious, *"the actual tables you write on like the benches are quite small so like my A4 sheet would be like hanging off the side"* (FG 7). More "Spaciousness" (FG 3) is required in the entire building as one student noted, *"I think this building is too busy"* (FG 4) and that *"for the size of our university they should have a lot more space"* (FG 7). However, students did also highlight that some of the university does offer this space, *"I quite like the open design of it when*

*you first go in its just nice spacious” (FG 2), this furthermore highlights students’ requirements for spaciousness out of the physical learning environment.*

### 5.5.3. Rooms

Another theme that emerged from the discussion was the importance of rooms for students’ perceptions of quality in the PLE.

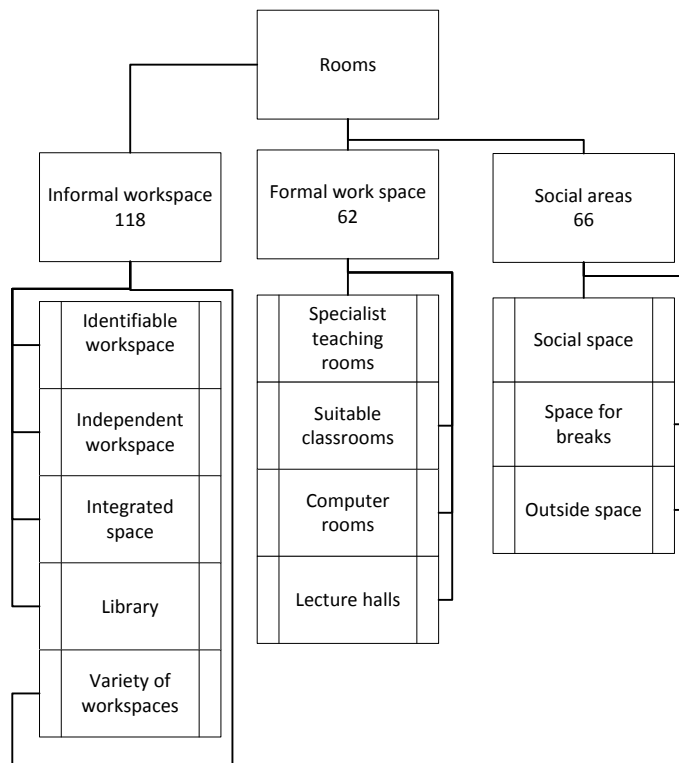


Figure 5.7 themes for the feature rooms

Students discussed many areas around the University that are integral to their learning experience. These places around the university which support students’ learning, for example are rooms where teaching takes place, are for independent learning, e.g. the library or are for socialising. Within the high level theme of place the middle level themes of ‘Informal workspace’, ‘Formal workspace’ and ‘Social areas’ were identified.

Within the middle level theme of Informal workspaces five low level themes were identified; ‘identifiable workspace’, ‘independent workspace’, ‘integrated workspace’, ‘Library’ and ‘Variety of workspaces’ were identified.

5.5.3.1. *Informal workspace- Identifiable workspace*

Students noted that they would like to have a clear area for working, currently there is a lot of working space in the university that is also a cafe. However, students discussed the idea of having separate spaces, *“it would probably be better if there was a space for one and a space for another”* (FG 10). With one student highlighting that currently *“the social spaces and the studying spaces are combined and they should really be one or the other”* (FG 10). Additionally to having specific workspaces students would like to be able to denote as a workspace for the school that they are in; a student highlighted this would be beneficial *“because then you’d have all your business ones[rooms]... but just each floor is designated as kind of specialised”* (FG 9). For the students from Engineering they have a space dedicated to them *“just for the school of engineering so product design people and electrical engineering can all use this space”* (FG 8). They found this space to be beneficial to their learning experiences as they could access the specialist equipment they required.

5.5.3.2. *Informal workspace- Access to workspace*

Unsurprisingly students discussed the requirement for the ‘access to workspaces’ in university. Some students discussed the importance of having workspaces within the university because they *“need to get out of the house to do work”* (FG 4). Therefore providing space within university is important for students to access suitable learning environments. It was noted however that *“there’s nowhere round here where you could just sit and do work”* (FG 2), therefore currently the environment is not offering what is required. Students highlighted that *“the building is essentially focused on the Starbucks downstairs it isn’t necessarily a place where people can interact for study purposes it’s just that cafe”* (FG 4). This further highlights the students’ preferences for specific workspaces accessible to them beyond the cafe environment. Although there are some workspaces currently available to them, students noted that these are rather busy but that they *“would always prefer to do some work in there but always end up in class rooms where there are not the resources we need really because we are limited by space I think”* (FG 10). This highlights students’ requirements of having access to the appropriate workspaces.



#### 5.5.3.3. *Informal workspace- Integrated workspace*

Students discussed the importance of having integrated workspaces into the PLE *“it would be better if was more integrated into the space”* (FG 4). The students described this as having access to workspaces all around the university campus some students commented that more workspaces should be provided across the campus. Although the library has been highlighted as, being important for students having these additional spaces would be good. *“For instance a bit like the library a room you can go to if you have time between your seminars get a bit of work done and know that you don’t have to travel around the place just to do it.”* (FG 9). The students pointed out in the discussion that this would allow for extra space needed at busy times. *“When people have like deadlines and stuff the rooms like the library get so busy so obviously it’s good to have the option to come into this building and work”* (FG 6).

#### 5.5.3.4. *Informal workspace- Library*

Unsurprising students highlighted that the Library is integral for their satisfaction with the PLE, and is therefore important to their perceptions of quality. Having access to the library is important to students, *“the library is good, open 24/7”* (FG 5) and students are *“in the library every day”* (FG 6). Therefore it plays an important role in their learning experiences. However as already noted *“the library gets so busy”* (FG6) and perhaps more space needs to be allowed for libraries; *“we should have another library because the library is always so full”* (FG 6).

#### 5.5.3.5. *Informal workspace- Variety of workspaces*

Students also noted throughout the discussion that having many different spaces in university is important to them. This includes workspaces such as bookable space, group workspaces, computer rooms, quiet zones and private workspaces. Students identified that a variety of workspaces was integral for their ability to work efficiently.

It was noted that *“Separate spaces like a space for comfort and a space for work”* (FG 3) are important, *“so you have got space for a quiet zone but then if you wanted it you also have space for a meeting, a space that’s casual so you can always mix it about”* (FG 4). The PLE should offer *“group study rooms”*(FG 8) and *“more private spaces if you just want to study individually”* (FG 4). Also enough access to computer space

*“good luck finding a computer because there is none” (FG 2)*. Therefore providing a variety of informal workspaces for students is important, as they need different facilities for different tasks.

Formal workspaces were also highlighted by students in the focus groups as being important for their learning experiences, satisfaction and perceptions of quality.

#### *5.5.3.6. Formal workspaces- Lecture halls*

Lecture halls were noted in the discussion as affecting students' satisfaction they thought that some of *“the lecture theatres themselves are the worst quality” (FG 2)* and similarly another noted *“the lecture theatres are awful.” (FG 9)*. This could be due to the students thinking *“the lecture theatres are just dark and it's freezing” (FG 6)*. In this discussion, it was noted that students were particularly derogatory about the quality of the lecture hall however, some noted *“the upper James parsons lecture theatre I think that's the best one” (FG 7)* and appeared more favourable to this space. Also having enough suitable lecture halls appeared to be important in the focus groups *“there are not that many big lecture halls on this campus really there are only a couple” (FG 8)*. Therefore, the quality of the lecture halls appeared to have an influence on students' satisfaction with the PLE.

#### *5.5.3.7. Formal workspaces- Specialist teaching rooms*

Some students also noted that specialist subject rooms were also important. One person noted that for their satisfaction with the environment they needed *“all of the necessary facilities like the labs” (FG 7)*. Another noted that, *“the best thing for us is that we have that room 222 downstairs” (FG 8)*, which is a specialist engineering computer lab. Having access to this space appeared to have a large impact on their learning experiences. One student also commented on the experiences of others and highlighted *“they say they want more studio time” (FG 5)*, therefore more access to specialist teaching rooms.

#### *5.5.3.8. Formal workspaces- Suitable classroom*

A middle level theme of 'suitable classrooms' was identified through analysis. Students noted that it was important for them to have classrooms that were suitable for the lessons, with students complaining that currently *“you have rooms that weren't*

*specifically designed for you*” (FG 1). Another noted that in one space *“It’s like having an assembly or a gym in a school and then taking out the tiered seating for a play.”* (FG 9), therefore suggesting that the space should feel like a learning environment. Although students do recognise that some spaces do work; *“I think the auditorium works but the lecture rooms don’t”* (FG 3). This highlights that students consider the suitability of the teaching rooms to be important. Within this theme, students readily discussed the importance of the visibility of the teacher in the classroom. Classrooms should be designed suitable for this because *“you can’t really tell when you sit at the back you can’t really see or hear anything clearly”* (FG 3).

Access to social areas was also highlighted by students in the focus groups as being important for their learning experiences, satisfaction and perceptions of quality.

#### 5.5.3.9. Social areas- Outside space

For students having access to social space outside was highlighted in the discussions as being important. It was noted that *“there’s not much outdoor space”* (FG 3) and *“I think people would prefer to sit outside really”* (FG 2). Currently for the students there isn’t much outside space, *“well there is a few trees and grass in the middle, but they haven’t really done anything with it. it would be nice if that was landscaped and it had benches and little areas and it was properly maintained.”* (FG 9). Although it was also pointed out that *“students are only in uni in the bad weather we are not really here in the summer so it is a bit pointless”* (FG 8) so a suggestion may be to *“be more shelter space outside rather than just seats”* (FG 1).

#### 5.5.3.10. Social areas- Plenty of social space

It was also noted that in University *“it’s not all about work you’re here to socialise so you don’t think there is enough”* (FG 4), so having plenty of social areas is important for students. This is further supported by others who state that although *“you are coming to learn but there is also a social side to it so you can sit there and have a coffee and you can sit on the comfy chairs and talk to your friends”* (FG 6). Therefore, the PLE needs to provide this for students. Within the students’ current spaces it was highlighted that *“it would be nice if there was there was somewhere you could go to just chill out”* (FG 5).

## Phase two

### 5.5.3.11. Social areas- Space for breaks

When students are attending University they may have many lectures or seminars in one day and it is necessary for them to stay on campus. It was highlighted that “*there are never enough places to sit and have your dinner*” (FG 10) or when they “*have a two hour break now I want to go and work somewhere and there’s not really that many spaces*” (FG 2). Currently students noted that, “*when I have an hour’s break I just walk home I’m only like 5 minutes away but there’s but if there was more places to sit I would probably go like.*” (FG 3). This is however not promoting a positive on campus learning experience for students, as it does not provide the environment they require. Therefore providing space for students to go when they have breaks would help improve students’ satisfaction with the PLE.

### 5.5.4. Environment

The environment of the PLE was discussed highly frequently by the students, therefore suggesting that this is highly important in their perceptions of quality in the learning environment. Therefore, it influences their satisfaction and learning experiences.

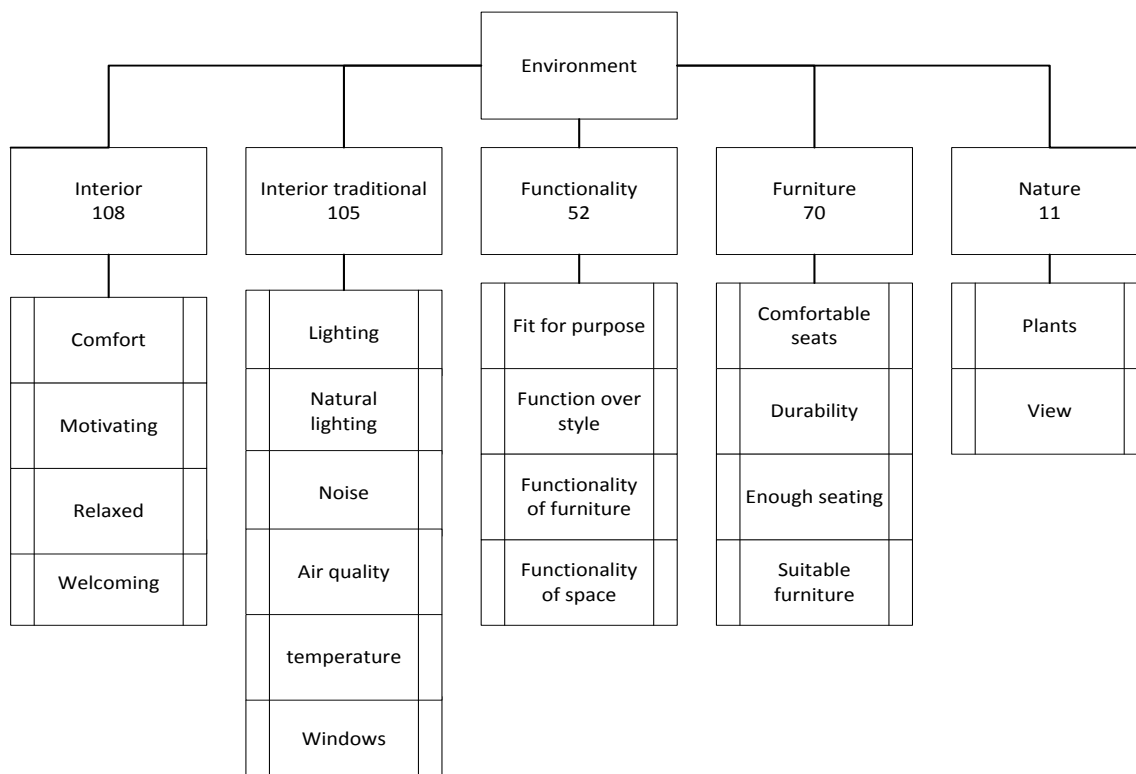


Figure 5.8 Themes for the feature environment

#### 5.5.4.1. Nature

Having a natural environment was discussed by students in the focus groups. One student noted that *“I think it is different preferences for individuals because I had a little tour around Harvard University and that's leafy and nice buildings”* (FG 4), it was perceived that this was nice as it had a more natural environment. Another student noted jokingly that, *“I think a nice plant in the corner”* (FG 5) would be good, although this appeared to get a good response from other students.

#### 5.5.4.2. Furniture

The furniture used in the PLE was also discussed as being important to the perceptions of quality. One student highlighted that *“in some lecture rooms the seats are so terrible and uncomfortable”* (FG 8), therefore this affected their learning experience. This is because *“if you are sat there doing your work all day then it can get quite uncomfortable on those hard chairs”* (FG 5) so *“comfy seats”* (FG 6) are important. Likewise the desks should be suitable too *“the table tops never sit on the legs so sometimes they just fall off”* (FG 5) with students noting that some of the equipment in the building is old.

#### 5.5.4.3. Functionality

An interesting theme that emerged from the discussion about the preferences in the PLE is the functionality. Both in furniture and in the space, but also that sometimes function is more important than style. When discussing a quality learning environment a student noted, *“if it's a very efficient effective comfortable work space you know very thought out”* (FG 2), then it is suitable for their learning requirements. When designing the PLE *“first and foremost when you are considering design in a building is does it do what it needs to do, then make it look pretty”* (FG 7), this is because *“it can look nice but if it doesn't get the job done then what's the point”* (FG 7). Therefore, the space should be *“fit for purpose”* (FG 4). When considering furniture it must also be comfortable as one student highlighted that some furniture does not meet this; *“the single ones [seats] are too big and too annoying and also the tables are too small”* (FG 2).

#### 5.5.4.4. Traditional features

Students also noted that traditional features of the environment are important for their perceptions of quality and that they are highly influential to their satisfaction. Some noted that *“lighting is a real problem in some of the rooms”* (FG 8), therefore, *“dimmer switches would be quite useful”* (FG 5). Additionally for lighting, some highlighted that *“I don't think there is enough natural light the lights are always on in this building”* (FG 7). When discussing two buildings one student confirmed this that *“it's just so dark in there in this one there's all windows”* (FG 6) and therefore they preferred the PLE with plenty of windows. *“I think there are a lot of people complaining about that actually I think it is the henry cotton building and they call it the prison room because there are no windows”* (FG 8). As well as lighting the temperature is important with some saying *“it's always really cold in the lecture theatre”* (FG 2) or *“the lecture rooms are really hot”* (FG 3), with the general consensus that the PLEs has its *“extremes though sometimes I'm really hot and then its freezing”* (FG 4).

#### 5.5.4.5. Interior- Environmental comfort

Another feature of the PLE that students perceive as quality is the comfort of the environment. Noting *“we don't want luxury we want comfort”* (FG 3), *“so when you walk in it's quite an uplifting space rather than being dark and gloomy”* (FG 3). What students meant by this form of comfort is *“it's not like comfort in the way you feel in a comfy chair, it's like the comfort you feel when it's ok to sit down and do some work without being uneasy”* (FG 2). This environmental comfort appears to affect their learning experiences, in the *“John Foster building, when we went there one time, no I didn't feel like I wanted to learn.”* (FG 9). Therefore, the students did not feel comfortable in the space to learn.

### 5.5.5. Cosmetics

Another theme that was highlighted as an important feature in the PLE was cosmetics. These students felt it was important for their perceptions of quality and consequently their learning experiences in the space and their satisfaction of the PLE.

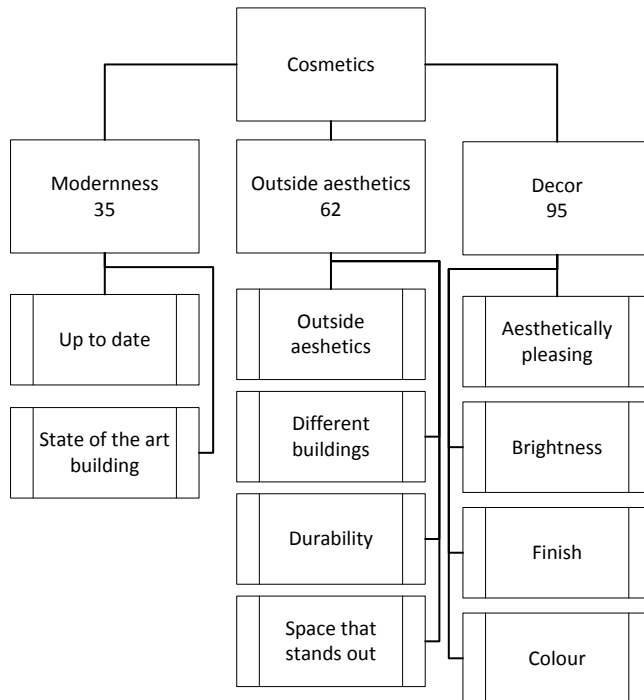


Figure 5.9 Themes for the feature cosmetics

#### 5.5.5.1. Aesthetics of exterior

The outside of the building was discussed as important, students discussed different kinds of buildings within this. Students from the business school highlighted that they did not like the look of the John Fosters Building but like the Redmond's building. *“you could walk past the John Fosters building without even wanting to go in, but this one when you see the design outside you do want to come in and see what is in there and because of the glass you can see what's in there”* (FG 7). However another student highlighted that the John Fosters building looked good *“John Foster on the outside does look really really good because it is a really nice building... there are really nice stained glass windows”* (FG 6). Students noted that *“we all are 50/50 on whether the building is ugly or not.”* (FG 9). It was discussed by one student that they like buildings from other universities *“I liked how they were old-fashioned and they were brick and*

## Phase two

*wood and stained-glass and really colourful and really inviting.” (FG 9). One student noted that the outside of the building is important because “it doesn’t really fill you with much confidence if you come to do an architecture course and the building is ugly” (FG 5) and another suggested, “it affects your perspective because you think the technology in there is old as well” (FG 4). Therefore, the outside aesthetics appears to be very influential on students’ perceptions of the quality of the PLE.*

### *5.5.5.2. Interior decor*

The decor on the inside of the building was also highlighted as being very important for students’ perceptions of quality in the PLE. The PLE should be *“aesthetically pleasing that is” (FG 9)*, because, as one noted, *“it ruins your mood if it’s not aesthetically pleasing” (FG 8)*. Some students preferred *“colour it’s got a very warm feeling to it a very comfortable feel” (FG 4)*, whereas some students preferred *“a blank canvas I’d say it is an art and design building” (FG 3)*. It appeared through the focus group that the decor of the interior was very much down to individual preferences. However overall it was important in some way to all of the students within the focus group.

### *5.5.5.3. Modernness*

Another theme that emerged as being important was the Modernness of the building. Students liked the *“new state of the art building.” (FG 9)* and highlighted that *one building “does look dated so you would assume that the inside of the building is dated as well not that it makes any difference to our performance as students but also it’s the general perception of it” (FG 4)*. Negative points of buildings tended to be *“it just looks like it’s from the 1980s” (FG 4)* or *“old and a bit dated” (FG 6)*. Therefore, emphasising the importance of a modern PLE.



### 5.5.6. Facilities

Another theme that was highlighted as an important feature in the PLE was the facilities the space provides. These students felt it was important for their perceptions of quality and consequently their learning experiences in the space and their satisfaction of the PLE.

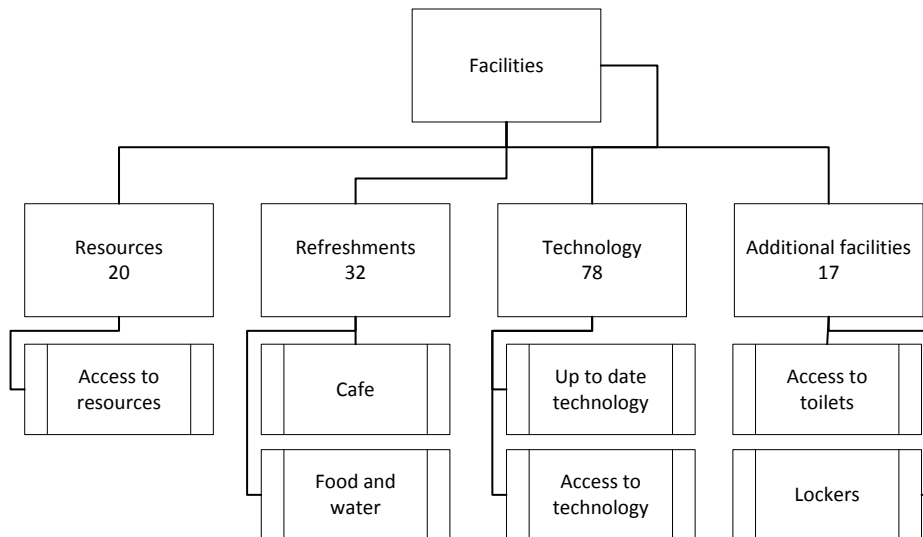


Figure 5.10 themes for the feature facilities

#### 5.5.6.1. Resources

Having access to resources emerged from the discussion as important for students learning experiences. This can be books, drawing boards, printers, computer programmes and many more. Students noted that *“if you had all specific books from the built environment were in a particular space was in a room like that would be good”* (FG4) and *“more A1 printers not just one for the whole building”* (FG 5). In regards to the library resources a student noted *“clearly the library facilities aren’t very good because Solid Works doesn’t work”* (FG 7) however another noted that *“it’s really good like there is so many books as well”* (FG 6). Therefore having the suitable resources is important for students’ satisfaction with the PLE.

#### 5.5.6.2. Refreshments

It also emerged that students also noted that having access to refreshment was important for their learning experiences. One student noted that *“there are not enough water fountains around within the building”* (FG 5). Also to improve the PLE, access to

*“a few microwaves that we can use or kettles” (FG 8)* would be good. For the students’ perception of quality *“having a branded coffee shop... that obviously shows that there is some money going into setting up a branch” (FG 2)*. This is also nice for students because it *“is nice you can come in and go and get a coffee and go to your lectures” (FG 6)*. Therefore providing a good cafe is good for students’ satisfaction of the PLE.

#### 5.5.6.3. Technology

Unsurprisingly technology emerged as an important theme in students’ perceptions of quality in the PLE and being very important in the satisfaction with the university learning experience. It is firstly important to students that they have *“enough computers” (FG 7)*, easily accessible computers around the university are important because *“the computers out there are handy to do a quick bit of work” (FG 9)*. General access to technology such as *“internet” (FG 6)*, *“more printers” (FG4)* and *“outlets are appreciated in the wall” (FG 2)*. It is therefore very important to students to have technology incorporated into all areas of the PLE.

#### 5.5.6.4. Additional features

Other facilities that were highlighted by students as improving their learning experiences were lockers; *“so if we do get books out we can leave them in the lockers and then if we do bring laptops in we can leave them in there because it's a pain having to always bring your laptop in so you can leave them in there and just lock them up” (FG 4)*. Also, access to toilets was important, one noted that it was good because *“there is a toilet on every floor so you can just nip to the toilet quickly” (FG 6)*. Other features included bike storage and smoking space, this therefore highlights that there are a range of feature of the PLE that students consider important that may not ordinarily be considered in the design process.

#### 5.5.7. Summary

Overall, the focus group analysis for the quality of the PLE found some interesting emergent features of the PLE. This research develops existing knowledge and provides emergent theory about how to design the PLE to meet students’ specific requirements. The findings also suggest further development for future research within

this project to develop the original questionnaire identifying the additional features emergent from the focus groups.

## 5.6. Community

To collect information on students' thoughts of how their sense of community could be increased through the design of their learning spaces questions were asked about the PLE and the students' sense of community. The aim of these questions was to identify how the physical learning environment could enhance students' sense of community. Unsurprisingly this was a difficult idea for some as they felt that the building was not a collaborator in developing this sense of community.

When students considered the role of the environment in the development of a sense of community some mentioned that *"I think it come it only comes so far from building I personally think it is more than a building that doesn't develop a sense of community"* (FG 7). However, it was noted, in response, by some that it did play an important role in facilitating this sense of community, *"I think it facilitates a sense of community"* (FG 7). Although when the discussion set out this was a difficult concept for students to discuss. Once the discussion commenced there were some strong ideas and suggestions. Therefore, the emergent factors have been discussed that may contribute to the understanding how students think the learning environment can develop their sense of community. It was highlighted by some in two sources that confidence gets in the way of meeting new people on campus

*"well I suppose it depends how confident you are because you aren't just going to sit next to some random [people] and just talk to them"* (FG 2). If students do not feel they have the confidence to approach new people in the university then this may be quite isolating and lead to a negative student experience, therefore developing an environment that supports this interaction may increase students' satisfaction.

During the focus groups students were asked what they think could be added or changed in the university learning environment to encourage and support their sense of community. From this discussion six higher level themes were constructed, these were; environment identifying with space, layout, sense of belonging, social areas and

workspaces. Students identified lower level themes within these factors that they felt could enhance their ability to create a community.

### 5.6.1. High level themes

Six high level themes were identified in the focus groups, this includes six high level themes that relate to the factors of the design of the learning environments and one is related to the student's feelings towards their current community environment. The focus group analysis revealed that the ability to socialise was discussed, with 126 references for this factor of the PLE contributing to the sense of community. The features layout and workspaces were referenced similarly with 84 and 82 reference respectively, identifying with space closely follows these with 62 references. Environment and sense of belonging appear with 27 and 33 references.

#### 5.6.1.1. Environment

Table 5.4 Community- environment references

Environment	References
Comfortable environment	11
Provides environment and resources	16

The high level theme of environment was found as a factor that would enhance the students' environment, within this were the lower order themes, comfortable environment and provides environment and resources. Although these lower level themes were not referenced many times they were referenced in 5 and 8 sources respectively therefore appear to be important for many students.

When talking about the comfortable environment students talked about elements such as achieving a 'warm environment'. "*more of a warm feel a welcoming feeling*" (Focus group 4). Students also noted that it was important for them to be comfortable in their space. "*people who are comfortable in their space will work better*" (Focus group 3). It was also noted that this comfortable environment helped their decision in choosing to attend LJMU. "*I think the good thing about this university ... it's more laid back it's a more relaxing environment, that makes a big impression, well it made a big impression on me*" (focus group 5).

## Phase two

The second lower level theme was provides environment and resources. Students noted that it was important for them to have the environment the way they required, that the space is flexible. *“you can come in and start making it a bit more interactive”* (Focus group 4). For the environment to be what they require they also highlighted the need for a range of spaces and resources like printers. *“with the student union and there is the Starbucks and the areas around it have computers and it’s got a printer there and then it’s got the comfy seats but then it’s got the desks as well”* (Focus group 6). Space that provides all the resources is good for students to develop a sense of community as they know they can go to the university and have all the resources and facilities that they require including learning spaces and social areas. This means that will stay in university and will interact with others and will feel like they can do their work. *“there is like a lack of equipment in the university as well I think, down stairs if you want to use it then... you have to wait ages”* (FG 3). This student noted that they find there is a lack of equipment in their school therefore they have wait around for the use of it.

### 5.6.1.2. Sense of belonging

Table 5.5 Community- sense of belonging references

Sense of belonging	References
Contact with staff	18
Feels like own space	15

Although this feature, sense of belonging has a few references it appeared to be important to many of the students and to be a distinct factor within the focus groups discussion. Sense of belonging was noted as a high level theme discussed by the students, within this the middle level themes of contact with staff and feel like own space was noted. A student noted that *“there is constant communication with all of the staff and I think from day one we are integrated into that environment straight away which makes us feel like we are involved”* (FG 10). So having contact with the staff helped them feel like they belong because they were involved. Students also noticed that having easier access to where staff are would help, *“we have surgery hours but they are all in the Cherie Booth building but if they were to be situated within these learning areas then they would again be much more accessible”* (FG 4). As well as

## Phase two

lecturers it's important for students to see other member of staff *"the library is really good like if you want to find out about careers it's really really good"* (FG 6).

Students also discussed the theme of feeling the space is theirs. A student noted that *"its not for anyone to use so everything that is in it is to help us"* (FG 6). Having access to the building supported their sense of belonging *"I've got a card we have got cards so we can get in I think because everywhere has such ease of access"* (FG 10).

### 5.6.1.3. Identify with space

Table 5.6 Community- identify with space references

Identify with space	References
Displaying students work	6
Home building	9
University Identity and branding	35
Subject area	12

The higher order theme discussed by students was the ability to identify with their space. Within this the lower order themes were; displaying students' work, home building, identity and subject area. This area was discussed more often by the students with 51 references in the sources.

Firstly students discussed that it would develop a sense of community if students work was displayed. *"I think it would be nice to have a proper display area where you can see people's work and stuff... I would also like to see a future wall where you can see peoples work and stuff and it can lead to a bit of an inspiration"* (Focus group 1). It was discussed that it would be an inspiration and motivation for their work. *"showing past students' work and what they're accomplishing now and showing that inspiration, that type of motivation as well"*. This may act as a connection to their environment. *"if you got to the second floor it is all marine stuff but you can tell that because of the walls, but I don't know if there is any sort of built environment area"*. Therefore, by displaying work students have a connection with other students who are there and who have completed their course already.

Students discussed having a home building, a place that they knew as their building and could go to work there. The students from art and design and business students highlighted this factor as something that provides them a sense of community in their existing buildings, which may highlight that they have a more defined environment.

## Phase two

Students noted *"I think this is officially our building"* (focus group 6) because their building consisted of similar students. *"it's business type ones like business management and HR but they are all the same"* (Focus group 6). This could be because they feel connected to the space and it is theirs which is highlighted by a student, who had visited another university. *"Westminster university is classed as a business building not business and architecture because I looked there as well it just classed as a business school so you [architecture] are just like shoved in there"* (FG 5). This suggested that they like to have a distinguishable place to work, which is further supported by another student. *"You'd think this is a business building. Make it more like a business building"* (Focus group 9). It is therefore noted from this that it is important to students to have a distinguishable home building.

University identity was also pointed out by the students as attributing to their sense of community within the environment. One student noted that *"we have got no identity of a floor or a room"* (FG 4), therefore suggesting that it is important for students to feel like they belong somewhere. This is supported by a student who stated that *"I walked through the university of Liverpool the other day and I felt, I need to leave, because it wasn't really my territory as they've made it their own"* (FG 9). The student felt as though they did not belong when they visited the other university. Creating this sense of identity both in and out of the university, for the whole university and specific schools could help to support a sense of community. Within the university identity a lower order theme was highlighted, branding. Students like the university having specific branding. One student noted that another university *"get a hoodie that instantly gets them into the feeling that I am part of this university"* (FG 8). This branding can be within the university *"if we unite the furniture, it may improve the sense of community with other facilities at LJMU maybe more interactive with other facilities... that is the best thing I can think of for providing a sense of community"* (FG 1). This would unite the university together as a whole.

Alongside developing a sense of community through an identity, a specific area for subjects was discussed. Students felt that the environment could be enhanced to develop their sense of community by having a devoted area specifically for their course or school. One student noted that *"I don't know if there is any sort of built environment"*

## Phase two

*area we are situated everywhere so one definite place we could go to would be good*'. Another student stated that this may not only be suitable for the main university it was noted that they would like this space *"especially in the library. I'd love that if there was a business floor"* (FG9). Students who have this space already noted that this supported their sense of community because *"you have got your own spaces"* and this was because *"you can leave your stuff there and people on your course will respect your own stuff whereas other people might move it"* (FG5). One student also said *"Say if you had pictures around, you'd realise 'I'm in the business school'."* (FG 9). This suggests that students would like to have a definite identity of where they are situated.

### 5.6.1.4. Layout

Table 5.7 Community- layout references

Layout	References
Campus environment	41
Open layout	18
Wayfinding	25

The third higher order theme that was noted from the data was the layout. The middle level themes that make up this factor are; campus environment, open layout and wayfinding. This section was spoken about in a significant proportion of the data with a total of 84 references. The second most mentioned theme, with 41 references, within developing a sense of community was the benefit of a campus environment with the university being connected. Students stated that *"I think having the buildings within quite close proximity to each other helps if you have them too far apart that can over time wear down the sense of community"* (FG 1). So developing a campus that is close together may help with developing a community because *"if they were closer together then you would get a lot more mixing"* (FG 1). So you wouldn't have the separation between students it would be integrated so there was opportunity to meet others. When discussing another university student noted that *"it's like they have got their own village or their own little town in the city where as John Moores is very spread out"* (FG 3). Currently Liverpool John Moores University has separate campuses and students highlight this as having a negative effect on their sense of community. A student also noted that a campus environment is good because *"it just makes me feel like a student. It makes you have that student experience of you are in this big environment and*



## Phase two

*you're not travelling from this building to that building*" (FG 9). Therefore, creating this connected campus environment may help to positively affect the students' experiences.

Open layout was noted as a factor in the design that would support students sense of community. Having an open layout was noted as being beneficial "*because if you haven't got walls and doors between groups then it's is more sort of close where you can choose to talk to people*" (FG 1). The ability to have the openness to meet people appears to be important "*the central entrance there everybody meets everybody there but once you go beyond that, like the cafe downstairs it's just a cramped space*" (FG 3). Having the enclosed spaced does not enable people to meet and talk therefore affecting their ability to socialise with others. This has been noted to negatively affect their ability to bond "*we've noticed that our year took a long time to bond as our seminar groups because there's so little space that a lot of people in between classes were just going home*" (FG 9). Therefore, creating enough open spaces for people to meet and interact appears vital for students to create relationships with their peers within the university.

Another factor in the layout of the buildings is the ability for students to find their way around. Students noted that they "*don't really know where the lecture theatres are and how to get all the way to them*" (FG 2). In the university students find getting around the university difficult and therefore may not make full use of the facilities, it was suggested "*you need a sign pointing to it from the beginning because if I have no idea where it is as I'm not going to get there*" (FG 2). With correct signage, students would then be able to identify where they were and where they needed to go. Some students noted that they did not know areas of the university even existed "*it was only a few days ago that I realised there was a bottom floor to the Aldham library*" (FG 9). It is however noted that four out of five of the focus groups of students who discussed problems with wayfinding were first year students and had therefore not attended the university very long, this may contribute to their lack of ability to find their way around. Therefore reducing this feeling of not know where buildings are straight away may help students feel like they belong.

## 5.6.1.5. Social areas

Table 5.8 Community- social areas references

Ability to socialise	References
Social area	46
Societies	10
Space to meet others	33
SU	37

Somewhat unsurprisingly, ability to socialise was recorded as a higher level theme within this the middle level themes were social areas, societies, space to meet others and Student Union (SU). This higher level theme was the most referenced therefore appears to be the most important factor in supporting a sense of community. Firstly students noted that *“more social space and a dedicated social space”* (FG 9), would enhance their sense of community. This means they can meet others, *“if you turned up 10 minutes early, there is the sense of community... if a couple of other people have turned up early as well”*. It provides students with space to meet others, it also may provide an opportunity for students to give each other support. A student noted, *“we all had really difficult presentations the other day we all were a bit disheartened, we all waited downstairs, and we all sat in the SU and we all chatted it out and it was really nice”* (FG 9). So having the social space to meet provided an opportunity to step away from work when needed. Included is having facilities, such as, *“a cafe in Starbucks”* (FG 2), *“a pool table”* (FG 2), or *“a small TV”* (FG 9) therefore having a mix of socialising space may be beneficial.

Another middle level theme noted was space to meet others, this included other courses and schools along with peers. This has a relationship with having a connected university and open layout however, students noted that it was particularly important to have social spaces to meet people, and therefore may be an explanation for the requirement of the layout. Students noted that *“I would like a bit more integration with people from other courses it would be nice to see them sometimes. A lot of my friends are in a different building so I would prefer to see them sometimes just walking around”* (FG 6). It also appears to help them catch up with others *“between lectures you would go up... speak to people and you had the printer there and I spoke to quite a lot of people on our course while we were there waiting for printing”* (FG 8). Therefore providing this space for students would improve their ability to meet others.

Finally, students discussed the importance of having access to an SU and their facilities, although not necessarily a university learning space, this is a space that is connected to the university and appeared to be highly important to students, with 37 references. When asked about what could be improved in the environment to increase their sense of community a student noted that *“I think it would be better if we had a student union It would increase your sense of community ”d feel like I belong more”* (FG. 4). Having access an SU appears to provide many benefits to students *“if there was a student union you could meet people from clubs and they could maybe encourage you into a club... I mean that would be a sense of community”* (FG 2). It would provide students with a place to meet; a student noted that they would *“meet up there because it is a nice place to meet and because it's a student union you know it wouldn't be expensive and you would be happy to meet up there”* (FG 4).

#### 5.6.1.6. Workspaces

Table 5.9 Community- workspaces references

Workspaces	References
Common room	21
Variety of workspaces	25
Work collaboration	18

The final higher level 3 document in the analysis was workspaces, within the discussed themes were a common room, a variety of workspaces and work collaboration.

When asked about what could be added or changed in the university learning environment to enhance their sense of community students noted *“it would be good to have a common room”* (FG 1). One student said it would be good *“across courses where we could go and have like labs”* whereas another noted that *“each, built environment, law, business, whatever should have their own... study place just for people on those courses”* (FG 4). Although some students suggested that this common room would be a permanent fixture one group discussed having a drop-in space *“each course should have like their own little drop-in space where twice a week they can meet up and if they want to they can go through work”* (FG 7). Having this space that is just focused on their course appears to be important to them as one student said in some space they used, *“we don't have any community really”* (FG 9).

## Phase two

By providing a specific study space for students on the same types of courses this may provide them with the facilities to work together.

In conjunction with the middle level theme common room, work collaboration was highlighted as a theme, the ability to help peers to work together. One student noted that it would be good to “*have a nice place where you are with people that can help you and they are getting on with the same kind of work as you*” (FG 4). This space would be good because “*you are peers helping peers*” (FG 7), so people don't feel on their own with work. A student also suggested that “*you could have different levels of experience so first years with third years*” (FG 7) and therefore there is always that support around. This idea of supporting others would explain why having a space where people from the same courses could meet easily is important

### 5.6.1.7. Summary

Overall, the focus groups discussion on developing a sense of community through the design of the physical learning environment highlighted several important themes that could be implemented into the design of HE facilities to support the students' sense of community.

## 5.7. Comparisons of features identified from focus groups

To further explore the focus group finding simple comparisons of the specific features identified were examined between the four schools. This highlighted some interesting findings in regards to differences in discussion of specific features.

### 5.7.1. Aesthetics

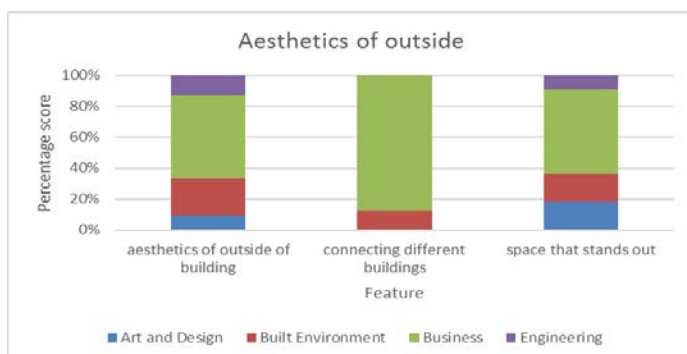


Figure 5.11 aesthetics focus group comparisons

## Phase two

It is interesting to highlight that although it was suggested from the first survey that students from the art and design school find the aesthetics an important factor in their preferences of the PLE, the focus group research did not find this for the outside of the building. However, they did note that they did like that “*you can tell that it is an art and design building because there is paper on the windows where people are doing their work*” (FG). The students from the business school discussed this factor, this may be because their building is the Redmond’s building as one student noted “*we all personally are 50/50 on whether the building is ugly or not*” (FG 9). Therefore, there appears to be a lot of discussion on this topic.

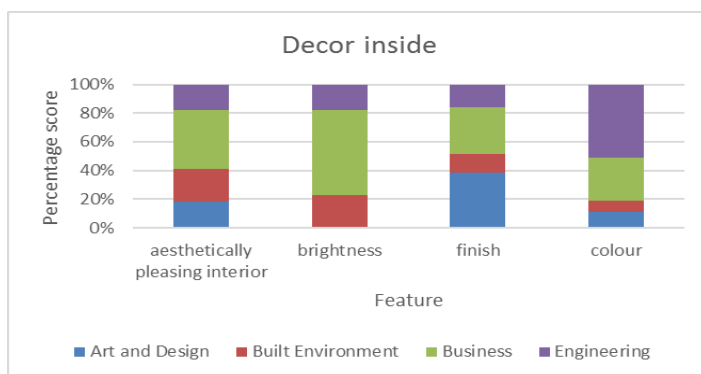


Figure 5.12 decor inside focus group comparisons

Again surprisingly in comparison to the findings from the original survey students from art and design didn't discuss the decor of the inside as any more important than the other students, although additionally it is noted that the business students discussed this the most with all four features within decor inside being discussed largely by them. Furthermore, interestingly engineering students discussed these feature and most notably discussed the importance of the colour of the rooms as being important and influencing their feelings towards the environment. With one students noting “*All of the bright colours in the computer rooms they are a bit overbearing*” (FG 7). Therefore, they do not like it when the colours are too strong and therefore this is a point that they have raised.

### 5.7.2. Design features

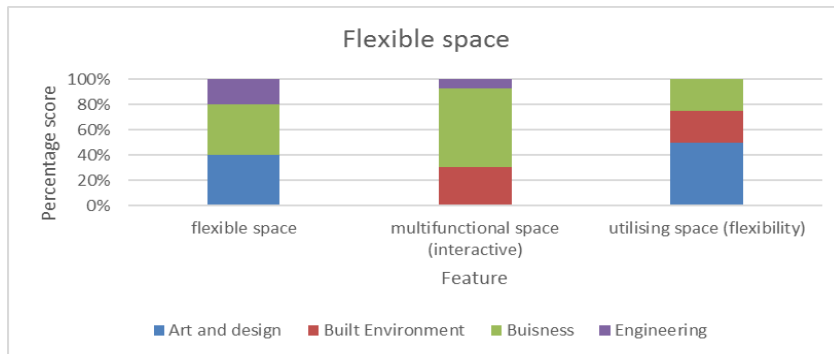


Figure 5.13 flexible space focus group comparisons

Within the theme Design features, the feature flexible space was identified. This highlighted that students from the business school found this important but also that students from the school of art and design found this important too as they discussed flexible space and utilising space. One student noted that “a foldable wall in case you just want to close off one part of the room” (FG 1). Students also noted that utilising spaces properly is important, “when there are no exhibitions it is completely empty nothings in there I feel like that the space should be more used, utilized a lot more” (FG 5). Therefore perhaps providing flexible space for these students is important to enhance their learning experiences.

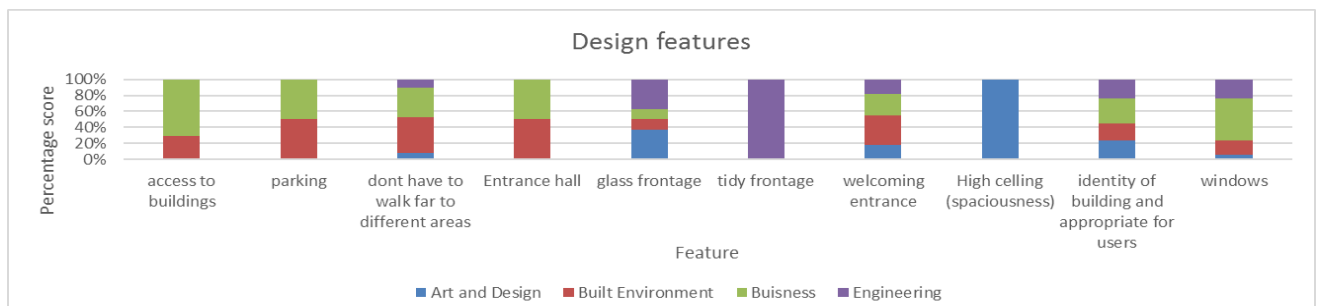


Figure 5.14 design features focus group comparisons

All students similarly noted the importance of the identity of the building. Students from BUE and Business discussed the access of the building as being important whereas students from Art and Design did not discuss these features of the design. Students from the School of Art and Design did discuss that having a glass frontage and high ceilings were attractive to them. Whereas students from Engineering discussed the importance of a tidy frontage and a glass frontage. Although art and design students

## Phase two

do not discuss having windows as much as the other students there was discussion on glass frontages as quality but also the need for natural lighting. From the focus groups discussion, a difference in preferences for design features emerged.

### 5.7.3. Environmental Factors

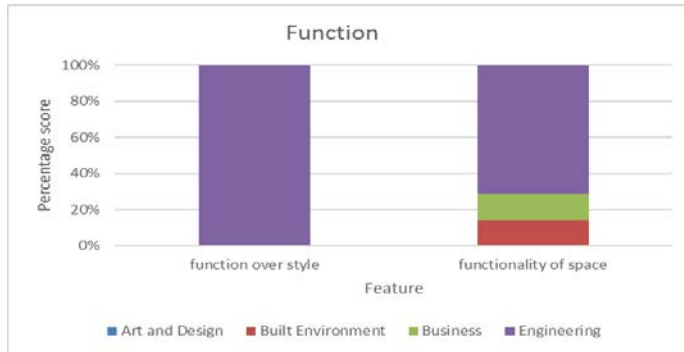


Figure 5.15 Function focus group comparisons

Overwhelmingly from the figure above it can be seen that students from the School of Engineering discussed the functionality of the space to be highly important compared to the other schools. When the theme of traditional environmental features emerged, it appeared from the discussion that sustainability and the control of light was important for engineering students but was not discussed by students from the other schools.

### 5.7.4. Operations

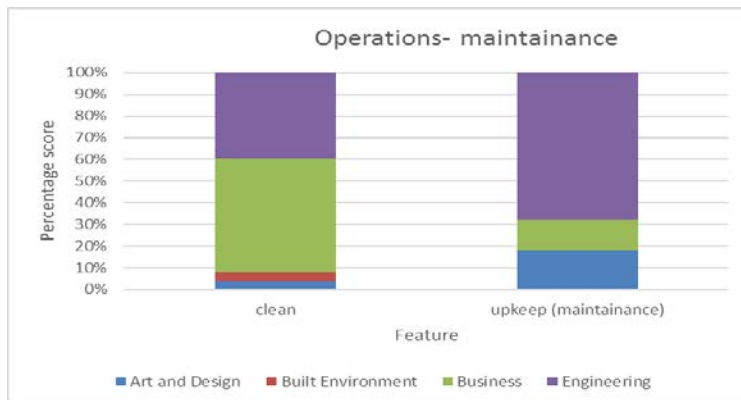


Figure 5.16 operations focus group comparisons

Students from BUE and Art and Design did not discuss cleanliness and upkeep therefore suggesting that this may not be as highly important in their perceptions of the PLE.

### 5.7.5. Workspaces

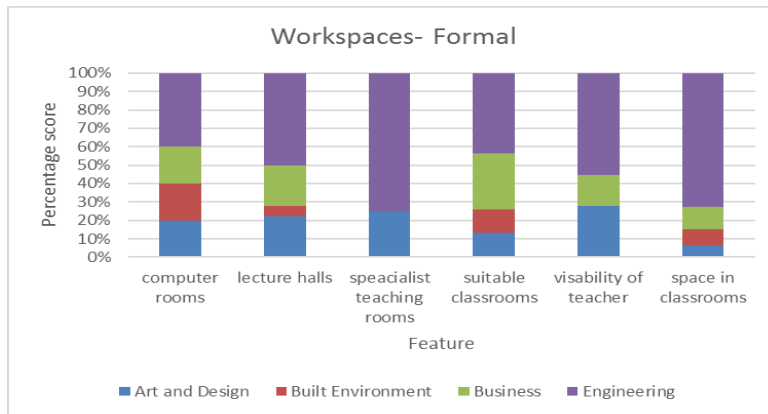


Figure 5.17 formal workspaces focus group comparisons

As can be seen from the above figure students from the engineering school discussed the importance of the formal workspaces more readily than the students from all the other three schools. Specifically they noted that specialist-teaching rooms were important to them. Students from art and design also noted this space was important to them. These two group of students tend to require more specialist space as opposed to the other groups such as labs and studio space. The students from engineering did discuss the need for suitable classrooms, which include enough space and the visibility of the teacher as being very important compared to the other groups. This therefore suggests that students from the School of Engineering focus upon the quality of the formal teaching spaces to inform their perceptions of the PLE.

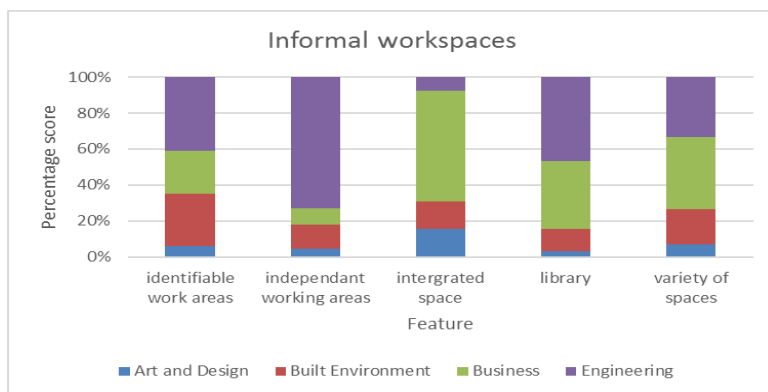


Figure 5.18 informal workspaces focus group comparisons

It is interesting to note that students from the business school discuss how they like informal workspaces integrated into the whole university environment as opposed to



being solely in the library. Although all students discussed this as a feature they would like, students from the business school already have this in the environment whereas the others do not, therefore they are highlighting how much they like this space.

Overall, comparing the discussion from the focus groups through the four schools identifies that there may be differences in the perceptions of quality in the PLE and therefore what requirements different students need. The emergent theory suggests that there are differences that need to be investigated further in order to develop a framework of design suitable for different students.

### **5.8. Summary**

The purpose of the focus group was to explore students' experiences and perceptions of the physical learning environment to identify differences in requirements and understand additional requirements. The focus group interview also highlighted the feasibility and importance of the research as it emphasised through the discussion that students feel that the physical learning environment can affect their learning experiences and satisfaction. This was further supported that it can influence their attendance to certain lessons and their choice of a university it the first place. Therefore, designing physical learning environments that meet students' specific requirements can help with the commerciality of the HEI and with the long-term experience of the students.

The focus groups did highlight certain aspects of the research that needs to be considered moving forward. This research supported the proposition from the first phase of analysis that facilities management features should be considered in the final survey. Consequently, this will be incorporated into the final phase of data collection and be considered for the framework development. Moreover, the research identified that even when an environment is designed for specific students this can benefit the students, for example, the A&D students noted that they liked their building the John Lennon building and said it suited their requirements. Therefore designing environments specifically for the students in mind is beneficial. The focus groups research did highlight that the questions regarding the learning environment and

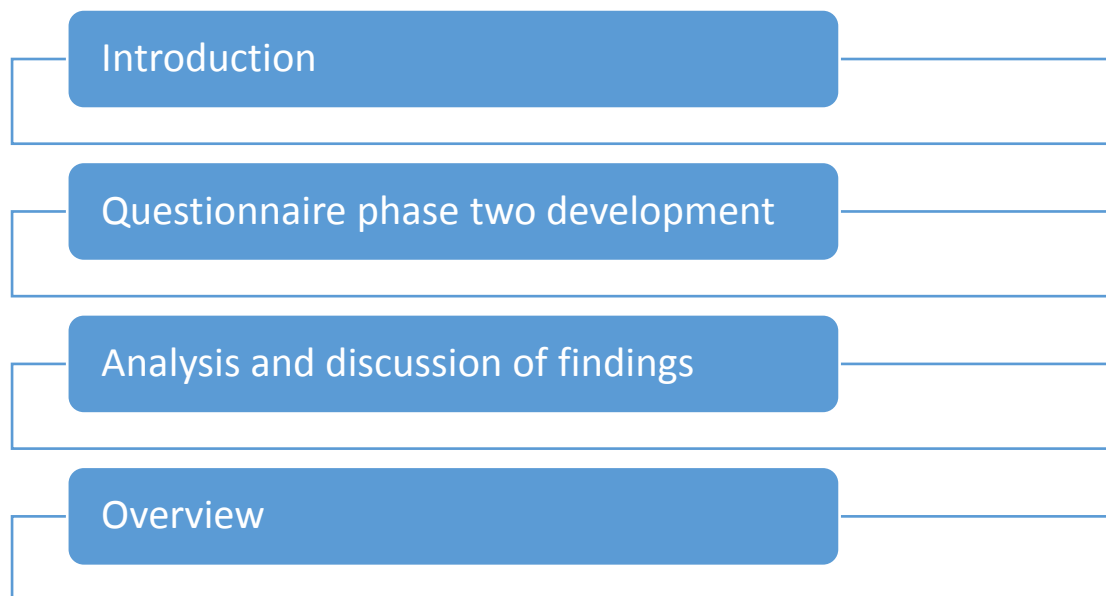
## Phase two

quality gain very similar discussion, therefore further supporting the suggestion from the first phase of data collection to merge these items together.

This phase of research has contributed to the understanding of the first four objectives of this research in determining students' specific requirements in the PLE. This research has developed previous research by asking students directly about their preferences within the PLE. The students identified additional features within the PLE that have previously been missed by solely quantitative research that investigations in the area of space design focus upon.

Overall, the focus groups have identified features of the learning environment that students perceive to be important in the PLE to meet their requirements of quality, and features of community. The focus groups also highlighted differences between schools in regards to features that are important to them, for example for engineering students, the function of the environment was discussed far more than for students from the three other schools.

## 6. Phase three



## 6.1. Introduction

This chapter discusses the third phase of data collection, which utilises the second quantitative approach in this research, a survey. The section will firstly outline the development of the questionnaire, which is developed from the findings from the previous two phases of data collection, the survey and the focus groups. The section will discuss the sampling method and then move onto the analysis and the discussion from this final phase of data collection.

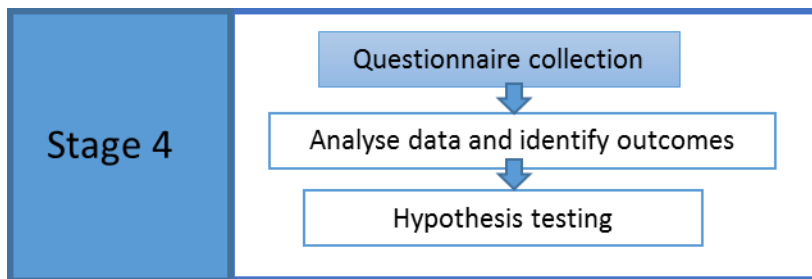


Figure 6.1 Stage 4 research process- data collection

This stage of the research process consisted of the phase three of data collection, this is the collection of questionnaire data, the analysis of the subsequent data and identifying the outcomes of this research. Finally, the hypothesis testing was undertaken in this section of the research, which leads onto the development of a framework of design for HE PLEs.

## 6.2. Questionnaire phase two development

The findings from both phase one and two of the current research led to required changes in the design of the final phase of data collection from the students. The following findings were highlighted from these two previous finding that were important to consider in the designing of this questionnaire

- *Additional features of the PLE highlighted in the focus groups and open questions in the questionnaire regarding developing a sense of community*
- *Additional features of the PLE found through both the focus groups and open questions in the questionnaire about the students' perceptions of quality in their PLE*

### Phase three

- *Overwhelmingly similar findings from the two sections of the phase one questionnaire, Quality and Learning environments, therefore these sections should be merged*
- *Length and ease of conducted phase on survey, therefore phase three questionnaire development should focus on the ease of completion*
- *Personality questionnaire was highly reliable and valid*

Further consideration in the redesign of this questionnaire is the aim for this final phase of research.

- *To validate and examine the findings from phase one regarding the relationship between features of the PLE and personality*
- *To identify features of the University space the students perceive as a quality PLE*
- *To identify features of the PLE that students perceive to enhance the sense of community*
- *To develop understanding of the relationship between the school that a student resides in and the their preferences for feature of the PLE*

In addition to the phase one and two of data collection another literature review was conducted to explore the validity of the findings to inform the use of the findings in the subsequent questionnaire. From the literature review further features of the PLE were identified that had been found in the PLE, however additional features from the focus groups, not identified in literature, were found. Therefore, this validates the use of such features in the current questionnaire development the conducting of this final phase of research in order to extend current knowledge of the PLE.

The personality section of this survey was retained, as this was a good measure of personality in the sample obtained in the first phase of data collection.

As was identified from both the focus groups and the first phase of data collection, the quality and the learning environment concepts should be added together as they are very similar. Furthermore, ensuring students' requirements of the PLE are understood will also help in the identification of a description of quality. Therefore, the two sections of the questionnaire, quality and learning environments were added together as they

## Phase three

were measuring very similar constructs. From the analysis of the first phase of the questionnaire data collection, the results showed very similar findings (see 4.3.4.1 Phase one statistical analysis conclusion). Furthermore from further research development it was understood that measuring all aspects of the environment when considering 'Learning environment', not just the lecture halls etc., was important to understand what was perceived as important in all aspects of the university campus (See appendix 12).

After the addition of the sections into one section about design aspects of learning environments across the whole campus, the section was divided into three sections, using the original foundations of the development of the original survey developed from the DQI (Gann et al., 2003), Build, Functionality and Environment. These were used once again as they were found to be good measures of elements of the design of HE learning environments, and produced interesting results in the first phase of data analysis.

After analysis of the focus group data, it was found that there were factors that should be included in the reconstruction of the questionnaire on the design of space to enhance a sense of community. The focus groups highlighted additional suggestions about the design of the PLE and how it could enhance students' sense of belonging within the university and consequently their sense of community. (See appendix 11) for the additional factors of the questionnaire that were included and where this has been constructed from is displayed.

### **6.2.1. Construction of the questionnaire**

To design the questionnaire the following considerations about the construction of the survey were also accommodated. The first phase of research highlighted the repetitiveness and length of the survey therefore it was considered important to construct the questionnaire differently. The learning environment section and quality section of the original questionnaire were merged into one and split into three smaller sections, for ease of completion. Questions were also formatted differently making use of features such as matrix questions (Saunders et al., 2012).

### 6.2.2. Sampling strategy- phase three

As identified in phase one of the research there were similarities between the original sample of Art and Design school, the school of the Built environment and the school of Engineering. Likewise with the focus groups the additional school, the Business school, was sampled in the third phase of the data collection. This time level seven (Masters students) were included in the sample as many courses consist of four year courses including masters level, therefore would have a similar experience in the HE buildings. This made sure that as much variation as possible in students was accounted for, therefore making the findings more generalizable. The method of sampling for this phase of data collection, similarly to phase one, was stratified random sampling. The students were identified in the same way as in phase one, through contacting the subject leaders in the schools.

The first step in the data analysis process was to identify the demographics of the population sampled. Within the sample there were Males (n=138 62.2%) and females (n=83 37.4%) and unspecified (n=1 0.5%) who completed the survey. With an age range of 21 and under (n=99) 22-30 (n=93) 31+ (n=30). The year of study for the students were; level 4 (n=72), level 5 (n= 44), level 6 (n=50) and level 7 (n= 55).

*Table 6.1 Participant demographics*

School	Frequency	Percentage
School of Art and Design	39	13.5%
School of Engineering	73	32.9%
School of the Built Environment	79	35.6%
Business School	40	18.1%

#### 6.2.2.1. Online survey

An online survey, Qualtrics, was employed again for phase three of data collection. This technique was applied again as it produced a good sample of respondents in the previous survey phase therefore was a viable option to utilise in this data collection phase. This questionnaire was sent out as a link to all students via their tutors and subject leaders across the four schools.

## Phase three

### 6.2.2.2. Pilot study for questionnaire

Once again, the same pilot study method was utilised for this questionnaire. This questionnaire was firstly handed to an expert, the researcher's supervisor to review the validity of the questionnaire. The questionnaire was deemed suitable for the measurement of the intended concepts. The improvements of the questionnaire were considered to be suitable and considered from the findings of phase one and two of the data collection.

Additionally this time a meeting was also organised with a specialist in the design of learning spaces, a lecturer in architecture in LJMU. This meeting was set up to review the questionnaire developed for this phase of the research. The questionnaire was then given to a small sample which gained 16 responses they were asked the following question;

*“Thank you for completing the survey. Could you let me know how long it took you to complete the survey? If you have any other feedback for me it would be greatly appreciated if you could leave it below.”*

It was commented that the questionnaire would take 15 minutes, which was good as the one of the aims of the new format was to be easier to complete in a timelier manner. A couple of issues were also raised related to the simplicity of completing some of the question formats in the bio demographics section, these were reviewed and reorganised to make completion simpler for respondents.

## 6.3. Analysis and discussion of findings

Analysis was conducted on the bio demographics to identify the spread of students. The descriptive statistics show that there was a diverse range of students who participated in the survey, and therefore who have different experiences of the HEI buildings. International, commuter and disabled students all took part in the survey.

*Table 6.2 Phase three demographics*

Demographic	Yes	No
International	39	179
Commuter	86	132
Disability	8	207



### 6.3.1. Data screening

#### 6.3.1.1. Missing data

The first important step in the data analysis process was to check for missing cases. Each data case should have a code, even if there is a no response. Missing data analysis can be used which identifies the case for analysis purposes (Saunders et al., 2012). 136 cases were removed after screening for missing cases. These were removed as between 31 and all responses were missing, therefore might skew the distribution. Missing data analysis showed there was missing data in 6 variables (see Table 6.3 year of study, age sport team, commuter students, disability and international. However, as these data sets were not used in inferential statistics, only for the bio demographic data, missing data analysis did not need to be conducted.

Table 6.3 Missing cases

Variable	Age	An international student	A commuter student	Physical disability	sports team
Number of missing cases	2	4	4	7	6

#### 6.3.1.1. Unengaged responses and Outliers

When examining the data one case 167 was removed after screening for unengaged responses by visually reviewing the data this case was made up of 3s and 4s. There were no outliers.

#### 6.3.1.2. Exploratory factor analysis

The data was analysed to ensure its suitability to conduct a factor analysis. Bartlett's test of sphericity and the Kaiser- Meyer- Olkin measure were used to test for this (Hoxley, 2008).

- KMO = .87
- Bartlett's test  $p < 0.001$

These results suggest that the data is suitable for factor analysis.

#### 6.3.1.3. Extraction and Rotation

For this analysis it was identified that a maximum likelihood estimation was to be used with a Promax rotation.

### 6.3.2. Quality

As described earlier the first phase of analysis is the descriptive statistics. This was conducted on the quality in the PLE section of the questionnaire. First of all the variables were measured individually (see appendix 14), which revealed a good amount of standard deviation with means ranging from  $m=3.07$  to  $m=4.57$ , therefore suggesting the factors at the higher end were rated higher on importance (see Table 6.4).

Table 6.4 Likert scale scoring

Unimportant	Of little importance	Moderately important	Important	Very Important
1	2	3	4	5

This figure below, Figure 6.2 displays the spread of importance for features of the environment. From this figure the most important factors for all students can be seen and also the least important factors. The figure displays the spread of ratings from unimportant to very important factors. From this the factors 'Temperature', 'General maintenance and upkeep', 'Comfort of seating', 'Cleanliness of building' and 'Motivating environment' are rated very important for features of the environmental PLE. For features of the building, 'specialist teaching rooms', 'Access to libraries' and 'Access to suitable toilets' was rated most as very important. And for features of the PLE that relate to functionality 'Room layout allowing for easy visibility of teacher', 'Access to resources and equipment', 'Access to required facilities', 'Access to building', 'Up to date technology', 'Access to technology', 'Spaciousness to avoid overcrowding', 'Contact with staff' and 'safety and security'.

When reviewing the figure as a whole it can be seen that access to technology ( $n=149$ ) is rated as very important most often, with access to libraries ( $n=141$ ) closely following. Cleanliness of buildings ( $n=133$ ), access to resources and equipment ( $n=131$ ) and up to date technology ( $n=130$ ) follow this.

## Phase three

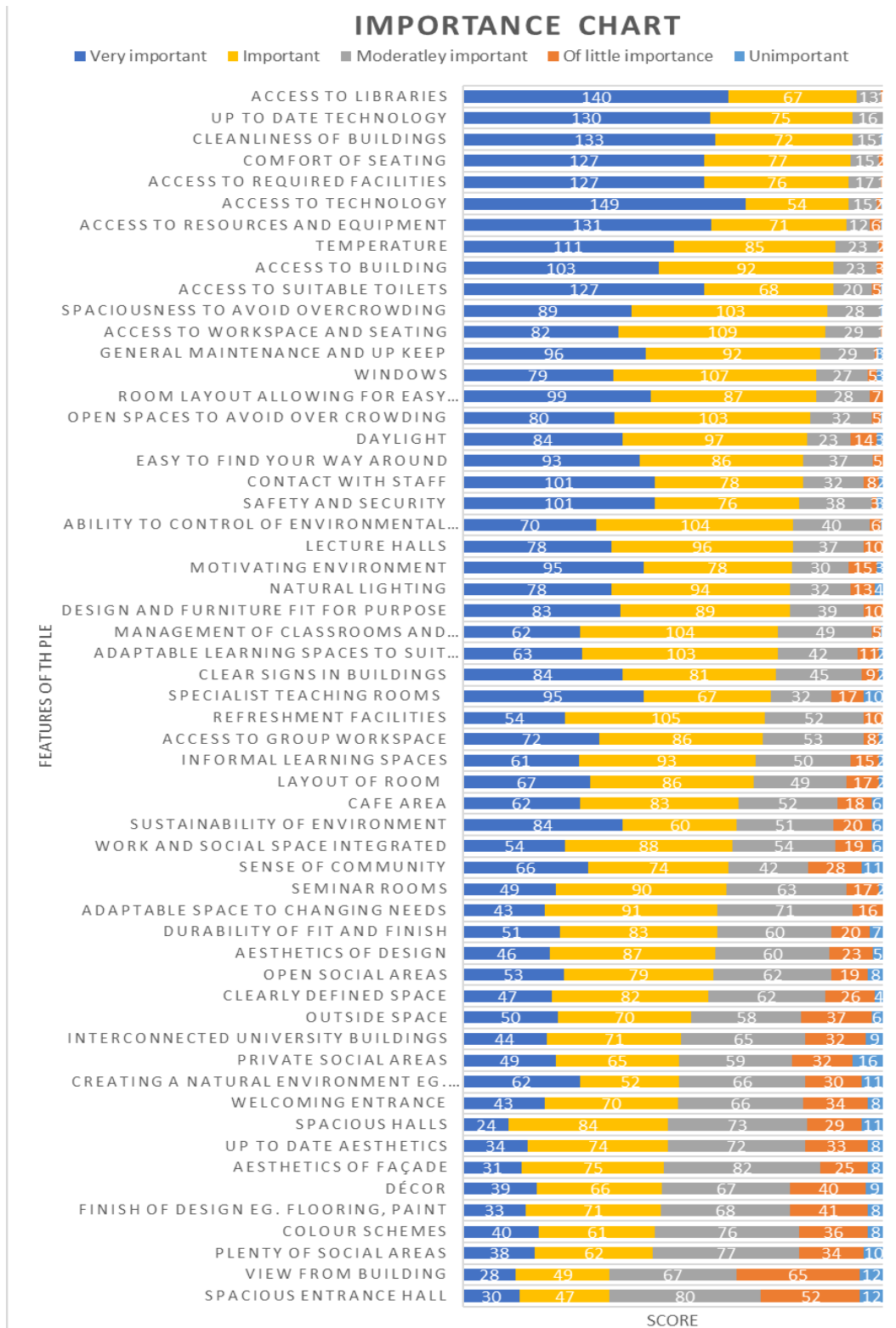


Figure 6.2 level of importance for features of the PLE

To identify components of the PLE that could be used to develop a definition and therefore a model of the design of PLE a factor analysis was conducted on the data.

## Phase three

*Table 6.5 Factor analysis for quality PLE phase three*

Component	Factor	Factor Loading	Extracted EV	communalities	% of variance	Rotation Cumulative %
<b>1</b> <b>Aesthetics</b>	Aesthetics of design	0.78	25.70	.80	8.41	8.41
	Aesthetics of façade	0.72		.75		
	Finish of design. flooring, paint	0.72		.67		
	Up to date aesthetics	0.65		.67		
	Décor	0.60		.64		
	Colour schemes	0.55		.71		
	Durability of fit and finish	0.50		.70		
	View from building	0.41		.68		
<b>2</b> <b>Facilities, equipment and resources</b>	Access to resources and equipment	0.78	6.83	.80	7.94	16.35
	Access to required facilities	0.77		.77		
	Access to technology (. plugs, computers etc.)	0.59		.74		
	Access to building	0.56		.65		
	Up to date technology	0.55		.74		
	Specialist teaching rooms	0.52		.73		
	Adaptable learning spaces to suit lessons	0.46		.56		
<b>3</b> <b>Peer collaboration</b>	Open social areas	0.78	3.76	.77	7.70	24.05
	Plenty of social areas	0.74		.76		
	Private social areas	0.64		.67		
	Work and social space integrated into all areas of campus	0.59		.69		
	Interconnected university buildings	0.44		.50		
	Cafe area	0.43		.69		
	Informal learning spaces	0.41		.62		
	Access to group workspace	0.40		.64		
<b>4</b> <b>Wayfinding design</b>	Clearly defined space	0.55	3.26	.57	6.04	30.09
	Clear signs in buildings	0.55		.67		
	Spacious halls	0.51		.69		
	Easy to find your way around	0.50		.66		
	Spaciousness to avoid overcrowding	0.48		.70		
	Spacious entrance hall	0.47		.68		
	Room layout allowing for easy visibility of teacher	0.45		.68		
<b>5</b> <b>Accessibility of university</b>	Access to workspace and seating	0.50	2.47	.68	5.83	35.92
	Refreshment facilities	0.49		.72		
	Access to libraries	0.48		.60		
	Open spaces to avoid over crowding	0.46		.68		
<b>6</b> <b>Environment feeling</b>	Sense of community	0.57	2.12	.64	5.18	41.10
	Motivating environment	0.50		.65		
	Contact with staff	0.44		.59		
	Safety and security	0.41		.61		
	Sustainability of environment	0.40		.64		
<b>7</b> <b>Environment-traditional</b>	Natural lighting	0.91	1.97	.87	4.99	46.09
	Daylight	0.79		.82		
	Windows	0.59		.65		
	Creating a natural environment	0.41		.60		

## Phase three

A maximum likelihood extraction was conducted with a promax rotation was conducted. The Kaiser-Meyer-Olkin measure confirmed the adequacy of the sampling for the analysis (KMO=.87), The Bartlett's Test of sphericity also presented a significant result ( $p < 0.001$ ) furthermore supporting the adequacy of the data. A preliminary analysis was conducted to explore eigenvalues for each factor within the data set. It was found that 14 factors had eigenvalues over Kaiser's criterion of 1. Combined these components explained 67.50% of the variance. The scree plot suggested due to its inflexions that 4, 7 or 14 factors should be retained. Due to this, and the theory identified through the previous outlined research, 7 factors were decided upon to be retained. The scale of 0.40 suggests that it had a substantial factor loading (Field, 2013).

The factor analysis revealed seven components of the environment that form a description of features of the PLE that students consider important in their perceptions of quality. These components are aesthetics, facilities, equipment and resources, peer collaboration, wayfinding and design, accessibility environment traditional and environment feeling. The combined variance for these factors was 46.06%, this value did lower however by identifying where the factors loadings were better. Therefore, the decision was made to keep the factors as they were as this fitted better into current theory and into the findings of the previous phases of research.

### **6.3.3. Community**

Descriptive statistics were conducted on the section of the questionnaire about sense of community. Table 6.6 displays the features rated most important such as, 'access to required facilities and equipment', 'access to workspaces when needed throughout the day' and 'comfortable spaces'. The least important are the features 'space to meet students from different courses', 'having work displayed' and 'university branding throughout campuses'. However, the features that score lowest still score within the moderately important to important range (3-4). Therefore, these features may be important to some students. There is some standard deviation around the mean (SD=0.82- 1.18) which is good for a five point Likert scale therefore suggesting that there is some difference in the rating of the students. However, the SD did show more

### Phase three

variation towards the bottom of the table, therefore suggesting that there is more variation amongst these features.

*Table 6.6 Descriptive statistics for the community*

<b>Descriptive statistics for the community section of the questionnaire</b>	<b>Mean</b>	<b>Std. Deviation</b>
Access to required facilities and equipment	4.32	0.75
Access to workspaces when needed throughout the day	4.28	0.81
Comfortable spaces	4.21	0.78
Safety	4.20	0.90
Contact with university	4.18	0.87
Ability to control environmental features (eg. lights, temperature)	4.18	0.85
Natural light	4.16	0.95
Access to suitable workspaces	4.10	0.82
Access to private work areas	4.07	0.86
Sustainability of environment	3.97	0.97
Welcoming environment	3.95	0.87
Don't have to travel far to sessions	3.95	0.91
Access to group work areas	3.91	0.87
Open and spacious environment	3.86	0.95
Access to workspace integrated into all areas on campus	3.86	0.91
Plenty of space available on campus for both socialising and studying	3.82	0.95
Cafe area	3.81	0.95
A common room where students from your school/course can go	3.69	1.04
Adaptable work and social space to change for you needs	3.68	0.96
Connected university campus	3.67	1.04
Open work areas	3.67	0.95
Clear signs to define space on campus	3.66	0.95
Space to relax	3.61	1.05
Outside space	3.56	1.04
A clearly named 'home building' for your school	3.51	1.18
Identity of the university that stands out	3.43	1.12
Student Union	3.39	1.23
Distinguishable identity of the school you are from (eg. School of Engineering)	3.35	1.25
Space to meet students from different courses	3.28	1.18
Having work displayed	3.24	1.13
University branding throughout campus	3.20	1.16

The next stage in the analysis of sense of community to identify the aim of this section was to conduct a factor analysis on the factors of the questionnaire. This was to identify component features of the design of the PLE that could enhance students' sense of belonging and displays the factors identified through the exploratory factor analysis that are important in students' development of a sense of community from the PLE. A maximum likelihood extraction method with a Promax rotation with Kaiser

### Phase three

Normalisation The Kaiser-Meyer-Olkin measure confirmed the adequacy of the sampling for the analysis (KMO=.85), The Bartlett's Test of sphericity also presented a significant result ( $p < 0.001$ ) furthermore supporting the adequacy of the data. A preliminary analysis was conducted to explore eigenvalues for each factor within the data set. It was found that 7 factors had eigenvalues over Kaiser's criterion of 1. Combined these components explained 50.96% of the variance.

*Table 6.7 Factor analysis for community phase three*

Component	Factor	Factor Loading	Extracted EV	% of variance	Rotation %
<b>Access to facilities</b>	Access to required facilities and equipment	1.07	10.694	27.293	27.29
	Access to workspaces when needed throughout the day	.81			
	Access to suitable workspaces	.57			
<b>Clear identity</b>	Identity of the university that stands out	.81	2.633	11.708	39.00
	Distinguishable identity of the school you are from (eg. School of Engineering)	.80			
	University branding throughout campus	.78			
	Student Union	.45			
<b>Environment</b>	Natural light	.80	1.457	3.385	42.39
	Open and spacious environment	.53			
	Sustainability of environment	.51			
	Ability to control environmental features (eg. lights, temperature)	.51			
<b>Peer collaboration</b>	A common room where students from your school/course can go to work or socialise	1.041	1.296	3.345	45.73
	Space to meet students from different courses	.506			
<b>layout</b>	Access to workspace integrated into all areas on campus	.885	1.239	2.795	48.53
	Safety	.490			
	Clear signs to define space on campus	.408			
<b>Social spaces</b>	Space to relax	.861	1.183	2.432	50.96
	Cafe area	.656			

## Phase three

The components were named with the understanding of current knowledge in the design of HEIs and the theory constructed through the current literature identified as: 'access to facilities', 'clear identity', 'environment', 'peer collaboration', 'layout' and 'social spaces'.

### **6.3.4. Learning environment design**

The aim of this research was to develop a framework of the design of PLEs that supports students' learning experiences by understanding the influences of satisfaction on their perceptions of the environment. Therefore, these elements of what students regard as being a quality PLE and developing their sense of community have been merged to identify how to develop the university PLE as a whole considering both factors.

A maximum likelihood extraction method with a Promax rotation with Kaiser Normalisation was the method conducted for this factors analysis. The Kaiser-Meyer-Olkin measure confirmed the adequacy of the sampling for the analysis (KMO=.89), The Bartlett's Test of sphericity also obtained a significant result ( $p < 0.001$ ) furthermore supporting the adequacy of the data. Preliminary analysis was conducted to explore eigenvalues for each factor within the data set. It was found that 16 factors had eigenvalues over Kaiser's criterion of 1. The scree plot suggested due to its inflexions that 8, 11, 13 and 18 factors could be retained. Through analysis, it was decided that 8 factors should be obtained as this produced the most suitable results, without cross loading and unsuitable Eigen values. Combined these components explained 46.09% of the variance.

Table 6.8 displays the components found through a factor analysis conducted to examine features of the PLE. Eight components were found that were distinct from each other. The components were named using the theory identified in the previous phases of research within this project and knowledge of the current literature. The components found were: 'integrated spaces' 'layout', 'aesthetics', 'convenient workspaces', 'access to resources', 'identity', 'environment feeling' and environment traditional'. These components identify the features that students require to enhance their satisfaction of the PLE and their learning experiences within that space.



## Phase three

Table 6.8 Factor analysis PLE

Component	Factor	FL	EV	%variance	Cumulative
<b>Integrated space</b>	Open social areas	0.91	20.78	26.98	26.98
	Plenty of social areas	0.80			
	Private social areas	0.72			
	Work and social space integrated	0.69			
	Access to group work areas	0.61			
	Access to group workspace	0.58			
	Plenty of space both socialising and studying	0.56			
	Informal learning spaces	0.53			
	A common room	0.50			
	Space to relax	0.49			
	Space to meet students	0.47			
	Open work areas	0.42			
	Adaptable work and social space	0.40			
<b>Layout</b>	Easy to find your way around	0.73	4.14	5.37	32.35
	Clear signs in buildings	0.68			
	Spaciousness to avoid overcrowding	0.54			
	Clear signs to define space on campus	0.50			
	Clearly defined space	0.49			
	Don't have to travel far to sessions	0.49			
	Spacious halls	0.45			
	Open spaces	0.42			
<b>Aesthetics</b>	Aesthetics of design	0.87	2.47	3.21	35.56
	Aesthetics of façade	0.81			
	Up to date aesthetics	0.69			
	Finish of design eg. flooring, paint	0.61			
	Décor	0.53			
	Durability of fit and finish	0.44			
	Colour schemes	0.41			
<b>Convenient workspace</b>	Design and furniture fit for purpose	0.55	2.02	2.62	38.18
	Up to date technology	0.55			
	Access to workspaces when needed	0.54			
	Access to suitable workspaces	0.54			
	Access to workspace and seating	0.49			
	Comfortable spaces	0.46			
	Access to workspace integrated	0.44			
	Access to technology	0.42			
<b>Access to resources</b>	Access to resources and equipment	0.87	1.8	2.31	40.49
	Access to required facilities	0.86			
	Access to building	0.52			
	Specialist teaching rooms (eg. labs)	0.44			
<b>Identity</b>	Distinguishable identity of the school	0.81	1.57	2.03	42.52
	University branding throughout campus	0.78			
	Identity of the university that stands out	0.75			
	Student Union	0.44			
<b>Environment feeling</b>	Motivating environment	0.69	1.42	1.85	44.37
	Sense of community	0.42			
<b>Environment traditional</b>	Natural light	0.92	1.32	1.72	46.09
	Daylight	0.81			
	Windows	0.66			
	Creating a natural environment eg. plants	0.47			
	Open and spacious environment	0.42			

### **6.3.5. School differences**

Analysis was conducted on the features of quality in the PLE and the four different schools school of Engineering (ENG), school of the Built Environment (BUE), school of Art and Design (A&D) and the Business school (BUS)

This table shows that there are features that students rate as important and unimportant different between the schools. (see appendix 13)

#### *6.3.5.1. Top differences*

Temperature was rated in the top 10 for students from ENG and BUE but, although not highly rated in the top 10 for the other two disciplines.

The features contact with staff and design and furniture fit for purpose was rated in the top 10 for A&D students. The features access to workspace and seating, easy to find your way around, spaciousness to avoid overcrowding and room layout allowing for both group and independent work were rated in the top 10 for BUS students. Engineering students rated specialist-teaching rooms to be in the top 10 for their preferences. Built environment students appeared to rate features to do with access to the appropriate equipment, for example resources and technology and the workings of the building more important to be in their top 10.

#### *6.3.5.2. Bottom differences*

Some interesting trends appeared when looking in the bottom 10 rated features. For example, colour schemes is in the bottom 10 for ENG BUE and BUS with means of between 3.21 and 3.43 however looking at A&Ds score they rate this as quite important with a means score of 4.00. Another interesting trend to point out is that BUE rate sense of community in their bottom 10 with a mean score of 3.42. However looking at the other 3 schools they rate this a fairly high with A&D rating it 4.2 which is between important and very important, BUS rating this 4.02, which again is a high score. Features of the environment that appeared in all of the disciplines bottom 10 are; Up to date aesthetics, Finish of design, View from building, Plenty of social areas and Spacious entrance hall. The bar charts below aims to further identify descriptive differences and similarities between disciplines in preferences for factors of the PLE.

### Phase three

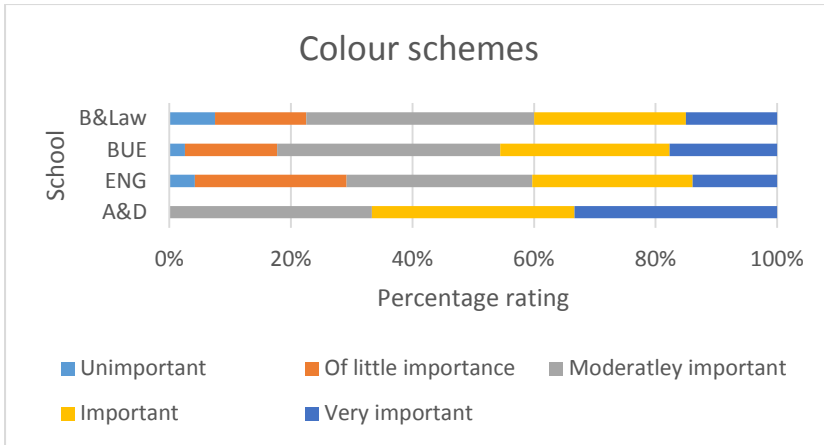


Figure 6.3 school differences- colour schemes

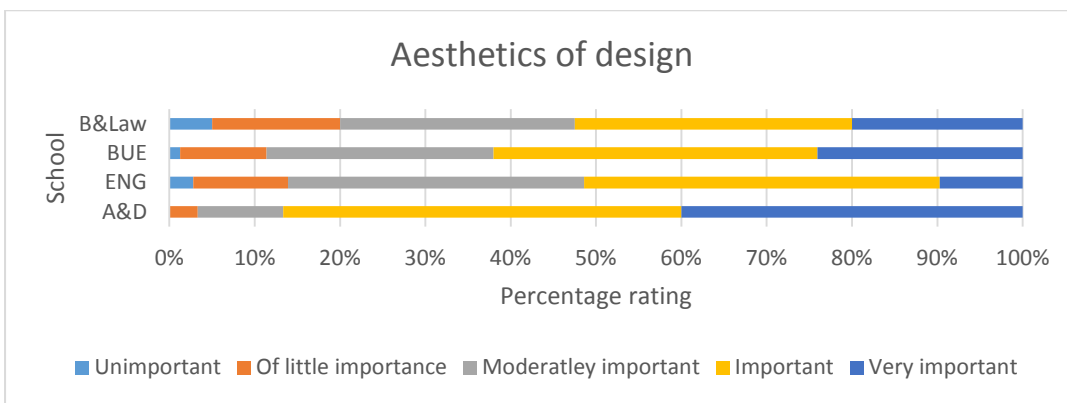


Figure 6.4 school differences- aesthetics of design

As can be seen from Figure 6.3 and Figure 6.4 students from A&D scored aesthetics of design and colour schemes as most important in the design of their PLE, very important and important more than the other students did.

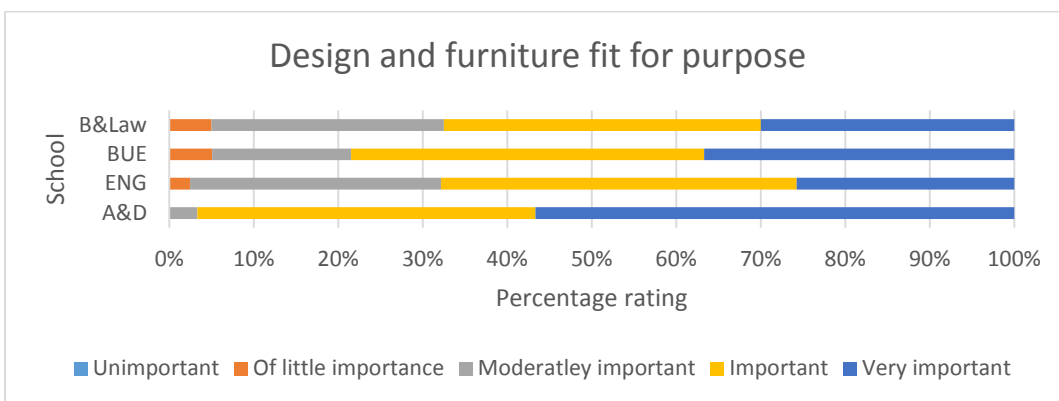


Figure 6.5 school differences- design and furniture fit for purpose

### Phase three

The questionnaire produced some interesting results. For example, the focus group research found that ENG students discussed 'fit for purpose' more than students from the other schools did. However, in the statistical results A&D scored highest with engineering sitting in the middle.

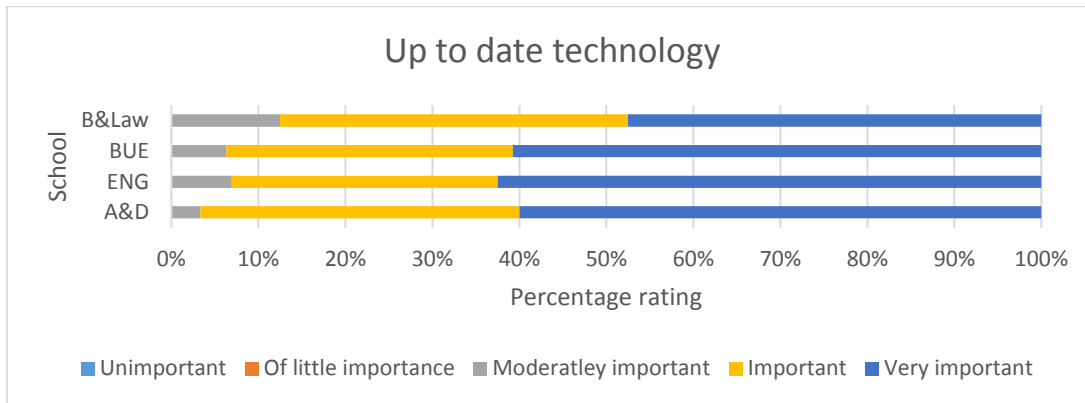


Figure 6.6 school differences- up to date technology

The results unsurprisingly showed that up to date technology was highly important for all students, displayed in Figure 6.6., most interestingly there was no rating of unimportant or of little importance.

#### 6.3.5.3. Inferential statistics

To understand if there is a significant difference between schools and their preference for individual features of the PLE inferential analysis was conducted. A Kruskal-Wallis test was conducted including an additional pairwise comparison to examine where the differences emerge. The results are displayed Table 6.9. This table shows for example that students from BUS and A&D statistically differ in their rating of importance for natural lighting. Furthermore, the table displays a significant preference of A&D students over both ENG and BUS students for the colour schemes of the PLE. Additionally, students BUE and A&D, and ENG and A&D differed significantly on their preference of access to required facilities.

### Phase three

Table 6.9 Inferential statistics comparisons between schools

Feature	Sig	Pairwise comparisons		
Natural lighting	p<0.05	BUS (m=3.60) A&D (m=4.37)		
Daylight	p<0.05	BUS (m=3.70) A&D (m=4.43)		
Colour schemes	p<0.05	BUS (m=3.25) A&D (m=4.00)	ENG (m=3.21) A&D (m=4.00)	
View	p<0.05	ENG (m=2.93) A&D (m=3.63)	BUE (m=2.99) A&D (m=3.63)	
Welcoming entrance	p<0.05	ENG (m=3.15) BUS (m=3.78)	ENG (m=3.15) A&D (m=3.90)	
Sense of community	p<0.05	BUE (m=3.42) BUS (m=4.03)	BUE (m=3.42) A&D (m=4.20)	
Seminar rooms	p<0.05	A&D (m=3.60) BUS (m=3.22)	BUE (m=3.62) BUS (m=3.22)	
Specialist teaching rooms	p<0.05	BUE (m=3.87) ENG (m=4.32)		
Aesthetics of design	p<0.05	ENG (m=3.44) A&D (m=4.23)	BUS (m=3.48) A&D (m=4.23)	
Aesthetics of facade	p<0.05	BUS (m=3.18) A&D (m=3.97)	ENG (m=3.24) A&D (m=3.97)	
Layout of room allowing for both group and independent learning	p<0.05	ENG (m=3.64) BUS (m=4.20)	ENG (m=3.64) A&D (m=4.50)	BUE 3.76 A&D 4.50
Access to resources and equipment	p<0.05	BUE (m=4.32) A&D (m=4.80)		
Access to required facilities	p<0.05	BUE(m=4.38) A&D (m=4.87)	ENG (m=4.44) A&D (m=4.87)	
Easy to find your way around	p<0.05	ENG (m=4.07) BUS (m=4.53)		
Contact with staff	p<0.05	ENG (m=4.10) A&D (m=4.67)	BUE (m=4.09) A&D (m=4.67)	
Design and furniture fit for purpose	p<0.05	BUS (m=3.93) A&D (m=4.53)		

Inferential analysis was then conducted for the comparison of schools and the components identified for the PLE. As shown in Table 6.10, statistical differences were found between the schools for the component feature, 'aesthetics', 'environment feeling', 'environment traditional'.

Table 6.10 FA components- statistical test for differences between schools

Component	Sig level	Pairwise comparisons	
Aesthetics	p<0.05	A&D m=3.88 ENG m=3.34	BUS m=3.35 A&D m=3.88
Environment feeling	p<0.05	BUE m=3.73 A&D m=4.29	
Environment traditional	p<0.05	BUS m=3.67 A&D m=4.27	

## Phase three

From this table it can be seen that there is a statistical difference in preferences for the features of the environment 'aesthetics', 'environment feeling' and 'environment traditional' between the schools explored within this research. For example, this table demonstrates that students from A&D find the aesthetics of the more important than students from both ENG and BUS. This therefore, suggests that students from different schools do prefer different features in their PLEs.

### 6.3.6. Personality

To begin the analysis of personality the reliability of the measure was examined. The results found that there was a high level of reliability within the personality measure (Table 6.11). A score of Cronbach's alpha above 0.7 is regarded as having good internal reliability.

Table 6.11 Personality reliability analysis

Trait	Cronbach's alpha
Extraversion	.88
Agreeableness	.85
Conscientiousness	.82
Neuroticism	.87
Openness	.80

To examine whether there are differences in personality traits across the four schools sampled, analysis was conducted. The analysis identified that the data was normally distributed therefore an ANOVA with a Bonferroni adjustment was conducted on the data. Within this data set, a difference was found for the trait neuroticism. A difference in scores were found between Business and Engineering ( $P < 0.05$ ) and Business and Built Environment ( $P < 0.05$ ). To identify the direction of these differences a Tukey B adjustment was conducted which identified that the Business school scored lower on the Neuroticism trait than Built Environment and Engineering. This suggests that Business students tend to be more emotionally stable than the other two schools.

Analysis was then conducted on personality traits and preferences for features within the PLE; relationships between individual features of the PLE and personality traits were examined. This research found differences in preferences for individual features of the PLE and all of the five personality traits (See appendices). For example those

## Phase three

who scored high on the trait openness had a preference for access to group workspaces and clearly defined space ( $P < 0.05$ ). Additionally, those scoring high on conscientiousness scored seminar rooms, cleanliness and general maintenance as important ( $P < 0.05$ ).

Through SEM analysis, relationships between the five personality traits and the features of the PLE identified through factor analysis were tested. Relationships between the PLE features and the personality traits were identified with three personality traits: Conscientiousness, Openness and Agreeableness. Relationships between the traits Extraversion and Neuroticism and the component features of the PLE were not found. Each of the models have the regression coefficients on the models which represent the factor loadings of each item (see appendix 15).

### 6.3.6.1. Conscientiousness

The features of the PLE and the trait conscientiousness was analysed by using an SEM model; the traits were modelled with features of the PLE that may have a relationship. The relationships found are displayed in Table 6.12, these were 'convenient workspaces', 'organisation and Layout' and 'access to resources'. The model fit for each of the models displays a good fit.

Table 6.12 Conscientious relationships

Trait	Feature	Beta
Conscientiousness	Convenient workspaces	0.026*
	Organisation and layout	0.007**
	Access to resources	0.044*

Significance level= \* $P < 0.05$ , \*\*  $P < 0.01$ , \*\*\*  $p < 0.001$ .

Table 6.12 displays the relationships found between the personality trait conscientiousness and convenient workspaces organisation and layout and access to resources. Therefore suggesting that those who score highly on the trait conscientiousness have a preferences for these features within their PLE.

### 6.3.6.2. Openness

The features of the PLE and the trait openness were analysed by using an SEM model; the traits were modelled with features of the PLE that may have a relationship. The

### Phase three

relationships found are displayed in Table 6.13 with ‘aesthetics’, ‘convenient workspaces’, ‘environment feeling’ and ‘access to resources’. The model fit for each of the models displays a good fit.

Table 6.13 Openness relationships

Trait	Feature	Beta
Openness	Aesthetics	0.009**
	Convenient workspaces	0.044*
	Environment feeling	0.003**
	Access to resources	0.011*

Significance level= \*P<0.05, \*\* P<0.01, \*\*\* p<0.001.

Table 6.13 displays the relationships found between the personality trait openness and the features aesthetics, convenient workspaces, environment feeling and access to resources. Therefore, this suggests that those who score highly on the trait openness have a preference for these features in the PLE.

#### 6.3.6.3. Agreeableness

The features of the PLE and the trait agreeableness was analysed by using an SEM model and the traits were modelled with features of the PLE that may have a relationship. The relationships found are displayed in Table 6.14, these were ‘organisation and layout’, ‘social space’, ‘environment’ ‘facilities’ ‘decor’ and ‘workspaces’. The model fit for each of the models displays a good fit.

Table 6.14 Agreeableness relationships

Trait	Feature	Beta
Agreeableness	Access to resources	0.006**
	Convenient workspaces	0.004**
	Aesthetics	0.009**
	Layout	0.000***
	Environment feeling	0.000***
	Environment traditional	0.000***
	Integration of space	0.000***

Significance level= \*P<0.05, \*\* P<0.01, \*\*\* p<0.001.

Table 6.14 displays the relationships found between the personality trait agreeableness and access to resources, convenient workspace, aesthetics organisation and layout, environment feeling, environment traditional, integration of



space. Therefore, this suggests that that people who score highly on the trait agreeableness have a preference for these features within the PLE.

The analysis of the personality measure in SEM and their relationship with features of the PLE, suggests that personality does influence an individual's preferences for features within the PLE. To ensure that the model fit was considered fit indices should be reviewed, for this research the Chi squared ( $\chi^2$ ), CMNIDF, RMSEA and CFI will be examined. For all models within this analysis the  $\chi^2$  value was significant which suggest the model is unsuitable, however as stated previously this number is highly affected by the size of the sample, over 200 cases is counted as a large sample. This data set is over 200 cases therefore this significant result is due to the sample size therefore other fit indices should be used instead. The CMNI/DF was used instead of the  $\chi^2$ , the level of suitability is below 3, all of the models in this analysis were very good and below 3, with all but one being below 2, therefore suggesting very good model fit. The RMSEA was then examined and all of the models fell below the required level of 0.08 with many within the good parameter of below 0.05. Finally, the CFI was examined, all of the models were in the acceptable range of over 0.90. apart from conscientiousness and layout, however examining other fit indices it was identified that this model was permissible in its fit indices. In order to improve the model fit the researcher added a number of correlated errors as suggested by the modification indices from the software (AMOS) output. The criterion followed was to address values over 10 which was chosen as an appropriately high fit indices to ensure the model did not reach saturation. Judgements were made on a conceptual and statistical basis so that the model was not over fitted (Byrne, 2016).

### **6.4. Summary**

This chapter has identified features of the environment that students regard as being important in their perceptions of quality. This chapter has also identified what features of the PLE students perceive as being important in developing their sense of community. It was also identified what features students consider as being important in the design of the PLE as a whole, for the culmination of both quality and community within the University space.

### Phase three

Overall, this chapter has identified that there are differences in preferences for features in the PLE between different schools. Differences in some personality traits between the schools have also been identified. Furthermore, it was found that there is a relationship between personality traits and preferences for different features within the PLE. The results of this chapter will be used in the development of the framework for the design of HE PLE with the consideration of students' specific requirements.

## 7. Framework development

Introduction

Principles of higher education  
physical learning space design

Key features of the PLE

Preliminary framework

Overview

## 7.1. Introduction

This chapter brings together the findings from all sections of the research. It aims to discuss the implications of the findings and explore the development of specific a framework for the design of the PLE. The research findings will be explored and referred back to with the aim of presenting the overall outcomes. Applying these outcomes enabled the development of proposed frameworks of physical learning space design.

As displayed in Figure 7.1 the development of this section of the project will focus on the development of the framework. It will then look to validate the framework developed through a series of interviews with Estates Managers. This interview data will then be analysed to identify any outcome, and implications of modifications that should be made to the final framework. Conclusions will then be drawn regarding the current research and its relationship to other works.

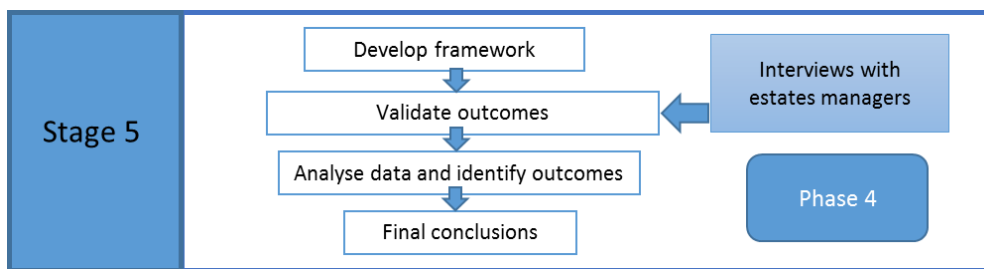


Figure 7.1 stage five-research process- framework development

The main aim of this research was to develop and validate a framework that can be used to inform the design solutions to space in HE facilities. This framework will allow for variance in personality, educational community and quality requirements of students from different subject areas. The frameworks are then validated in Phase four of the data collection using interviews and pragmatic survey methods.

## **7.2. Principles of higher education physical learning space design**

When considering the purpose of the final framework for designing the PLE it is important to consider the final proposed implementation of the framework and also the current understanding of the design of the PLE. From the literature review, it was noted that the framework must satisfy the specifications to meet the demands of the HE sector.

Firstly, it was noted that the framework should be useful in the design process to provide support to the design and management team developing HEI PLEs. Therefore, it should be a framework to guide practitioners before the construction and completion of the building unlike current assessments (Vischer, 2002; Neary et al., 2009; Tookaloo & Smith, 2015). The design process involves many stages and different practitioners and working bodies (Johnson & Lomas, 2005). Therefore, it is a complicated procedure to develop appropriate guidance for, as there are many people with different roles (Gann et al., 2003; Jamieson et al., 2005). Therefore, the framework should be simple enough for all to understand within the design process.

Additionally, the framework must be specific - it must highlight the features of the PLE that students consider most important. This is because currently literature does not inform on actual design processes (Rullman & Kieboom, 2012), as it is largely not specific enough. Key requirements should be specified as otherwise they could be overlooked during the design process due to miscommunication in the project (Jamieson et al., 2000). To make the framework usable during the design process they must specifically highlight important features for practitioners to focus upon during the design phase. The literature review also highlighted there are a wealth of characteristics that should be considered during the design phase. However, developing a framework that is too large and complicated would not allow the effective use and implementation of a framework within the design process of HEIs. Therefore, the framework should aim to highlight specific features for practitioners to focus upon, which may then lead to the consideration of these more detailed characteristics within.

The framework should be simple - as previously discussed currently research does not explicitly inform design processes. This is crucially down to the complexity of

## Framework development

current literature as findings are too broad; they do not focus explicitly on HEI PLE (Rullman & Kieboom, 2012). Additionally, because of the complexity of designing HEIs, practitioners revert back to the traditional learning environment that is already known to them (Thomas, 2010). It is also too basic in areas, as the research tends to focus in on one specific feature or a mixture of similar features. The research does not currently examine the PLE as a whole to identify students' specific requirements. Frameworks should be simple and approachable for practitioners to understand and apply to their own design work. The framework should provide a briefing to practitioners, whilst still allowing for flexibility of design (McNamara, 2012).

It also noted that the framework should be applicable - to design a framework of space it must be suitable for the demands of a changing society by taking advantage of all that architecture can offer us (Calvo-Sotelo, 2001). By informing practitioners of the required feature of the PLE an appropriate design process can be adopted (Jamieson et al., 2005). It is important to include relevant factors that have been considered as 'most important' by users and that which is specific to the intended end user of the facility as research supports different schools having different needs. The framework should reflect the needs of the students whilst also considering individual needs and current teaching practices and requirements (Dixon, 2006).

Although trends in innovation and learning pedagogy are continually evolving (Turner et al., 2013) understanding the individual requirements of students and their differences may be a good path to follow as behaviour is unchanging and therefore our basic need should not change out of the PLE. Consideration of the specific requirements of students in HE buildings should be attended to in the design conception stages of a project as outlined by (Riley, 2013).

The current work emphasised the following findings-

- Students are good bodies of information to advise on their requirements
- Using the knowledge of staff is also advisable to develop appropriate PLEs
- The Quality of the PLE had a considerable effect on students' perceptions of their PLE and ultimately their satisfaction with the PLE

## Framework development

- Incorporating features of the PLE that can encourage a sense of community can positively influence students' learning experiences and consequently increase their satisfaction with the university
- Incorporation of quality and sense of community into the design of the PLE results in a larger explanation of variation in the preferences. It is therefore a good framework to develop for the effective design of the PLE.

When reviewed, these findings suggest that a specific, simple and applicable framework can add real benefit to student learning experiences influenced by the design of the PLE. A framework that can be defined that allows practitioners to identify the detailed requirements of the end user of the building would benefit not only the students but also the design process.

To provide clarity for the development of the frameworks the findings of each phase of data collection are highlighted in the table below (Table 7.1). To develop the intended frameworks the findings from the first stages of the research project were considered.

## Framework development

Table 7.1 Findings overview

Stage	Conclusion
<b>Stage 1 Literature review</b>	Understanding how to develop the PLE depending on students requirements needs further understanding
	Factors that influence students satisfaction and learning experiences in the HEI PLE should be explored
	Students description of quality within the PLE
	Explore the influence of individual differences in subject choice or personality trait affects preferences in the PLE
	Identification of features of the PLE that develops sense of community
<b>Stage 2 Questionnaire data-phase 1</b>	Relationship between personality variable and features of the PLE
	Factors of the environment that could describe quality
	Factors of the environment that could develop the sense of community
	It was also suggested when reviewing the findings of the questionnaire that It would be important to included facilities management elements into the questionnaire because they have an important impact on the perceptions of the PLE.
<b>Stage 3 Focus group data- phase 2</b>	The focus groups highlighted the feasibility and importance of the research as it emphasised through the discussion that students feel that the physical learning environment can affect their learning experiences and satisfaction
	Additional features of the PLE that students perceive as quality
	Additional features of the PLE that students think would enhance their sense of educational community
	Differences in specific requirements between different schools
<b>Stage 4 Questionnaire data- phase 3</b>	A difference in personality traits between some schools
	Differences in specific preferences in the PLE between schools
	Differences in personality between choice of feature in the PLE
	Definition of quality in the PLE
	Specific features of the PLE that enhance and educational community



## Framework development

Constructed from the finding of the research undertaken during the project several features in the design of the PLE have been identified that should be considered throughout the design process.

To develop the framework initially all the features identified during the focus groups and the final questionnaire were collated. Through the focus group analysis features of the PLE that are important for Community, Quality, and Overall learning environment were identified. The features identified in the questionnaires through factor analysis, of students' rating of importance, for community and quality. Finally, through factor analysis all, the individual features of the environment were combined and a further factor analysis conducted to identify

### 7.2.1. Community framework identification

To develop a framework for practitioners to understand the important features in the development of a PLE that facilitates a sense of community, the factors identified through both the questionnaire and focus group analysis were considered. Table 7.2 displays the features of the PLE that students considered most important in their PLE; this includes both the focus group and questionnaire data. What is worthwhile highlighting, are the similarities between the findings from the focus group and the questionnaire; both found that the environment layout and identity were important. Additionally, features that contain similar characteristic traits, workspaces, peer collaboration access to facilities and social spaces appear in both the focus groups and questionnaire findings

*Table 7.2 Community features*

<b>Community- questionnaire</b>	<b>Community- focus group</b>
Access to facilities	Workspaces
Clear identity	Identify with space
Environment	Environment
Social spaces	Sense of belonging
Layout	Layout
Peer collaboration	Social areas

Although they are categorised differently if the individual characteristic of the design of space are explored (Table 7.3, it can be seen that this provides a suitable

## Framework development

breakdown of the features required in developing a sense of community via the design of the PLE.

*Table 7.3 Community- questionnaire and focus group individual characteristics*

<b>Questionnaire</b>	<b>Focus group</b>
Access to required facilities and equipment	Comfortable environment
Access to workspaces when needed throughout the day	Provides suitable working environment
Access to suitable workspaces	Displaying students work
Identity of the university that stands out	Home building'
Distinguishable identity of the school you are from	Subject 'floor'
University branding throughout campus	University identity
Student Union	Campus environment (connected)
Natural light	Open layout
Open and spacious environment	Wayfinding
Sustainability of environment	Contact with staff
Ability to control environmental features	Feels like own space
A common room where students from your school/course can go to work or socialise	Social area
Space to meet students from different courses	Societies
Access to workspace integrated into all areas on campus	Spaces to meet people or courses
Safety	SU
Clear signs to define space on campus	Common room
Space to relax	Variety of workspaces
Cafe area	Peer collaboration

Table 7.3 displays the individual characteristics of the environment that can enhance students' sense of community in the learning environment. As highlighted in the results section students discussed in the focus groups how having the sense of community is important to them to enhance their learning experiences. Therefore, these features should be considered when developing a framework of design for fulfilling the criterion of a sense of belonging in the PLE.

### 7.2.2. Quality framework identification

To identify a framework and consequently a description of quality, from the students' perspective, about the HEI PLE, the factors of the space from both the questionnaire and focus group were examined.

*Table 7.4 Quality- focus group and questionnaire factors*

<b>Quality questionnaire</b>	<b>Focus group</b>
Accessibility of Uni/Layout	Rooms
Enviro feeling	Environment
Enviro traditional	Operations
Wayfinding	Design
Facilities and resources	Facilities
Aesthetics	Cosmetics
Peer collaboration	

Table 7.4 provides an overview of the features identified in both the focus group and the questionnaire that students consider important when identifying what is a quality PLE. In addition to the findings from the factor analysis students discussed in the focus groups that operation of the university, the facilities management side of the PLE, is important in their perceptions of a quality PLE. This is an important point to consider as although students did not rate it particularly highly in the questionnaire, it was discussed through the focus groups as being very important in affecting the perceptions of the PLE. Although this may not be something that is in the forefront of their thought, and consequently how they would answer a questionnaire, through the discussion and the deeper consideration in the focus groups it was revealed that students did consider this vital. Therefore, it is an important feature to consider in the design process when developing a suitable framework. Apart from this difference, the features that are highlighted through both the questionnaire and the focus group are very supportive of each other. However, looking more closely at the features from the focus group and the questionnaire and examining the individual characteristics, there are certain individual features that students discuss in the focus group that appear to be important. Therefore, they should be considered as part of the development of the framework.

## Framework development

When reviewing the focus group and questionnaire findings the individual characteristics were compared to explore any differences. Students in the focus group discussed the additional following features as being important in their perceptions of a quality-learning environment. These features, although asked in the questionnaire, for example control of environmental conditions e.g. noise and air quality or access to facilities, were specifically discussed in the focus groups and therefore attention also needs to be given to the specific features.

*Table 7.5 Additional features of the PLE to consider in framework development*

<b>Feature</b>
Space that stands out
Brightness
Don't have to walk far to sessions
High ceiling
Identity appropriate for users
Multifunctional
Utilising space
Comfort
Welcoming environment
Relaxed environment
Noise
Air quality
Temperature
Function over style
Comfortable seating
Access to toilets
Lockers
Bike storage
Smoking space
Clean
Upkeep
Management of rooms
Management of upkeep
Space utilised correctly
Outside space

Many of these features focus on the environment, and additionally the operations of the building such as, the upkeep and management of spaces. Also noted are access to more facilities such as bike storage, lockers and smoking spaces. Although in the focus groups the discussion of these features was limited, it still appears to be

## Framework development

important to consider during the design process. In addition, in support of the consideration of these supplementary features to consider in the PLE, students did also note them in the open questions of the questionnaire. The features should therefore be considered for inclusion in the final framework of design for practitioners.

### 7.2.3. PLE framework identification

To accomplish the aim of this research project to develop a framework of the design of the PLE, importantly considering both the influence of the quality of the PLE and a sense of belonging enabled by the PLE, it was important to consider the PLE as a whole. Therefore, from the findings (6.3.4 Learning environment) eleven features that students requirement in their PLE to enhance their learning experiences and satisfaction of the PLE were identified.

*Table 7.6 Community and Quality – Overall design of the environment*

<b>Learning environment questionnaire</b>	<b>Focus group quality</b>	<b>Focus group community</b>
Integration of space	Rooms	Workspaces
Layout	Environment	Identify with space
Aesthetics	Operations	Environment
Convenient workspace	Design	Sense of belonging
Access to resources	Facilities	Layout
Identity	Cosmetics	Social areas
Environment feeling		
Environment traditional		

Table 7.6 is the culmination of all of the features from both the quality and the community sections, as examined throughout this research to enhance the students' PLE. The proposal to incorporate both a sense of community and students' perceptions of a quality learning environment has been reinforced. Therefore, as the final stage of the results a factor analysis was conducted on all features explored in the questionnaire about the development of a suitable PLE.

As the eight features were constructed from the two proposed factors of the PLE, community and quality these features identify the PLE and what features students evaluate as being important in the PLE. The above eight features of the environment were used to explore the differences between school preferences for specific features.

### **7.3. Key features of the PLE**

From the review of the findings from the three phases of data collection, several key features of the PLE were identified. These features refer to community, quality and the PLE as a whole. To understand and review each of these individual features of the PLE, to ensure that they are grounded in established theory, a discussion of each of the features should be considered.

#### **7.3.1. Aesthetics**

Students identified aesthetics of the environment as integral to their perceptions of the PLE. This finding is supported by environmental psychology literature that notes that the aesthetics of the environment influences people to be more favourable to their environment (Yildirim et al., 2015). The element of the aesthetics, durability of the fit and finish, have been reflected by the literature where it was identified that it may influence school attendance and therefore has an impact on students' learning experiences (Durán-Narucki, 2008). Although overall aesthetics was not rated as the most important feature of the PLE to influence students' perceptions of performance, it appears to be an important consideration. This is supported by Beckers et al. (2016b) who noted that although aesthetics of the physical environment is not the most important consideration it should still be deliberated in the design process. Students identified the colour of the environment to be important in the perceptions of the PLE. This supports previous literature, which found that the colour of the environment has been found to influence people's perceptions of the environment in many different situations. The colour of the space has been found to influence perceptions of attractiveness (Hidayetoglu et al., 2012), therefore this may influence students' perceptions of the attractiveness of the PLE. This may consequently influence how much they like the space. The colour of the environment has been found to influence performance on tasks (Stone, 2001), and therefore perhaps students have perceived this as being an influence on their own performance. Consequently, considering the décor in the PLE appears to be important to students and therefore should be considered in the design process.

### **7.3.2. Operations**

Operations was found as an important indicator of quality within the PLE. This is the element of PLE, which relates closely to service quality and facilities management. This element of the design is important, as it is how the environment is maintained following on from the original design and construction. This encapsulates the cleanliness, maintenance and the subsequent management of the environment along with contact with staff. This adds to the current literature by Wakefield and Blodgett (1999) that noted that recognition of cleanliness is missing from current consideration of quality. Therefore, the consideration of operations in the PLE and how this will manifest itself is important to students' learning experiences within the PLE.

### **7.3.3. Integration of space**

This feature of the PLE was highlighted in that final EFA that identified the PLE as a whole, through the discussion it was also highlighted as an important feature in the design of space. The integration of space in the university is very important for students' learning experiences. Having both the access and availability of social space and workspace within the PLE is important for students' satisfaction. This integration can enable students to make most use of the space by staying on campus to do their work, work with others or even to have a break and socialise. Therefore it can be seen how this is an important aspect in the design of space to positively influence students' learning experiences. JISC (2006) noted this integration of space under the title 'learning centres', it is now important that these spaces are considered in the design of space, because "it is now expected that learning will involve many different activities" (p.22). This integration of space could allow for flexible learning spaces that allow students to move from one activity to another without having to leave the university campus. Therefore, the university is allowed the availability of space to enhance students learning experiences

### **7.3.4. Social spaces**

Social space was noted by students as being important in the PLE. Although fundamentally the university campus is for learning, in order to provide students with a positive learning experience it is important to include social spaces into the PLE.

## Framework development

Students like spaces where they can meet their friends (Harrop & Turpin, 2013). Providing opportunities for meetings between students is important as many have moved from home to a completely new place (Moghisi et al., 2015). Therefore, the incorporation of social space is important in the design process in HE buildings, over and above that of other places. Therefore, the incorporation of social spaces into the PLE is an important factor in the specific design of space for students in HE buildings.

### **7.3.5. Convenient workspaces**

Convenient workspaces was a feature of the environment that was highlighted in the final EFA and was regarding how the workspaces functioned for the students. This was also noted in the discussion as being an important factor in their learning experiences. This feature included the access to suitable workspace, including technology and comfort, it also included the design and furniture being fit for purpose and that the workspace is integrated into all areas of the campus. Therefore the PLE should provide workspaces that all students find convenient and appropriate . Students noted that the workspaces in the PLE are important in their perceptions of the space. This is the accessibility to suitable space when needed throughout the day and the space being integrated and adaptable. This feature is about the informal space where students can work outside of lessons. Learning does not only occur in lessons (Dabbagh & Kitsantas, 2012) and therefore it is important to incorporate spaces for learning outside of the teaching spaces in universities. Providing spaces that are adaptable supports current literature that supports providing flexible spaces for students (McNamara, 2012; Harrop & Turpin, 2013). However there are limitation to this as it can be difficult to upkeep, therefore fixed flexible may be a viable and attractive option. To enable students to learn well, appropriate environments should be provided so students do not have to go home to work, they can have access to the facilities and the environment required on campus. In doing so they can help in the development of a community as instead of students leaving the campus and working alone it allows them to work together and take advantage of what is available on the campus. Although this feature is similar to others, it is a distinct feature that should be deliberated by practitioners as it identifies, when designing a workspace how it should be considered. Designing informal workspaces for students to learn can support



students in taking control of their own learning (Dabbagh & Kitsantas, 2012). This is therefore in line with current pedagogical theory regarding students becoming more active learners. This preference for having convenient learning may be because students are aware that active learning has a positive impact on their learning experiences (Lumpkin et al., 2015). Therefore, students would like spaces within the university where they can engage with their own learning. Consequently, the spaces should be considered in the design process in HE buildings.

### **7.3.6. Access to facilities, equipment and resources**

The facilities that are available is noted by students as being important in their experiences of the PLE. This is access to the required facilities tailored to the students' specific needs. Therefore, this will be different for students in different schools, for example, students from engineering may need 3D printing, but students from business may not require this. However, having access to these is important to the learning experiences of the course as they support effective teaching and learning. This is supported by previous research that observed that learning styles and strategies are influenced by the resources available (Parra, 2016). Therefore, to enable students to reach their full potential providing the required facilities is important in the design process. Overall, there was little discussion for the requirement of books as extra resources. However, a lot of discussion of access to technology was identified. Perhaps there is less of a need for books as students are now using computer databases and electronic copies instead. Therefore, libraries could reevaluate the large percentage of their space dedicated to books. This could be reduced to make space for other spaces for example different types of informal workspaces and more space for computers/laptops.

### **7.3.7. Technology**

Technology was in the analysis within facilities equipment and resources. These have been separated into two subsections as they are both theoretically important to students and this was a feature of the environment that was rated particularly high both in the discussion and in the statistical analysis therefore, should be considered separately by practitioners. With the assimilation of technology into everyday lives,

especially for students of today, the inclusion and integration of technology in the PLE is highly important to students. The integration of technology into the environment has been noted as developing a blended learning environment (Fisher & Newton, 2014), enabling a more personalised teaching environment (Zhang et al., 2004) which may enhance students' learning experience. Students identified that the incorporation of technology into the PLE is the most important aspect in the PLE and therefore should be considered in the design process as a necessity.

### **7.3.8. Peer collaboration**

Peer collaboration may be important in students' perceptions of quality in the PLE in HEI buildings as this supports their learning experiences. This feature can help in their academic life and learning as having the support and collaboration with other students is a benefit. Encouraging students to engage with each other and providing the space to facilitate this has been suggested as a development for learning spaces (Ditoe, 2006), This research supports this finding, presenting that students find the ability to work with others important in the PLE. The theory of 'territories' also supports this finding, providing spaces that people can identify themselves are important. Spaces where people can collaborate provides an opportunity for students to develop a sense of place and develop an identity. This feature is important in the development of a community, as a factor in community is that group members matter (McMillan & Chavis, 1986), therefore allowing students spaces in the PLE to work together and support each other helps in the development of a sense of community. Therefore, developing spaces for peer collaboration is important for students' perceptions of the PLE and therefore should be considered in the design process.

### **7.3.9. Way finding design**

The ability to navigate the environment is important. For students finding their way around university to new rooms or buildings simple design and signage could help to make students feel like they know the environment. No one likes to get lost in a building and therefore providing features to support with wayfinding is important. Being able to navigate the space as it is open and spacious means the students are not stuck in hallways or entrances, therefore making the space more accessible. Having open

spaces is important to people, otherwise they feel their space is being invaded and they then experience negative emotions (Evans & Wener, 2007). This sense of spaciousness is important to people's psychological experiences of space which therefore impacts behaviour (Evans & Lepore, 1992). Therefore, providing open and accessible spaces for students may influence students' behaviours and therefore this is an important consideration in the quality of design of PLEs. When navigating around an environment that is obscure or lacks the appropriate signage a phenomenon known as 'spatial anxiety' can occur (Lawton, 1994). Therefore, students note that having an environment that provides the appropriate aids to navigate can help to reduce these negative emotions. Consequently, it is important in students' perceptions of a quality PLE.

### **7.3.10. Accessibility of university**

Being able to access the university was noted as being important in student perceptions of quality in the PLE. This feature encapsulates features that were discussed within the focus groups, lockers, parking and bike storage. In addition, having easy access to libraries is important and this is supported by much literature which highlights the importance of libraries as spaces for learning (Bryant et al., 2009; Turner et al., 2013). This feature is also important for those with disabilities as being unable to access the space can make them feel excluded. Having access to refreshment is important to students in their experiences of the PLE, this is access to food and water, and this can be in a café or access to water fountains and microwaves. This supports previous research that found that the availability of refreshments is important in libraries (Walton, 2006), this research develops this finding that access to refreshments is important across the university environment. This can be used in a way which most suits the intended environment, but having access to some sort of cafe or refreshment facilities is important for students, and therefore should be considered in the design process. Therefore considering the accessibility of the university is important in the design process.

### **7.3.11. Environment feeling**

Students noted that the feeling of the environment is important in their perceptions of space; this includes the features of sustainability, safety and security, motivating and sense of community. This highlights the importance of developing a sense of community for students, as it is important for the feeling of the university environment. Additionally, providing motivating spaces for students can allow students the opportunity to group and develop, as it is a challenging environment (Augustin, 2009). This feature also highlights that the sustainability of the environment should be explored more. Research has highlighted the importance of nature as it impacts satisfaction (Zhang et al., 2014), and therefore sustainability may endorse the same feelings as it has an impact on the environment. Consequently, considering the feeling of the environment in the PLE should be considered in the design process.

### **7.3.12. Layout**

The layout of the PLE has been found to be important in the students' perceptions of the space. This includes the ability to find your way around, visibility and the spaciousness of the environment. This supports previous literature which identifies that the spaciousness of the environment is important in offices and the quality of neighbourhoods (García-Mira et al., 1997; Kim & de Dear, 2013). It has both behavioural and emotional effects on people (Evans & Wener, 2007; Vartanian et al., 2015) and therefore it can be seen how this is a highly influential factor of students' perceptions of the PLE. Therefore ensuring the layout of the PLE is considered is important to students' perceptions and therefore should be considered in the design process.

### **7.3.13. Identity**

Developing a sense of identity was highlighted as important for the students in their PLE. This feature supports previous research in schools, noting that identity is important in students' attachment to place (Tupper et al., 2008). Therefore, the spaces should be distinguishable for students. Developing place attachment is an important aspect of community, and can enhance people's positive relationships with the place and the people within (Rollero & De Piccoli, 2010). Therefore, providing an identity

within the PLE for students can help develop a relationship with the university and other students. Consequently, this feature of the PLE should be considered in the design process.

### **7.3.14. Sense of belonging**

Students noted that a sense of belonging was important in their PLE and this included contact with staff and feeling like ownership of the space. A sense of community has been explained as a sense of belonging and a feeling that members matter to one another (McMillan & Chavis, 1986). To develop this, people need to feel connected (Chen & Chiou, 2014), therefore by enabling students to have easy contact with staff and a space where they feel they belong can help with being connected to others. Therefore, considering these features in the design of the PLE is important to positively influence students' learning experiences.

### **7.3.15. Environment- traditional**

This research identified a description of quality from the students' perspective within the HE PLE. This feature incorporates the traditional feature of the PLE that much of the research within the built environment body of literature explores. The features such as lighting, temperature and noise, are often examined (Winterbottom & Wilkins, 2009; Yang et al., 2013) and this research supports the importance of factors from students' perspectives. These features are also supported by psychological theory, that the sensory environment has an effect of human behaviour, emotional and cognitive abilities (Enmarker & Boman, 2004; Chiou & Cheng, 2013; Zhang et al., 2016). Therefore, it is highly important in the design of the PLE for students' learning experiences.

### **7.3.16. Teaching rooms**

The teaching rooms were also noted by students as being an important part of students' perceptions of the PLE. Although this feature did not appear in the final EFA as an individual factor, features of appropriate teaching rooms have appeared throughout the analysis. Furthermore throughout the focus groups there was discussion regarding the importance of suitable teaching rooms, therefore it has been highlighted as a specific feature of the environment important in students' perceptions

## Framework development

of the PLE. This feature is rather unsurprising as it is an integral part of the university learning experience, as well as having both seminar and lecture rooms, the suitability and visibility of the teacher is important. There are many initiatives such as Scale Up (Beichner, 2008) and JISC (JISC, 2006) that have identified the design of the PLE that is more suitable to pedagogic theory today. Dominant theory as discussed previously in this report has highlighted active and collaborative learning environments as effective strategies for development in learning space design (JISC, 2006). This appears to be more suitable for students today and perhaps preferred by students, according to this current research project. The spaces are more suitable to regulated learning and interaction with staff, therefore initiatives of this kind should be considered in the design process.

The features of the PLE that students identified within this research project are all grounded in current theory. However, this research brings the research together in the understanding of students' specific requirements in the PLE. The research therefore allows the PLE to be evaluated and designed according to students' specific requirements.

### **7.4. Preliminary framework**

The next stage of the framework development after reviewing all the features established through the analysis was to integrate them into one simple specific and applicable framework. To do this all of the features were evaluated, during this it was noted that in general, most of the factors overlapped with each other, see Figure 7.2. However, there were additional features for each theme that should be considered

- Community - sense of belonging and a welcoming environment were found to be an additional feature of the environment that should be considered to ensure that the PLE encourages a sense of community.
- Quality - Students additionally regarded accessibility, wayfinding, environmental feeling and operations to be vital to defining their perceptions of quality in the PLE.
- Learning environment - Overall when the characteristics were considered together integrated space and teaching rooms were additional features.

## Framework development

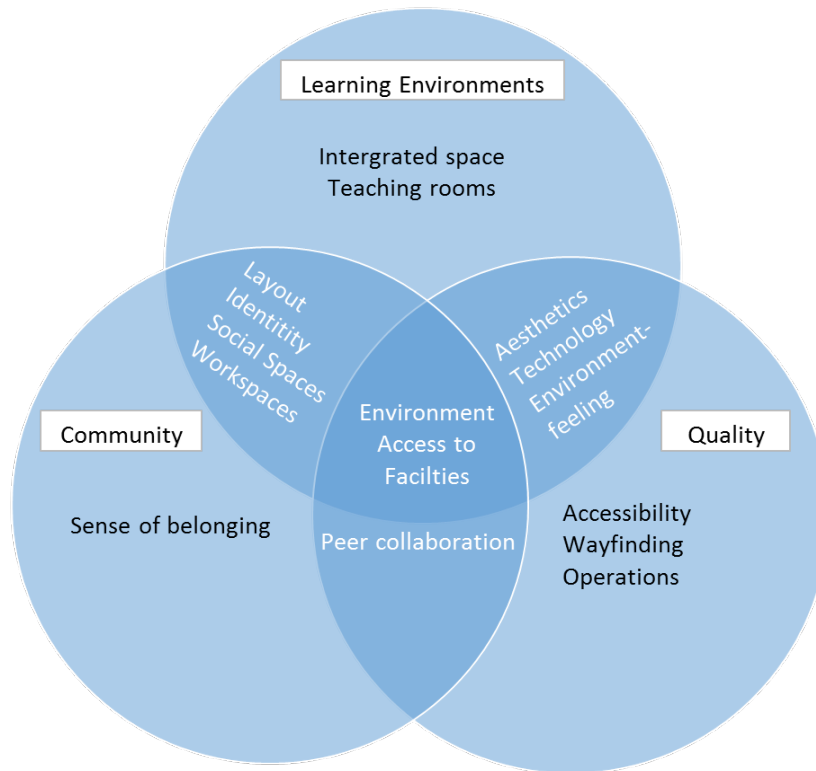


Figure 7.2 Framework of Learning Environment design

From the framework shown in Figure 7.2 it can be seen that integrating the elements; community, quality and learning environments provides us with a detailed view of the suggested development of HEI PLEs for students. It is suggested that a bottom up approach should be used to attend to the two fundamental features, identified through the literature in the design of the PLE, community and quality, as this allows a progressive approach within the design phase. Then following this, identifying the required feature of the learning environment as a whole should be considered.

To develop the frameworks further, the outcomes of the main aims of this research were exercised. This research found that there is a difference in preferences for specific features in the PLE between schools. Applying this unique knowledge, it would be wrong to only develop one framework and apply that across the board to use in the design of PLE. For this reason, the findings from the analysis phase were used. Using the findings from the analysis phase, individual frameworks were developed for each of the schools examined in this research.

### **7.4.1. PLE framework**

As is highlighted in Figure 7.2 there are several features of the environment that should be considered in the design process. Further explanation of the individual features within each component of the PLE should be examined, which also highlights the characteristics that should be reflected upon in the design process for each of the features. The framework shown in Figure 7.3 presents the features of the environment the students consider important in the physical learning environment.

The framework also highlights the additional features of the PLE that students feel can develop a sense of community and also meet students' requirements for a quality PLE. These features are for community - 'sense of belonging' and 'peer collaboration' and for quality - 'accessibility' and 'wayfinding'. This framework outlines the components of the PLE that designers should consider, and the features within each component that are important to students within the PLE. This framework relates back to Figure 7.2 as it further elaborates on each of the features of the PLE that students regard as important. It identifies the specific aspects of the environment that should be considered in the design brief to ensure that students' requirements are met



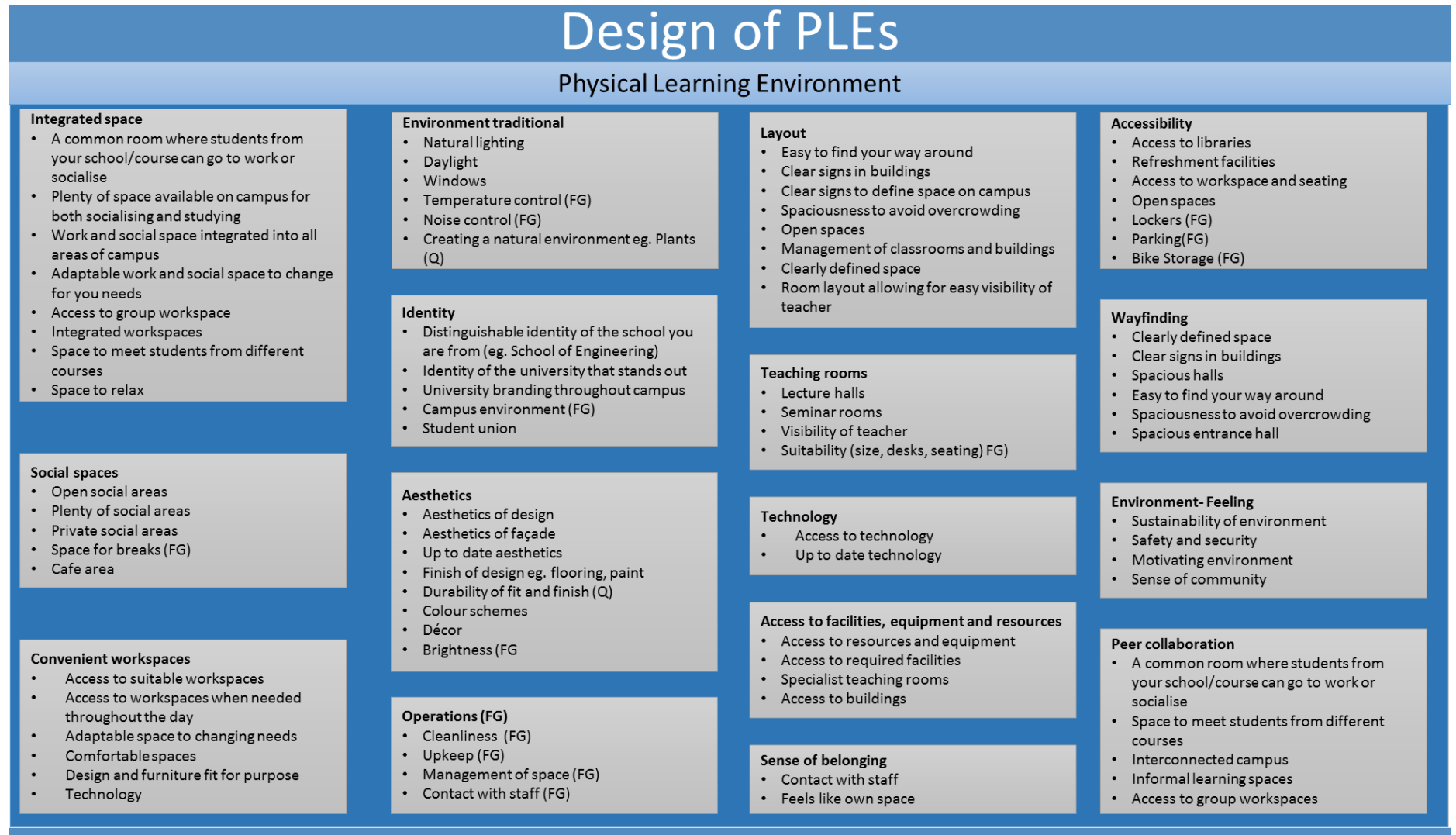


Figure 7.3 Design of PLEs features break down

#### **7.4.2. School specific framework development**

From the findings and literature review of this research interesting differences were found between the students of the different schools, Built Environment, Engineering, Art and Design and Business. As this would be a practical application in the design process of the individual differences between sets of people, frameworks for the specific design of space for students for different schools was considered. In the design, process spaces tend to be developed with the intention of certain subject cohorts to move into, developing frameworks that could guide this design appears to be efficient in producing the intended use of this research project.

To develop a framework that identifies the differences between schools, the factors that were rated most to least important for students were identified. The significance of those differences was also identified, and therefore these feature are those that need to be highlighted as the most important differences between schools. The framework were developed by focusing on the importance of each particular theme from the factor analysis and questionnaire results. It also identified the common 'universal' themes and then applied school specific themes to the framework. To make the framework that were simple and specific to each school, an individual framework was first developed for each school to identify their specific requirements. By reviewing all of the features of the PLE and the requirements of each school a framework was developed to construct each individual school framework from. This framework consisted of five phases:

- Phase 1 - Identify school - Firstly to explain the framework there are five stages that should be negotiated, to begin with, the end user of the building must be identified. As the findings of this study posit, PLEs should be designed for the students that are going to use them as each has different requirements.
- Phase 2 - Universal- The next phase consists of the factors that are consistent between subjects studied and are the most important to them.
- Phase 3 – Required - The third phase consists of features that are still highly important to students and have similarities with each other but do change

according to the subject and therefore would need to be considered for each different school.

- Phase 4 - School specific - The fourth phase is the section where most of the differences appear therefore this phase should be focused upon to ensure the space meets the student specific requirements.
- Phase 5 - Noteworthy - The final phase consists of features that were the least important to the students. Although these were rated as low in importance, they were still noteworthy recurring features in both the focus group discussion and in the findings of the questionnaire analysis therefore although they are not at the forefront of the consideration process when designing space they should still be reflected upon.

When working through the design process this framework can be used to support in the identification of the specific features that need to be considered when designing spaces for the end user. The framework allows the designer to evaluate the key features that should be considered throughout the process focusing on the most important features, but still allowing for the consideration of the features that are not so important to the student who will be utilising the space.

#### 7.4.2.1. Art and design

Figure 7.5 displays the school specific framework for the feature of the PLE that students from A&D considered to be most important in their perceptions of the PLE, that affect their learning experiences and satisfaction.

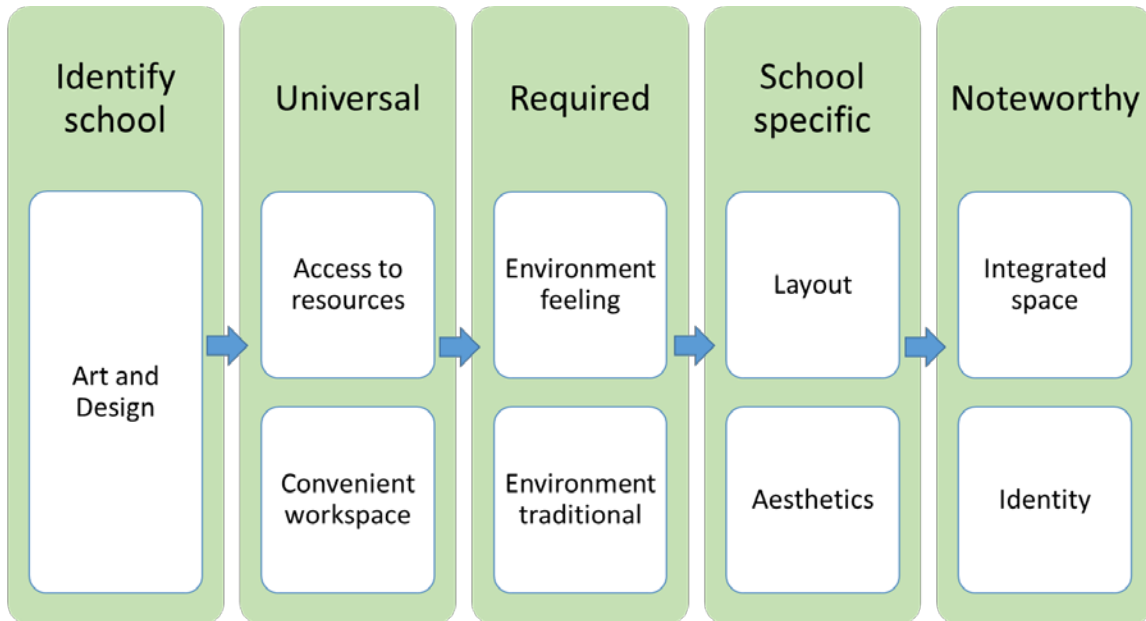


Figure 7.5 Framework for Art and design students- differences in preferences

The framework shown in figure 7.5 identifies the features that are important to students from the school of Art and Design.

In the universal phase, both access to resources and convenient workspaces are considered the most important. In the design process access to resources equipment and the building should be considered first to make sure that students have access to their requirements. Access to technology should be considered for example, computers and printers available around the building access to charging points for laptops, phones etc. Facilities should also be considered, for example making sure that students have access to the resources that they need e.g. books or specialist art equipment. A student noted “*I like the CAD suite because it has got specialist software for us*” (FG 5). Furthermore, including factors in the infrastructure such as plug sockets are important considerations. Students from this school find having access to independent workspaces important for a positive learning experience. This was

supported throughout the focus group with students noting that studio space is very important to them *“our studio is probably the best”* (FG5).

In the required phase of the design process for art and design students the environment feeling and environment traditional are important for consideration. It is important for them that they have a motivating environment *“so when you walk in it’s quite an uplifting space”* (FG3). Furthermore, it is important that the traditional environmental features are considered in the PLE because, *“you get a lot of light in the building”* (FG 1), and other factors such as temperature *“too cold or hot there isn’t that happy medium”* (FG 3). These features of the environment are important to students in art and design and therefore should be considered.

In the school specific phase of the specific design process, the specific features should be considered, for A&D students these are the ‘layout’ and ‘aesthetics’. Layout was also regarded as important for students from A&D, it was noted in the focus group that some corridors are too narrow. They also like that their current building is *“easy to get around”* (FG 1) because *“the main thing is the space.. to move around”* (FG 3) and *“easy to navigate”* (FG 5). Interestingly and of note, only students from A&D have the feature aesthetics in this phase. This is supported by the analysis finding that A&D students preferred these features significantly more than students from other schools. ‘Aesthetics’ was concerned with characteristics such as aesthetics of the facade and finish of the design e.g. flooring, students from A&D noted that *“more pictures would be a lot nicer”* (FG 1). Additionally, the decor was important to them as one student noted that they like that they worked in a *“blank canvas”* (FG 1) as it was a nice environment for them to conduct their work.

Finally, in the noteworthy phase students rated integrated space and identity as least important. This is still an important factor to consider in the PLE, when reviewing the focus groups as students discussed the use of their studio space as being their area for working and socialising therefore incorporating social space into their workspace is already a consideration for this subject cohort. However perhaps the integration of more social space would be good. One student noted, *“I think I like the fact that we have a self contained environment just for us. We have got the studio we have got the workshop downstairs and the CAD suite even the cafe...because we have such an*

*intense course it's good to be in an environment where you can just go to one thing from another quickly and get things done*" (FG 5). Additionally, students noted that they would like to have a sofa in their studio, not that they would specifically like more independent social areas *"I think we need a couch in our studio...somewhere to sit down and chill out and have a little table and relax"* (FG 5). Although students for this school did note in the focus groups that it is important to *"just to have a ... environment for learning"* (FG 3). Therefore, the integration of space is an important consideration in the design. Identity also appears to be not as important for these students. However, they did note in the focus groups that they like that they could identify the building they are currently in as an art and design building. *"you can tell that it is an art and design building because when you walk up to it there is paper on the windows where people are doing their work and you can see that it is a working environment"* (FG 5). Therefore, this criterion does appear to be important in the design process however, it may possibly be a consideration in the later phases for example branding. This could be a feature that is attended to in the concept stage, when considering the students who are going to be using the space but does not rule out early design and layout based decisions.

Students from Art and Design overall scored highly on the trait agreeableness, a mid to high score on extraversion, highly on conscientiousness, a mid score on neuroticism and highly on openness. This personality profile may have influenced their overall preference for different features within the PLE. Students from Art and Design scored the highest of the sample for the trait openness for a preference for the feature, likewise they had a preference for aesthetics in the PLE over and above that of those in the other schools. Most notably there was a significant difference for this trait for Art and Design students and Engineering students. Additionally, students from engineering scored lowest on the trait openness, and their preference for aesthetics was low. Therefore, perhaps the preference for Aesthetics may be influenced by their personality traits. Additionally, students from Art and Design scored highly on workspaces and environment, these features had a relationship with the trait conscientious. Therefore, students from art and design may have a preference for these features due to their high score on conscientiousness. Although certain

preferences within the PLE may be due to difference in requirements from the specific course, it appears that the personality traits of Art and Design students may have an influence on preferences for certain features within the PLE.

#### 7.4.2.2. Engineering

Figure 7.6 displays the school specific framework for the feature of the PLE that students from ENG considered to be most important in their perceptions of the PLE, that affect their learning experiences and satisfaction.

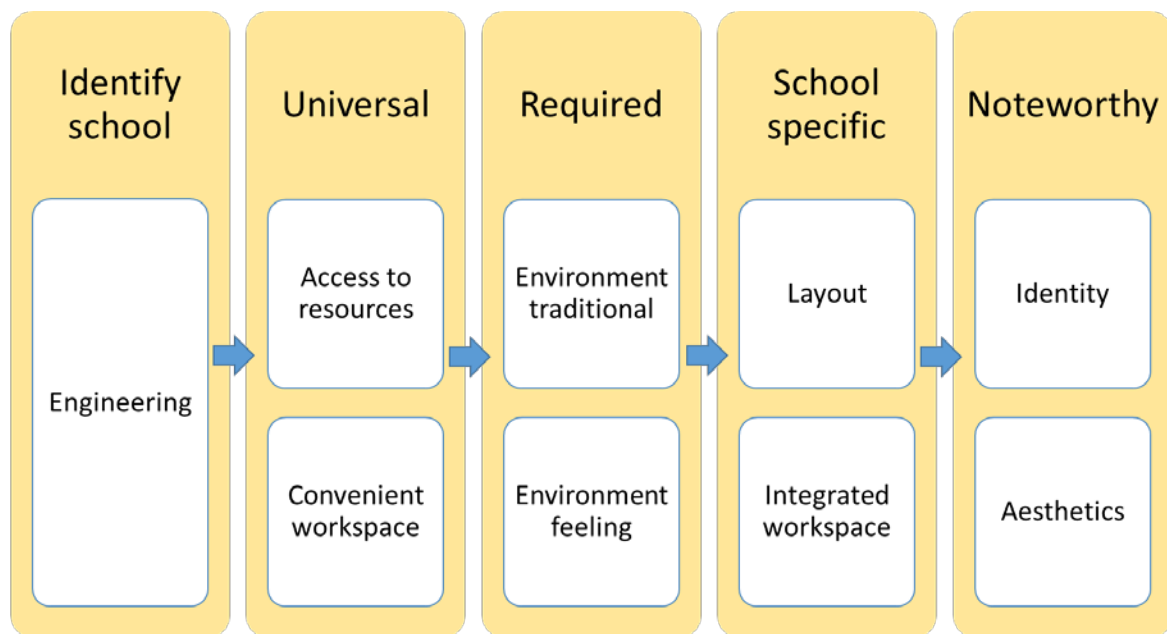


Figure 7.6 Framework for engineering students- differences in preferences

In the universal phase like the other schools is, access to resources and convenient workspace and should be considered first to make sure that students have access to their requirements. 'Access to technology' should be considered for example, computers and printers available around the building access to charging points for laptops, phones etc. Facilities should also be considered, for example making sure that students have access to the resources that they need for example books or specialist engineering equipment. A student noted, "*I have problems with going to the library because Solid Works (a subject specific software) doesn't work*" (FG 7) therefore providing the appropriate technology for the students is important. Furthermore, including factors in the infrastructure such as plug sockets are important considerations. It is also important that they have convenient workspaces so they can

*“get (their) laptop out and do your notes” (FG 7).* In the focus groups, the students from engineering noted that they like having access to their specific ‘work space’ that has computers and the right software. Having informal workspaces is important for students from engineering, *“there are a lot of cafes and that kind of spaces but there isn’t a proper table to work on” (FG 2).* In their space, they feel *“there’s nowhere round here where you could just go sit and do work” (FG 2).* They also noted that they preferred to have specific spaces for engineering and therefore perhaps this is a focus in the design process for engineering students. This is important because it may mean they do not use the university space. As one student noted, *“I think that is why I don’t generally use the facilities in the computer room because I just feel like there is too much going on for me” (FG 7),* this workspace does not provide a suitable environment for them to work in. Additionally a quality environment for engineers is having *“all of the necessary facilities like all of the labs” (FG 7), “computer labs are really good” (FG 8)* and *“lecture theatres themselves are what’s quality” (FG 2).* Therefore providing convenient workspaces is important.

In the required features phase, environmental traditional and environment feeling are also important for students from Engineering. The environment was also highlighted as important for these students, for example, the environment should be functional *“I think if it is a very efficient effective comfort work space, you know very thought out” (FG 2).* It was also noted that they do not *“think there is enough natural light the lights are always on” (FG 7)* and that *“it’s always really cold in the lecture theatre” (FG 2).* Therefore making sure the traditional environmental features are considered appears to influence their learning experiences. The environment feeling is also important because they students like *“feeling relaxed” (FG 2)* and that they feel comfortable *“as in the comfort when you feel ok to sit down and do some work without being uneasy” (FG 2).* Additionally one student noted that they think the building *“facilitates a sense of community” (FG 7)* therefore it is important to consider this in the design process.

The tertiary school specific features for engineering students consist of layout, and integrated space. Although layout was not as important as other features, it is still important in the design consideration for engineering students. The space should be open in its layout with one student noting, *“I think there needs to be more open space*



*because when I came to this Uni from college I thought wow everything is closed off* (FG 7). The integration of space is also important although the subject is more classroom and lab based compared with other schools there should still be some flexibility with labs and computer spaces. For example *“we have little rooms that are around the university out where you have got little group rooms”* (FG 8) Social spaces were highlighted as important however in the focus groups engineering students highlighted that *“there so many places for socialising”* (FG 2). It was highlighted through the research project that the engineering students found workspaces to be more important therefore, perhaps their environments should focus more on including informal workspaces and teaching rooms. In addition to this, having *“some dedicated social area”* (FG 8).

The noteworthy features for engineering students consist of identity and aesthetics. These results are consistent with the results from the pilot survey finding that students from engineering rated the importance of the ‘aesthetics’ far lower than did students from A&D. However, they are still important features to consider in the design process for these students, even though they may not have been rated as highly as the other features in the focus groups, engineering students still discussed these elements. For example, engineering students noted that the outside aesthetics of the building are important stating that *“when you look at it when you are going along Byrom street you think it must be a decent uni, you know the bigger the uni then obviously they have got the money”* (FG 2). They were still concerned with the colour of the decor inside noting that *“there’s too much green in this uni”* (FG 2) and *“all of the bright colours in the computer rooms they are a bit over bearing”* (FG 7). Engineering students also feel identity is not a highly important feature of the PLE. Although once again they noted that university, branding is good to develop their sense of community. *“Promoting the Uni is not necessary but it’s not a bad thing”* (FG 8). Additionally, they highlighted that they like to have school specific places to work which should be considered in the design process, these elements develop a sense of identity for these students. *“The sport science people they have got little kitchens and bathrooms and places to eat in their new building we have nothing here”* (FG 8). Therefore, they would like a space that they can identify as their own.

Students from Engineering score high on the trait agreeableness, low on extraversion, a high score on conscientiousness, a mid score on neuroticism and lowest on openness. Engineering students differed significantly from Art and Design having significantly lower preference for aesthetics. Engineering students also scored lowest on openness compared to Art and Design students who scored higher. Therefore, this personality trait in Engineering students may have influenced this preference within the PLE.

#### 7.4.2.3. Built Environment

Figure 7.7 displays the school specific framework for the features of the PLE that students from BUE considered to be most important in their perceptions of the PLE, that affect their learning experiences and satisfaction.

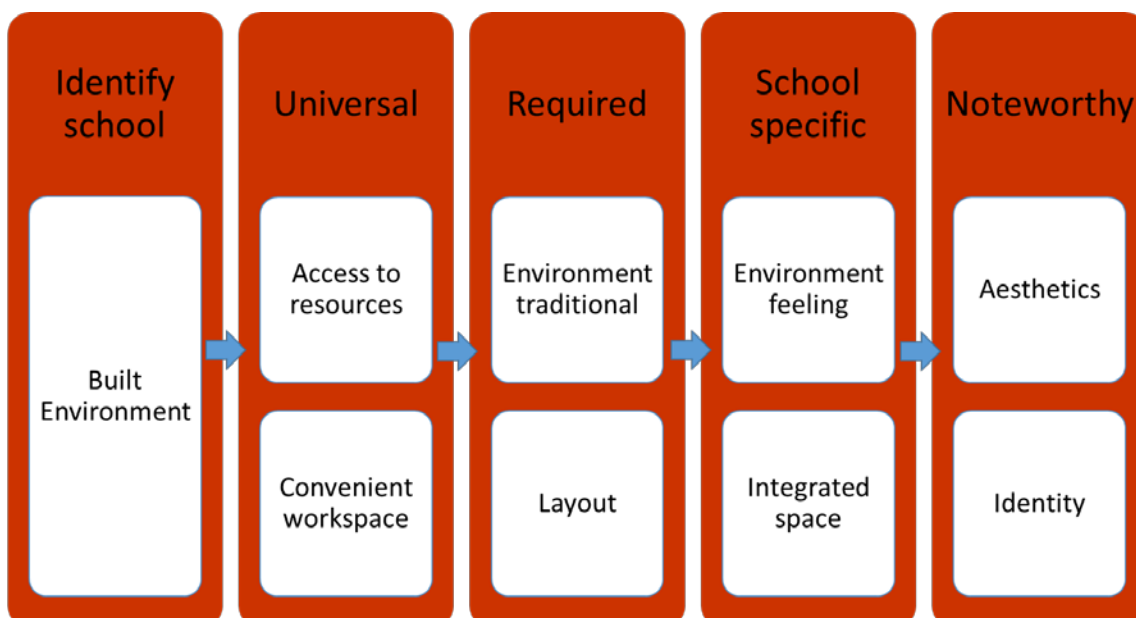


Figure 7.7 Framework for Built Environment students- differences in preferences

Access to resources and convenient workspaces is also in the primary universal phase for students in the school of the Built Environment. Having convenient workspace is important one student noted *“I think there should be some areas where you can go if you want be on your own and do your work”* (FG 10). Within this technology is important for BUE students; *“access to technology just because when we do our group work emails are involved and you need to research on the internet so that is important too”* (FG 4). Technology for students to be able to communicate with each other is

important. This may be due to the lesson format that students have, working in groups, therefore considering the different teaching structures is important in the design considerations. Having the correct facilities should also be considered in the PLE for BUE students. They would prefer *“all specific books from the built environment were in a particular space in a room”* (FG 4), *“because the lecturers pick out specific ones”* (FG 4). Also having enough facilities is important *“it’s really hard to book rooms here I think this building is too busy”* (FG 4). However, for this school specialist teaching rooms were not important unlike for ENG and A&D.

The required features for BUE students consists of ‘environment traditional’ and ‘layout’. Like with the other schools, factors such as lighting and temperature control were rated as important in the PLE. Students discussed the temperature as an important feature in their building, *“the temperature can become an issue”* (FG 4), *“there is no middle ground it’s either one extreme or the other”* (FG 4). The layout of the PLE should also be considered, *“the library is very much like a call centre just thousands of people sitting at the desks and you have to weave in and out of the desks to get to the printer for example so the layout of the room isn’t very inviting”* (FG 4).

The school specific features include environment feeling and integrated space. Students like a positive working environment, a student noted that a bad environment *“makes you tense up it doesn’t make you feel like I will go in and get my work done and make you feel positive straight away when you walk in”* (FG 4). Therefore creating the right environment has a positive impact on their learning experiences. BUE students find workspaces to be important for example in the form of integrated space; *“it would be better if the space was more integrated”* (FG 4). Additionally, it was noted that workspaces should be separate; *“the social spaces and the studying spaces are combined and they should really be one or the other”* (FG 10). A lot of the teaching that built environment students receive is formal lectures and seminars and therefore a preference for suitable lecture halls and seminar rooms is important to a positive learning experience. Furthermore, the students for the BUE highlighted that currently the rooms that they are taught in are not suitable and therefore this highlights it’s an important influence on their learning experience therefore needs to be corrected for these students. Finally, social spaces should be considered, as one student noted,

*“it’s not all about work you’re here to socialise so you don’t think there are enough social spaces”* (FG 4). In addition, there should be space in the PLE for relaxing *“there is never enough places to sit and have your dinner”* (FG 10).

In the noteworthy phase of the research process, ‘aesthetics’ and ‘identity’ are the final consideration. Although aesthetics was not rated as the most important feature within the focus groups students still noted that this still had a role to play in their perceptions of the PLE. For decor in the Focus groups there was very little discussion regarding the colour etc. for decor however it was noted that it was important to work in *“somewhere that looks nice”* (FG 4). *“I would say if it looks nice to me I am going to use it, if it just looks horrible and uninviting I am not going there”* (FG 4). Although there was no specific mention in the focus groups of what looks nice, it may be they have no specific preference. The aesthetics is the next consideration in this phase. A student noted that currently *“the lead up to our campus isn’t very nice is it”* (FG 4) therefore suggesting that the outside facade has an effect on their perceptions of the PLE. This may be because *“it does look dated so you would assume that the inside of the building is dated as well”* (FG 4). Therefore, it may lead to preconceived ideas about the quality of teaching and learning. Finally, the identity is the last consideration in this phase. Although it is rated very low for BUE students one student noted, *“I don’t know if there is any sort of built environment area so one definite place we could go to would be good”* (FG 4). Therefore, including specific areas for them may be useful in the design process. Also being connected to the other areas of the university because *“what the uni does offer is the other side of town so all of the facilities and services are the other side of town from us so we can’t really access them”* (FG 4). Although this phase encompasses the least important features in students’ satisfaction of the PLE, they are worthwhile considering in the design process as they do still appear to have an impact on students’ perceptions. However, these features are not as important as the other features and therefore should be considered within this phase of design.

Students from Built Environment scored mid to high on extraversion, high on agreeableness, mid to high on conscientiousness, mid on neuroticism and high on openness. Engineering students and Built Environment students score similarly on

their preferences for features within this PLE; this is seen in both quantitative phases of data collection. They were also similar on personality traits; this may be therefore why they have similarities in preferences within the PLE. Built Environment students scored highly on extraversion. If a look is taken at specific features of the PLE extraversion had a positive relationship with a preference for a control of environmental conditions. Therefore, this may explain why a preference of the environment was important for Built environment students.

#### 7.4.2.4. Business

Figure 7.8 displays the school specific framework for the features of the PLE that students from BUS considered to be most important in their perceptions of the PLE, that affect their learning experiences and satisfaction.

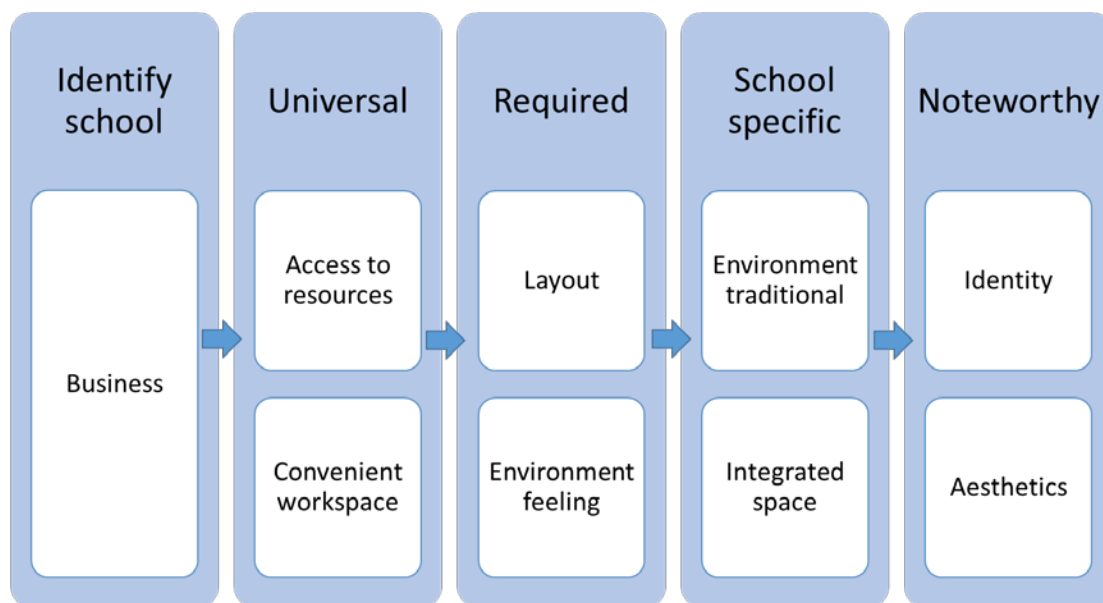


Figure 7.8 Framework for business students- differences in preferences

As discussed above the features that are in the universal phase, access to resources and convenient workspace should be considered first to make sure that students have access to their requirements. Making sure there are the suitable workspaces is important, making sure they are more accessible would be ideal for business students. “For instance the computers out there are handy to do a quick bit of work” (FG 9) and enough accessibility is important, “there is not a lot of workspace here” (FG 9). Access to technology should be considered as with the other schools, such as plugs and

computers. There should be “*all up-to-date technology*” (FG 9) and working technology “*even the computers, at school the internet used to go down the network would crash all the time, but here it is generally good. I mean the last few days*” (FG 9) and “*I think it’s good modern technology*” (FG 6). Facilities should also be considered in this first phase, for example by making sure that the students have access to the resources and facilities that they require for their specific course. A student noted that “*it’s really good there are so many books*” (FG 6). Therefore, making sure there is enough space for their resources is important. Students from this school, however do not rate specialist-teaching rooms as important, this may be because they do not require these for their course.

To meet the secondary required features for business students, ‘layout’ and ‘environment feeling’ was important for these students. Currently students from the business school reside in a very open, spacious environment; the students expressed their preference for this environment saying that it was a nice place to learn. When discussing the teaching environment, a student noted “*a lot of open planned classrooms*” (FG 6). Additionally, the management of the classrooms was noted as important, students liked classrooms that were always laid out well and remained this way between lesson changeovers. The layout of the buildings could be developed; “*it could be designed in more of a distinct way so you were clearly in the business zone or the music*” (FG 9), “*I don’t think it is very clear*” (FG 6). Conversely, in some spaces the students highlighted that the layout was very good and they can navigate their way around easily as the layout was clear and well sign posted. It is “*laid out the same so it’s like you come up [the stairs] and you know that the rooms go round the same way*” (FG 6), Therefore, when designing PLEs for business students considering the layout is very important for a positive learning experience. The feeling of the environment is also important when talking about her friend one student noted, “*she doesn’t have that effort or the motivation to go for the simple reason that she doesn’t feel comfortable in that building*” (FG 10). Therefore, it is an important consideration in the design of the PLE.

The school specific features for business students include ‘environment traditional’ and ‘integrated space’. Throughout the focus group, the business students discussed

their preferences for the bright environment with lots of windows; therefore, this is an important feature to consider when designing their PLEs. One student noted that on *“the top floor there is a lot of natural light and you just feel like you’re in your own room”* (FG 9), which they really liked in the space. Integrated space should also be considered because as one student noted *“There is literally nothing. We all have to go to the library. There’s nothing here.”* (FG 9), which affected their learning experience. There should be workspace and social spaces integrated into the university campus as a whole. Social spaces are important for students’ learning experiences in the business school because *“you are coming to learn but there is a social side to it so you can sit there and have a coffee and you can sit on the comfy chairs and talk to your friends”* (FG 6). However, currently *“I wouldn’t say that there was any social space in this university”* (FG 9). Therefore, including social spaces in the PLE can encourage students’ interactions with each other.

In the noteworthy phase of the research process, ‘identity’ and ‘aesthetics’ are the final consideration. Once again, aesthetics appears low on the list of requirements however it is an important consideration. One student noted, *“I quite like the library because it is quite colourful isn’t it. It’s really nice.”* (FG 9). Therefore, the decor of the environment does appear to influence their perceptions. In addition having a bright environment is important *“the floors are black, and then it’s quite dark in the main corridor... it’s quite dingy”* (FG 9). They perceived their building to be quality because, *“these window panels aren’t cheap, whereas a lot of buildings are just brick, and you can tell that a lot of money has been spent on the building”* (FG 9), therefore the finish is important. Being up to date appears to be beneficial as well, *“I think this building’s nice; the Redmond’s building. Because it’s quite new”* (FG 9). The identity of the building is the final consideration in this phase, in the focus groups it was noted *“it would be good if all of the buildings were closer”* (FG 6). Also having an identity as a school for example having *“themes with colours and tops and hoodies, so everyone knows ‘Oh business is blue”* (FG 9).

Students within Business scored low on neuroticism, mid-range on extraversion, high on agreeableness and high on conscientiousness and openness. Students from business scored highest on conscientiousness, and although not significantly this may

be why they prefer many features highly correlated with the trait conscientiousness. Such as, layout that was lower down in preferences for the other three schools. An interesting finding from this research was that the Business students scored significantly lower than students did from BUE and ENG on the personality trait Neuroticism. This may have influenced their difference in preferences of features within the PLE, emotional stability; the opposite on the spectrum to neuroticism is associated with being calm and less tense. Therefore, they may be less worried about having additional features within the PLE such as environment traditional factors and aesthetics. As long as they have the fundamental features like access to resources, which are integral to the specific teaching experiences.

#### **7.4.3. Framework for practitioners**

Figure 7.9 depicts the framework suggested for designer use. The framework displays firstly, the individual features of the environment that should be considered when fostering an environment that supports community, quality and understands the PLE as a whole. It highlights the three elements of the PLE, the features that overlap and the features that are individual to each. This therefore allows the designer the ability to identify what components are necessary in the understanding of each of the elements, community quality and the PLE as a whole. Secondly at the bottom of the figure is an overview of the features that each school prefers in their PLE and how this differs from each other. The framework then moves on to the specific features of each other school researched to explore the design process for each of the schools specific environmental requirements. Significant differences were found between specific schools on certain features, therefore ones that need most consideration, have asterix (\*) denoting the significant relationships. Therefore, when designing environments for the different schools attention needs to be given to these features between these schools.



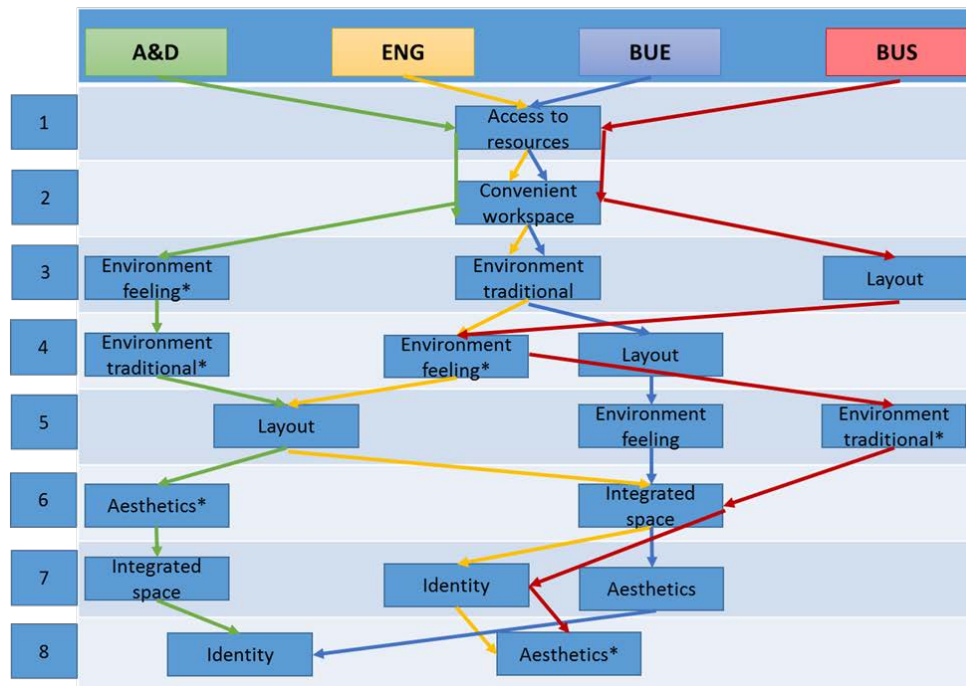
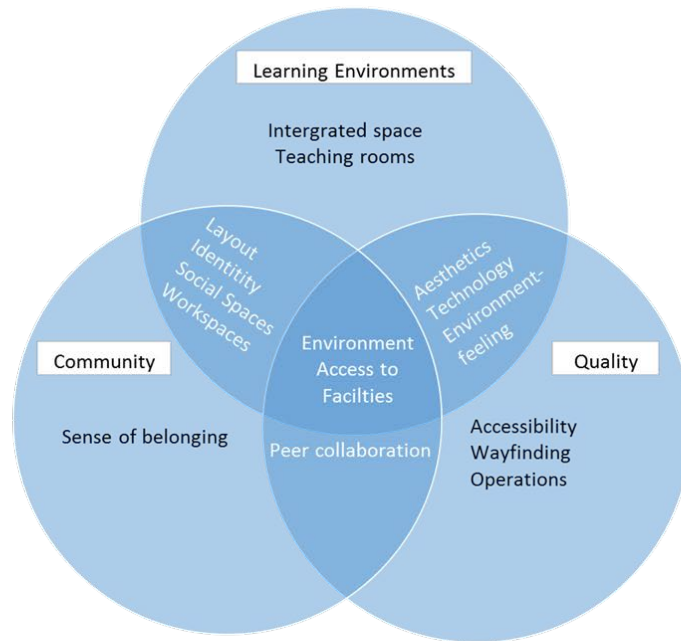


Figure 7.9 framework for practitioner's school comparison

Overall, the framework of the environment can be used in conjunction to design environments specifically for the students who are going to be using the PLE.

Firstly, this framework highlights the features of the PLE as a whole, to be considered in the design of a quality PLE and the development of a sense of community. This framework then demonstrates the combination of the four

frameworks of the specific school design of the PLE. It highlights the four schools across the top, A&D, ENG, BUS and BUE. It highlights their preferences of the PLE as a whole, from one through eleven. This framework highlights the similarities and difference in preferences. If the arrows are followed, you can see the preferences for each school and then how it is similar or different to that of another.

A guide for implementing these models can be found in the appendices.

## **7.5. Summary**

Overall, the chapter demonstrates the framework development, firstly of the PLE framework and then secondary to that, more specific frameworks according to the specific preferences of the school. The chapter then incorporates these frameworks as one simple overview for practitioners to utilise. This chapter has also discussed each of these frameworks, how they should be used and how they have been developed from the findings of this research. It has also discussed the specific features of the PLE and how these are supported by current understanding within the literature.

This chapter has also highlighted that this research has identified few significant differences in personality traits between schools. Therefore, it is hard to get a complete picture on its influence of specific schools preferences although we can identify personality does influence preference, therefore for future work research should expand this research to identify personality profiles.

## 8. Discussion



## 8.1. Introduction

This chapter aims to provide an overview of the findings of the current research in relation to the current knowledge in the field. This chapter will examine the findings in regards to both the aims and objectives of the research framework to examine the contribution to the field of work.

## 8.2. Summary of research

This research undertaking was divided into nine chapters to provide clarity of this research project **Error! Reference source not found.** provides an overview of the thesis. This figure provides an overview of each chapter and how it has contributed to

Table 8.1 Overview of thesis

Chapter	Overview
Introduction	To provide an introduction to the research, outlining the research problem and setting the aims and objectives of the research
Literature review	To identify and examine existing literature in the field, identifying the areas of quality community and individual differences in the design of PLE in regards to students requirements. This chapter identified the theoretical background for the foundation of the current research.
Methodology	To review the philosophy and methodological underpinnings to develop a conceptual framework to allow the answering of the aims and objective of the current research
Phase one	To examine relationships between PLE factors and specific preferences for students. To establish the validity of the research.
Phase two	To explore student’s specific requirements additionally to the current literature, identifying specific features of the PLE.
Phase three	For the final identification of the specific requirement of the PLE from students’ perspectives.
Model development	The findings of the research have been discussed alongside the presentation of the development of the models of design for the higher education PLE. In addition this chapter presents the validation for the models develop and the valid version of the final models.
Discussion	To explore the finding of this research in relation to current understanding.
Conclusions	To present the main findings, contributions to knowledge and theory, limitations and recommendations for further work.

the present research project.

### 8.2.1. The research aim and objective

The current research aimed to develop a framework of design within the PLE that could develop students’ learning experiences by identifying the influences of

## Discussion

personality community and quality on their preferences. Through this the objectives of the research were explored;

- To analyse personality types, educational community and quality definitions in the different schools to establish whether there are differing levels of environmental satisfaction and therefore differing built environment requirements.
- To analyse factors of an educational community within students' built environment by designing a questionnaire to identify what creates an educational community
- To examine personality traits to identify if there are differences in general personalities between schools to identify personality types within subject areas to assess differences in needs
- To identify what quality means in terms of the built environment, then develop and determine a definition through questionnaires
- To develop a framework that can be used to inform the design solution to space within the HE facilities.
- To validate a framework that can be used to inform the design solution to space within the HE facilities.

For clarity of the research process, **Error! Reference source not found.** presents the aims and objectives and how these were achieved, along with where to find the synthesis of this. The following sections provide a summary of the findings in relation to each of the objectives, which together form a presentation of the completion of the research aim.

## Discussion

Table 8.2 Research objective and method of achievement

Research objective	Achievement	Chapter
To analyse personality types, educational community and quality definitions different schools at LJMU to establish whether there are differing levels of environmental satisfaction and therefore differing built environment requirements.	Quantitative and qualitative data collection	Chapter four, five and six
To analyse factors of an educational community within students built environment by designing a questionnaire to identify what creates an educational community	Literature review and quantitative and qualitative data collection	Chapter two, four, five and six
To examine personality traits to identify if there are differences between general personalities between schools to identify personality types within subject areas to assess any differences in needs	Quantitative and qualitative data collection	Chapter four and six
To identify what quality means in terms of the built environment, then develop and determine a definition through questionnaires	Literature review and quantitative and qualitative data collection	Chapter two, four, five and six
To develop a framework that can be used to inform on the design solution to space within the higher education facilities.	Literature review and quantitative and qualitative data collection	Chapter two, four, five, six and seven
To validate a framework that can be used to inform on the design solution to space within the higher education facilities.	Validation through individual interviews and survey	Chapter seven

Overall, the research has met the proposed research objective and the production of the final aim. Features of the PLE were identified that students perceive to be a quality learning space. Features of the PLE were also identified that can contribute to the development of a sense of community in the PLE. The findings were then synthesised into a framework of design for the PLE as a whole. This framework was then explored with its relationship to differences in preferences with students from difference subjects and differing personality traits. Differences in preferences were identified, which then led to framework being identified to design the PLE according to the differences in school and personality traits.

The present research offers a unique perspective on the design of HEI buildings, PLE design. Literature is beginning to question the design of the PLE (Hill & Epps, 2010; Perks et al., 2016), however further research into the development of appropriate PLE is required (Jamieson, 2003b; Temple, 2008; Cleveland & Fisher, 2014; Ferrell, 2016; Johnson et al., 2016; FLEXSpace, 2017). By examining students' preferences as defined by their personalities and choice of subject to study within the PLE and identifying positive impacts, their satisfaction and students' learning experiences can be enhanced (CABE, 2005).

### **8.2.2. Objective one**

*To analyse personality types, educational community and quality definitions in the different schools to establish whether there are differing levels of environmental satisfaction and therefore differing built environment requirements.*

The first objective of this research was achieved through phases one, two and three of data collection. From the literature review it was identified that there are differences in personality traits in students studying different subjects. It was hypothesised that the individual differences between schools in HEI's would influence preferences for features within the PLE. This research found differences in preferences for features within the PLE as a whole considering both education community and quality factors, between the four schools investigated. For example, there was a significant difference in a preference for the aesthetics of the environment between students from Art and Design and Engineering. Students from Art and Design had a preference for aesthetics over and above students from engineering. Therefore, when designing the PLE for Art and design students it is far more important to consider the aesthetics of the PLE than for the environmental design for Engineering students. However, it was identified that students from engineering discuss the importance of the functionality of the PLE, these factors are more important than the aesthetics of the PLE. Therefore, when designing the environment for engineers the functionality should be considered over the aesthetics.

This research supports previous research that highlights that the design of the PLE may be more suitable for certain students than others (Holm, 2011; Luketic & Dolan, 2013). However additionally this research emphasises the specific differences in preferences between different schools. Consequently, this research recommends that the PLE should take into consideration the main users of the environment. In meeting this first objective this research has highlighted the requirement to consider the specific students who are intended for the planned PLE. This also supports the development of specific areas for students in a university campus. Although it is not always going to be possible to have specific spaces for all student to learn in, an area should be considered for its specific dedication, this can take many forms in conjunction with the

## Discussion

aims of the project. Whether it be refurbishment, where space can be re-organised or a new development where space can be specifically designated.

### 8.2.3. Objective two

*To analyse factors of an educational community within students' built environment by designing a questionnaire to identify what creates an educational community*

This research objective was achieved through a review of current literature regarding the theory of psychological sense of community and phase one, two and three of data collection. The features of the PLE that were identified by students to develop a sense of community were; Access to facilities, Clear identity, Environment, Peer collaboration, Layout and Social spaces. Figure 8.1 displays the features of the environment and the component parts to each, these are the features of the PLE that should be given attention to develop an education community in the HE PLE.

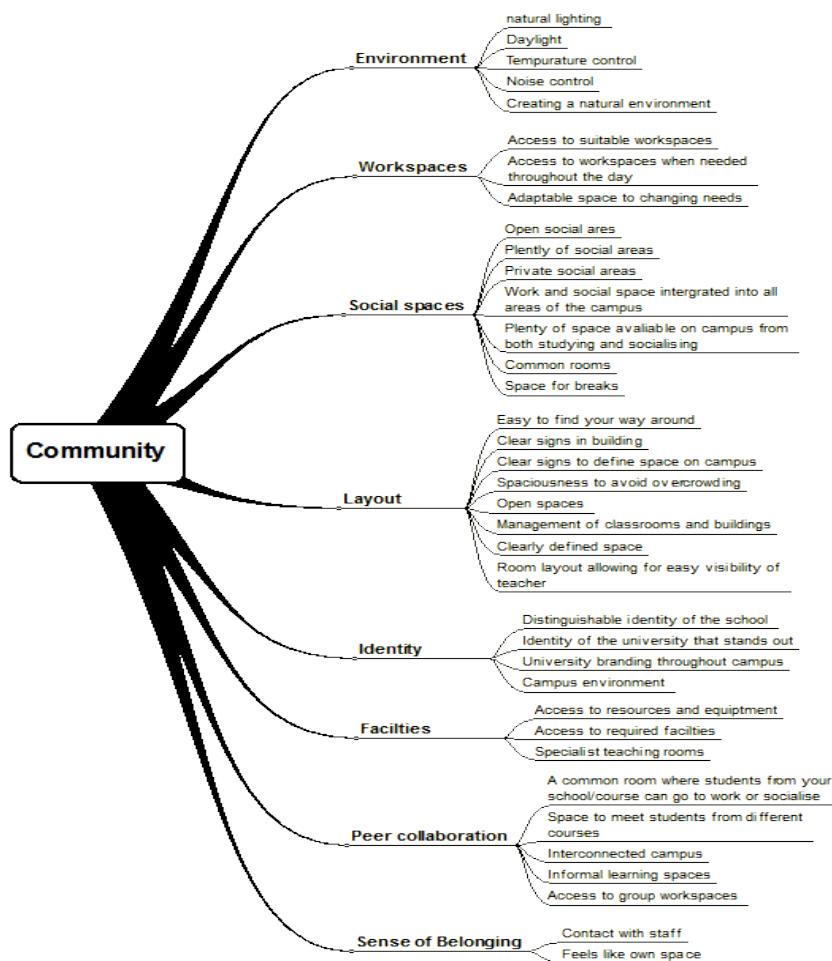


Figure 8.1 Educational community



## Discussion

To ground the findings of this research in theory, referring back to McMillan and Chavis (1986), they identify that four factors are important for the development of sense of community; membership, influence, integration and fulfilment of needs and shared emotional connection. Membership is a person's right to feel like they belong, by providing a clear identity for students and providing them with a feeling that they belong to their space as a member of the university. Influence is the ability of the group member to influence the group, by allowing space for peer collaboration, to enable students to help and learn from others. Integration is having needs fulfilled, by providing the facilities and the environment conducive to learning that provides students with their requirements of the PLE. Likewise, providing an appropriate layout means students can access workspaces and navigate their environment. Finally, providing a shared emotional connection is met by the provision of social spaces where students can share and develop friendships. Incorporating the features of the PLE into HEI design should support students' psychological sense of community, which may therefore positively enhance students' learning experiences (Bickford & Wright, 2006).

Although much research into psychological sense of community in the physical space is in the development of residential neighbourhoods, this research has identified that students perceive the environment to be an important part of their psychological sense of community. Students were able to identify many features of the PLE that they feel would make them feel a sense of community. Students also noted on separate occasions that a sense of community was important in their experiences of university.

The identification of this research objective provides insight into the development of a psychological sense of community by the design of the PLE. It also provides the achievement of one aspect of the aim of this research. This identifies how the HE PLE can be designed specifically for the students. By developing a community environment, it provides a space required for students at a transitional phase of their life. This environment must provide much more than lower levels of education or the requirements of a workplace.

### **8.2.4. Objective three**

*To examine personality traits to identify if there are differences in general personalities between schools to identify personality types within subject areas to assess differences in needs*

This research objective was met by the quantitative sections of this research seen in chapters four and six. Differences in personality traits between the schools were found in this research. In phase one, differences were found between schools on openness and neuroticism. The third phase of data collection only found a difference between Business students and both Engineering and Built Environment for the personality trait neuroticism. This research found that students from the Business school scored significantly lower on the neuroticism trait than the students from the other two schools. Business students are therefore more emotionally stable than students in the other schools are; this finding is supported by personality trait theory and research. Business owners have been found to be more optimistic (Owens et al., 2013) which is a trait associated with emotional stability. Furthermore, one of the four top predictors of success in business is emotional resilience (Owens et al., 2013), along with work drive, social networking and goal setting. Further research has also identified that there are specific personality factors that predict entrepreneurship, which was concluded as an important aspect in the consideration of successful business owners (Rauch & Frese, 2007). These included personality traits such as stress tolerance, which again is another element of an emotional stability personality trait. Therefore, this research expands the understanding of personality traits in different subject traits. Even business students, who have not yet reached the business world, demonstrate the personality traits associated with being good business owners and entrepreneurs.

Although few differences were found between the big five personality traits, there is promising findings from this research to identify general personality traits from students from different schools. However, these differences may be clearer if the sub groups of the big five personality traits were examined. For example, the trait conscientiousness includes organisation and achievement; these facets have been found to be good predictors of behaviour in their own right (Paunonen & Ashton, 2001).

## Discussion

Therefore, these may provide a better indication of the differences between students in different schools in HE.

The relationship between personality and preferences for features within the PLE was explored. Relationships were found between the personality traits, conscientiousness, agreeableness and openness.

A relationship between conscientiousness and features of the PLE is unsurprising if this trait is examined. Features of this trait are organised, reliable and responsible, and these traits are ones that lead to high academic achievement (McIlroy et al., 2015) and motivation to achieve (Eysenck, 2014). As people are more organised they may have less cluttered homes or they may plan their time out precisely. Within the research a relationship was found between conscientiousness and the organisation and layout of the PLE, and this therefore reflects current personality theory. In addition to current personality theory, this research demonstrates that this personality trait also influences preferences for the physical features of the environment. Within the current research, a relationship was found between conscientiousness and convenient workspaces and access to resources. All of these features are to do with having enough and suitable workspace, or the access to the resources required for their education. Therefore finding a relationship between these features and the trait conscientiousness, fits with current personality theory. This trait is highly related to academic achievement and therefore finding a relationship with the features of the PLE that are most to do with the teaching and learning experiences as opposed to the campus experiences as a whole, is remarkable. This extends current understanding of how conscientiousness may support academic achievement and students who exhibit this trait prefer spaces that allow for their educational needs, and therefore perhaps seek this environment. Therefore providing these spaces may support a student's educational experiences.

Those who score highly on openness have the traits: artistic, imaginative and original. This research found that there is a relationship between aesthetics and openness. This fits with current personality theory as openness has been found to have a relationship with abstract art (Gridley, 2013). Therefore perhaps those who score

## Discussion

highly on openness perceive the environment differently as they have a different style of thinking (Gridley, 2013). This expands on current theory, demonstrating that openness also influences the requirements of the PLE. Openness was also found to have a relationship with the feature access to resources and convenient work spaces. This is interesting as the feature facilities access to required resources and equipment, is related to the specific teaching and learning requirements. Openness has also been found to have a relationship with academic performance (McIlroy et al., 2015). Although this relationship does not appear to be as strong as conscientiousness (McIlroy et al., 2015), there is still a requirement for features of the PLE which support in learning. This research develops current personality theory as it demonstrates that students who score highly on openness prefer access to resources and convenient workspaces in their PLE.

Relationships were found between the traits of agreeableness and organisation and layout, access to resources, convenient workspaces, aesthetics, environment feeling, environment traditional and integration of space. Those who score high on agreeableness tend to have the traits appreciative, generous and trusting. A relationship between agreeableness and social space was found in this research, this reflects current personality theory as agreeableness has also been linked with altruism (Eysenck, 2014). Therefore, students who score highly on agreeableness may like integrated as it gives them the opportunity to interact with people and perhaps help them with their work. This also may be why there is a relationship with environment feeling as this encapsulates a sense of community. Agreeableness was also found to have a relationship with convenient workspaces and access to resources, both features most related to educational experience. This also reflects personality theory as agreeableness has also in some cases been found to influence academic performance (Babakhani, 2014).

Agreeableness was found to have a relationship with seven of the eight features of the PLE, which is a lot compared to the other traits. This may be because those who score highly on agreeableness have been found to have strong psychophysiological responses of emotion (Tobin et al., 2000). Therefore, as was identified from the literature review, the physical space can cause emotional responses (Chiou & Cheng,

## Discussion

2013; Vartanian et al., 2015; Zhang et al., 2016). The PLE may influence students' emotions, those who score highly on agreeableness are more emotionally aroused by external stimuli, and as such, it is important to design the environment considering this association.

Relationships were not found between extraversion and neuroticism and preferences for features in the PLE. This is remarkable because it was theorised that extraversion would have a relationship with a preference for social spaces. This is because features of the trait extraversion are that students are out-going and talkative, therefore it would be hypothesised that preferences for a place where they can meet and talk to others would be found. However, an explanation for this may be that they feel like they do not need specific social areas, as they are outgoing and confident they may feel that they can exert this anywhere across the HEI.

Relationships were not found between neuroticism and any of the features in the PLE. This is in contrast to the findings from the first phase of research that identified that low levels of neuroticism had a relationship with features, such as, view out of the window. Therefore, perhaps neuroticism is associated with specific individual features of the PLE, as identified in this research. Consequently, they may gravitate towards these features in the PLE, for example private social areas.

This research objective has been met by identifying differences in personality traits between schools in HE, and then identifying how personality traits may influence preferences in the PLE. The proposed method for use within the design procedure is in the identification of the intended users of spaces. Through a better understanding of the intended users, the design process can be better attuned to the specific design requirements of the PLE.

### **8.2.5. Objective four**

*To identify what quality means in terms of the built environment, then develop and determine a definition through questionnaires*

This research objective was met by firstly reviewing the literature to identify the current understanding of quality, and then determining a definition by both quantitative and

## Discussion

qualitative methodologies as seen in chapters two, four, five and six. The features of the PLE that were identified to describe students' perceptions of quality were; aesthetics, cosmetics, facilities, equipment and resources, technology, peer collaboration, wayfinding, accessibility, operations, environment traditional and environment feeling Figure 8.2. The figure demonstrates the features of the PLE that students perceive as quality and therefore should be considered in the design process to develop specific student focused environments. The figure breaks down the features into their component parts, which should be considered when identifying the features of the PLE that student regard as quality.

To ensure this definition took a comprehensive view on quality in the PLE, theories in the existing field of quality were used in the development of the framework. Owlia (1996) highlighted two themes that are present in TQM that should be met in the provision of quality.

1. Quality is what satisfies users' requirements
2. Quality is features that can be measured

The identification of these two features of quality determinants are clear in the proposed definition of quality. This definition of quality in the PLE was developed through the exploration of students (the users requirements), by specific and measurable features of the PLE. This framework includes elements of both the PLE and facilities management, which highly influences perceptions of the PLE.

To ensure that the HE buildings meet students' expected requirements of quality, the factors highlighted through this research should be attended to. Defining what quality is in terms of the HE PLE is important as it is the vital first step in quality improvement (Ghobadian et al., 1994). This descriptive framework will help to close the gap between the perceptions of the users' requirements and the actual requirements of the students (Riley, 2013). Consequently, this definition of quality can be used for future progression in improving quality in HEIs.

## Discussion

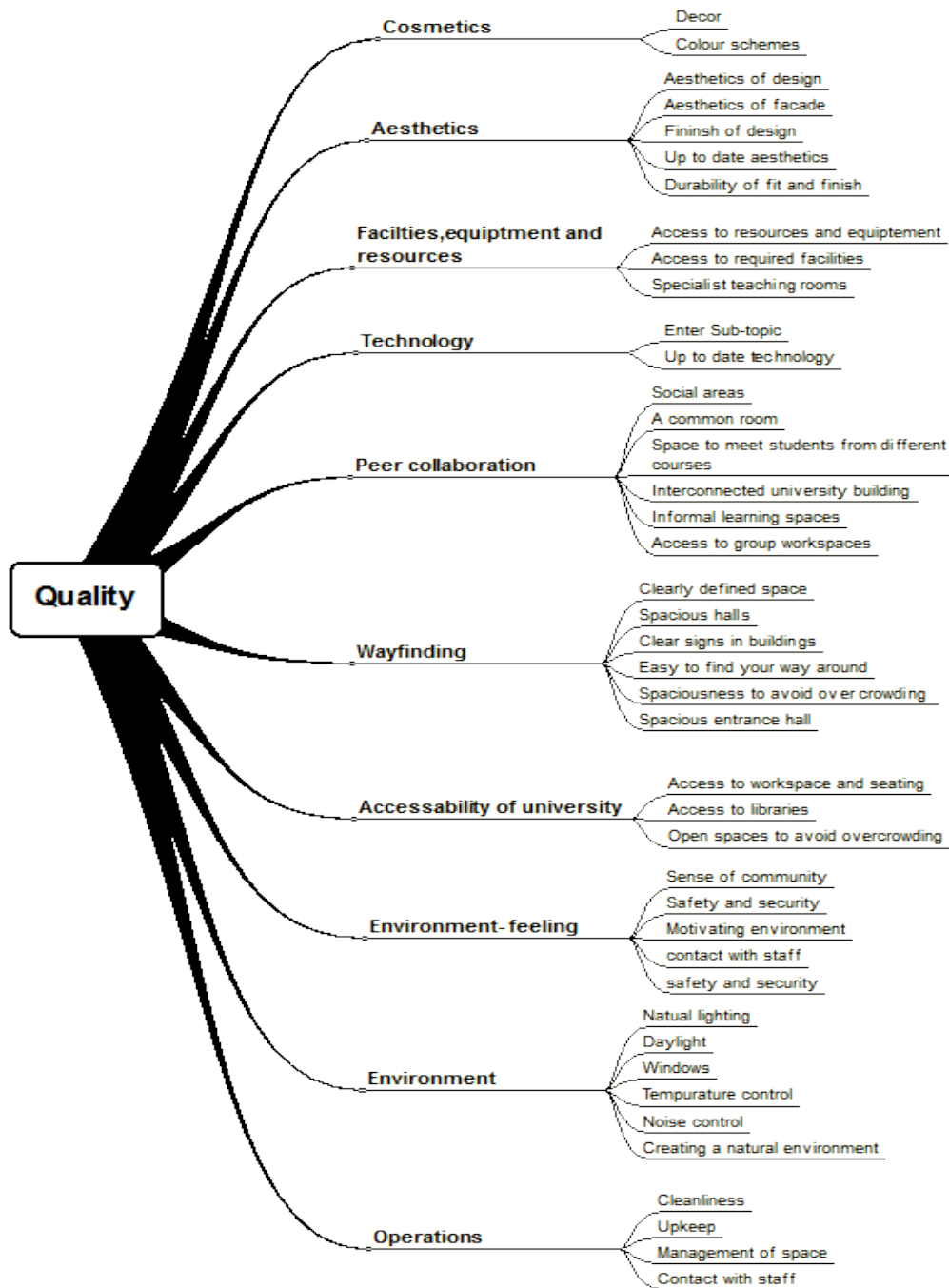


Figure 8.2 Quality definition

If a look is taken back to the TQM model, Figure 2.3, identified by (Oakland, 2011) this research has identified the people in the identification of quality in the PLE, by understanding student specific requirements. It has also met the requirement for the performance criteria by identifying students' critical requirements of the PLE in their perceptions of quality. This research also updates the knowledge to employ in the

planning process by identifying the image of the PLE that students identify as quality. This research also aimed to integrate quality improvements into the design process to ensure the outcome of appropriate PLE for students is met. However, this research has also identified that more work needs to be done to ensure that the process of implementing the quality improvements is better structured. From phase four of the research, the validation phase, it was identified that incorporating the proposed framework into the design process may still be difficult as there were differences in the applicability of them.

### **8.2.6. Objective five**

*To develop a framework that can be used to inform on the design solution to space within the higher education facilities.*

This objective was achieved through the development of a framework identified in chapter seven; the contributions to these frameworks can be seen in chapters two, four, five and six. The proposed framework was developed through the combination of the findings from the first four objectives of this research project. The proposed frameworks are based on the theoretical underpinnings regarding the requirements of students in the design of the HE PLE, which have been reinforced and developed from the findings of the four phases of data collection.

This research has identified an overall framework that can be used to inform the design of the PLE within higher education. This framework includes the features of the PLE that students regard as being important in their perceptions of the space that consequently influence their satisfaction and learning experiences. Additional framework were then developed that identify the specific disciplinary requirements. These develop the overall framework allowing practitioners the opportunity of developing environments specifically for the school who are intended for the space.

This research does not only identify frameworks for the specific development of the PLE from students' perspective, but also grounds this research in a framework for integration into the design process. This work provides practitioners with the tools to identify the specific requirements of the space but also how to integrate this into the



design process. This work supports the requirement of designing HE buildings for the intended users, the students, and the consequential development process.

### **8.2.7. Objective six**

*To validate a framework that can be used to inform on the design solution to space within the higher education facilities*

On development of the proposed framework it was important to validate the findings of the research therefore the final objective required a validation process. The validation of this research was achieved through three interviews and a pragmatic survey, which validated and identified barriers and practical implications. This validation strategy identified areas for improvement in the original frameworks to simply and clarify certain features. The validation also highlighted the requirement of the applicability of the frameworks developed into the design process, therefore an additional framework was developed. This framework identified, as set out by previous research (Riley, 2013), where in the design process the proposed frameworks should be considered and applied. To summarise, this objective allowed the exploration of the usability and the validity of the proposed frameworks.

### **8.2.8. Research aim**

The aim of this research was;

*'To develop and validate a framework that can be used to inform the design solutions to space in higher education facilities that allow for variance in personality, educational community and quality requirements of students from different subject areas'*

Through a systematic mixed method design, utilising different data collection techniques, this research was able to answer the aim of this research project. This research identified that there are differences in preferences for features of the PLE between students from different subject areas. This was reinforced by finding that there are differences in personality traits between these subject areas, which also has a relationship with preferences for feature of the PLE. This research identified a definition, formed from both theoretical underpinnings and the current research, of quality from a student's perspective in the PLE. Finally to ensure the development of

a specific framework for students in HE, features of the PLE were identified that could help in the development of an educational community. To ensure that this framework could inform the design process, recommended from the validation phase of this project, a framework was developed to identify the stages of the design process in which the framework of this research could be utilised. Therefore, this research achieved the intended aim by developing a set of frameworks that can be used for guidance by practitioners in the design process on HE PLEs. A guide has been developed from this research that can be utilised by estates managers to guide them into the implementation of the framework (see appendix 21)

### **8.3. Framework validation – phase four**

To evaluate the frameworks developed in this research phase four of the research was to conduct validation interviews and a survey.

The participants for the validation interviews and survey were selected from the estates management teams across HEI's and an architect with a specialism in the design of learning spaces. The sample of estates managers for the interviews included two directors of estates, one from a pre-1992 university and a post 1992 university. In the survey, eight members of estates teams between one to twenty five years experience in the HE estates management team participated from universities across the UK. The groups sampled for this phase of research, encapsulated people with a wide range of knowledge of the design of HE PLEs, from many different types of university, therefore allowed for the successful evaluations of the outcomes of this research.

Semi structured interviews were undertaken with the participants to understand their perceptions of the proposed outcomes of this research project. The following questions were asked;

#### **Contextual questions**

1. *What are the current design processes for developing new Physical Learning Environments for students?*

## Discussion

2. *Do you think that currently the students' preferences for the design of their learning spaces are considered? And if so how?*

### **Framework validation questions**

3. *To what extent do you think the specific framework could inform the students' preferences when designing Physical Learning Environments?*
4. *Would you use the framework in the design process for Physical Learning Environments?*
5. *What are the barriers to the use of the framework?*
6. *What extent do you feel the proposed findings will have on the effective development of Physical Learning Environments for the students?*

The questions within this phase of research provided the opportunity for the evaluation of the research as a whole and additionally the frameworks developed through the findings. The interviews were constructed in two sections contextual and framework validation questions. The contextual questions were used to identify perceptions of the current design process and their consideration of students within the design process. This was therefore aimed at providing insight into the research topic as a whole for the evaluation of the validity of the research as a whole. The second set of questions are regarding the validation of the frameworks specifically. This set of questions were directed to each of the frameworks, the overall framework and the specific school frameworks. In particular, questions 3, 4 and 5 were crucial in the refinement and validation of the framework. These questions asked participants to reflect upon the frameworks presented and comment upon their suitability and usability. They were also invited to highlight alternative options or barriers, based on their own experiences with the design of PLEs. The outcomes of this phase of research utilising both the survey and interview data was then used to refine the frameworks. Firstly, to explore the participants' perceptions on the context of this research the contextual questions will be examined. The framework validation questions will then be reviewed in association with each of the proposed frameworks.

During the course of the appraisal of the frameworks and the consequential data collected, it was important for all of the points to be assessed against each other to ensure a robust evaluation of the frameworks. All points were therefore considered to develop the final framework by reviewing each of the contextual questions and then a more specific review of the frameworks. In general, there was a positive consensus with the use of the frameworks however, there was some discussion about the clarification of specific items, which would make the frameworks more functional.

### **8.3.1. Contextual questions**

*Question 1: What are the current design processes for developing new Physical Learning Environments for students?*

There was a common response in the discussion regarding the design process for the development of new learning spaces: that is an estates strategy is formed which leads the design process. The strategy must encapsulate how the learning landscape will develop in the future and therefore what the buildings must provide. Furthermore there must also be consideration for the future development of the institution and the growing demands placed on the HE sector. It is also important to consider the aims of the institution itself, which can vary from place to place. There is also the considerations of the physical capacity of the space, for example how many more lecture halls or seminar rooms is needed or how many students must we accommodate. Additionally, the teaching and curriculum plans for the heads of schools must be considered, and how this influences the spatial requirements.

As one interviewee stated;

*“We have to take a holistic view of the estate; we have to consider the interdependencies, the development, the costs, the affordability, along with what really will help us in the future. So there are things like student experience, growth, staff experience, performance, sequencing, deliverability, what the risks are. This leads to the overall vision, or functional brief of the learning space design.”*

## Discussion

This integration and fulfilment of the spectrum of requirements that HE buildings provide are considered in the design process. This leads to the overall vision, or functional brief of the learning space design. This supports the current direction of learning space design.

*Question 2: Do you think that currently the students' preferences for the design of their learning spaces are considered? And if so how?*

Reviewing the responses to the question there appears to be different extents to which the students' perspective is used as a guide for understanding how the environment should be designed to enhance their learning experiences. In some cases it appears that students play a role in the design by being part of it, an example of this was a comment where a student representative takes the role of students advisor.

*"we have one of the guild officers, who represents the students and links back to the students. As we did with the estate strategy, we involved the students and the guild in terms of... We link through the guild to get the study body."*

At times, the students who use the current spaces are also asked about what they would like out of the space.

*"We've been in touch with students, they don't want the grey austere, they want something warm, almost Scandinavian type, less corporate but has a kind of consistency across campus, pixelated colours that break up the dynamic"*

However, some institutions take a different approach by asking senior management about their requirements of space;

*"We've consulted with heads of schools, of which we have four currently, we have a faculty of art, design, media, we have a faculty of computing science and engineering, we've got a faculty of business, and we have a faculty of physical and social life sciences."*

Although they do appreciate the need to understand students requirements;

*“But equally, from an estates point of view, when I try and paint the picture of people’s...trying to understand the customer , it sounds a little bit blunt but often it’s the easiest way to put it across, is people are coming to see us and they have a cheque for £9,000 in their back pocket, and they can choose.”*

It was highlighted that the interaction with student opinion is not done effectively enough in the institution and therefore they suggested that they require further support in developing this. Overall, it appears that there is a discrepancy in how the students are engaged in the design of future learning space to understand their specific requirements. As highlighted in this research, this is something that should be considered during the design process and a consistent approach, such as the implementation of the proposed frameworks should be adopted across HEIs.

### **8.3.2. Framework validation questions**

To enable a comprehensive evaluation of the frameworks developed in this research, the validation will be reviewed by framework. Firstly, the physical learning environment frameworks will be reviewed, followed by the school specific framework (see Figure 7.2 and Figure 7.3). This will allow a full evaluation of the perceptions of both usability and suitability of the framework by those interviewed and surveyed, therefore allowing for the identification of any improvements or modifications required.

#### *8.3.2.1. Physical learning environment framework*

*Question 3: To what extent do you think the specific framework could inform the students’ preferences when designing Physical Learning Environments?*

The below rating scales demonstrate respondents’ responses to question three, framework one and framework two are the frameworks for the design of the physical learning environment. As the figure shows there was a mixture in responses the how much the frameworks could inform on the design of space, although most of the responses are at the positive end of the scale 6-10. On expansion of the reasoning of these responses the lower ratings appear to surround the usefulness of the consideration of students specific requirements as this can be uncertain and can be down to interpretation.

## Discussion

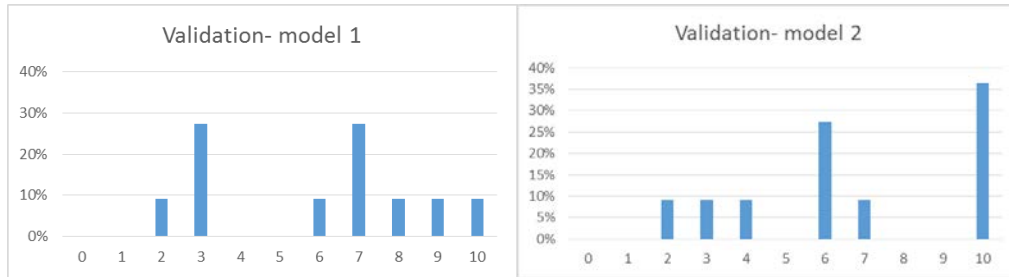


Figure 8.3 rating scale showing responses to extent to which the PLE framework could inform on the design process

### Question 4: Would you use the framework in the design process for Physical Learning Environments?

The below rating scales demonstrate respondents' responses to question four, framework one and framework two are the frameworks for the design of the physical learning environment. The rating response to this question regarding if respondents would use the framework were more positive. Although there was some disagreement regarding how useful it is to consider students specific requirements many of the respondent said it would either be useful or very useful, with those giving the lower score doing so as they felt it would only act as a guide due to the difference in requirements for the estates strategy.

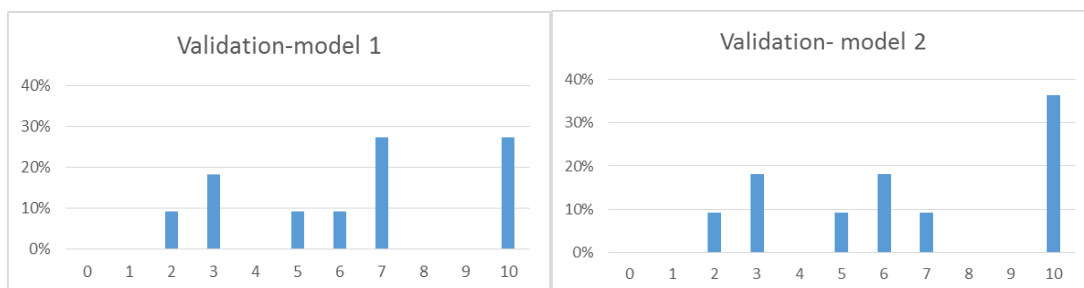


Figure 8.4 rating scale showing responses to respondents use of frameworks in the design process- PLE

These ratings are further explored in question five.

### Question 5: What are the barriers to the use of the framework?

Between these two questions generally, there was a consensus that the framework would be helpful in the design process. Additionally, alongside the complete list of factors and items, these frameworks are comprehensive and would be useful in the design process.

## Discussion

Although the physical learning environment has been presented as two frameworks and were asked about separately, there was very much a consensus and overlap of the discussion of these two frameworks as they were both referred to together. Therefore in this discussion the frameworks will be discussed together as one, which further supports the use of the two frameworks jointly in the design process as it highlights the simplicity and applicability of using these together. Many of the comments regarding the frameworks were encouraging and positive regarding the use and the current construction, such as;

*“First of all, this exactly, really resonates with what we’re doing at the moment. So at the moment in terms of teaching environment, we’re picking up the same kinds of themes, they’re looking for a high quality standard of teaching environment.”*

*“I align with all of this, and there’s a commonality for what we understand as a university here with that. So I would...from how I believe a student’s mind would work, I would strongly agree with that”*

*“I think it would be good to make use of it, so as to ensure that new Learning environments are designed based on student requirements not on what is thought what the students might require.”*

Although, there were additional points worth considering for the evaluation of the current frameworks regarding the barriers that may hinder the use of the framework and how the framework could be interpreted. It was highlighted that the framework would perhaps be down to interpretation to what would be required for the individual institution.

*“Models are an abstraction and so are subject to misinterpretation”*

*“People will have differing views about the labels and overlaps i.e. they’ll want to come up with their own version of the model.”*

For evaluation, this would be a benefit of this framework that although it allows for the identification of students’ specific requirements and can act as guidelines for the inclusion of features that enhance students learning experiences, the frameworks can also be used as per the individual institution’s functional and future brief. This is



## Discussion

supported by the discussion with some of the respondents with one identifying how the framework can be used to inspire creative thinking about spaces.

*“In terms of teaching rooms and learning environments, what we’re looking at now is moving away from structured learning. So in other words you have the row type seating which is very, that’s the way it’s always been, very traditional type of learning, to a more interactive and collaborative kind of teaching”*

This was also echoed by another respondent who recommended that;

*“The model can function as a checklist at the beginning of the process but needs to be adapted to individual projects.”*

There are also additional barriers that are more general to the use of such a framework that identifies specific requirements of students, such as budget provisions.

*“Funding restrictions are likely to influence the space types within universities - especially the provision of specialised teaching space, of which this is likely to become less and less and more space comes under central control”*

*“We have, the constraint that we have, whether or not you’ll have it as a question, is that we don’t have any money.”*

There may also be specific barriers to the institution such as the building stock available.

*“So specific to this university, and I think it may be a thread that not many institutions are bound by, but that’s the fact that I’m in a listed structure, in a listed building.”*

However, it was highlighted in the discussion that although there may not be the availability in funding for re-development and new buildings, there is the opportunity to use these frameworks to identify where the biggest impact could be made with the least financial investment. Therefore, the frameworks can be used to highlight areas that may be lacking within the university and use this to refurbish areas in the PLE, whether this be creating a better students identity or refurbishing classrooms.

The use of such frameworks may also be influenced by the current position and surroundings of the buildings and spaces.

## Discussion

*“Ultimately there will be a point in time where you need to think about the estate, and the physicality and the geography, and the land locking issues and the fixed points”*

It was also finally highlighted that there may be an issue with people buying into meeting students' requirements with the physical space and how this can have an impact on the learning experience. With one respondent stating;

*“In essence do the students know best or should their learning (and their learning environments) be guided in an academically led direction?”*

However, another respondent identified that this may be the view of some, but we should aim to recognise that it is important to positively influence students' learning experience by providing suitable environments.

*“I think it's more of a buy-in issue from your peers and staff, is to recognise that we need to deliver an experience that the customer wants.”*

In terms of the framework, it was suggested by some respondents that some additional factors should be included such as ergonomics, heating/ventilation, and furniture. Additionally, the discussion with the architect, who although they agreed with all of the features of the PLE, suggested that some points, would be better for the user if made clearer. For example;

*“I suppose it depends if you want to make it distinct between open and private, because in a way I can see that's quite a good thing to do, you get different degrees of for want of a better word, business within them perhaps. It almost feels like they're two sub headings underneath that one and it's almost a variety”*

*“Or is it worded in such a way as large group teaching/small group teaching/interactive teaching, I don't know. It just concerns me slightly that they might end up being reductionist”*

Therefore, based on an evaluation of the feedback the framework has been developed in order to enhance some of the more abstract factors on the list to tie them more coherently back to current pedagogic theory. The model has also been simplified by ordering the features in order of importance to make it easier for practitioners to follow.

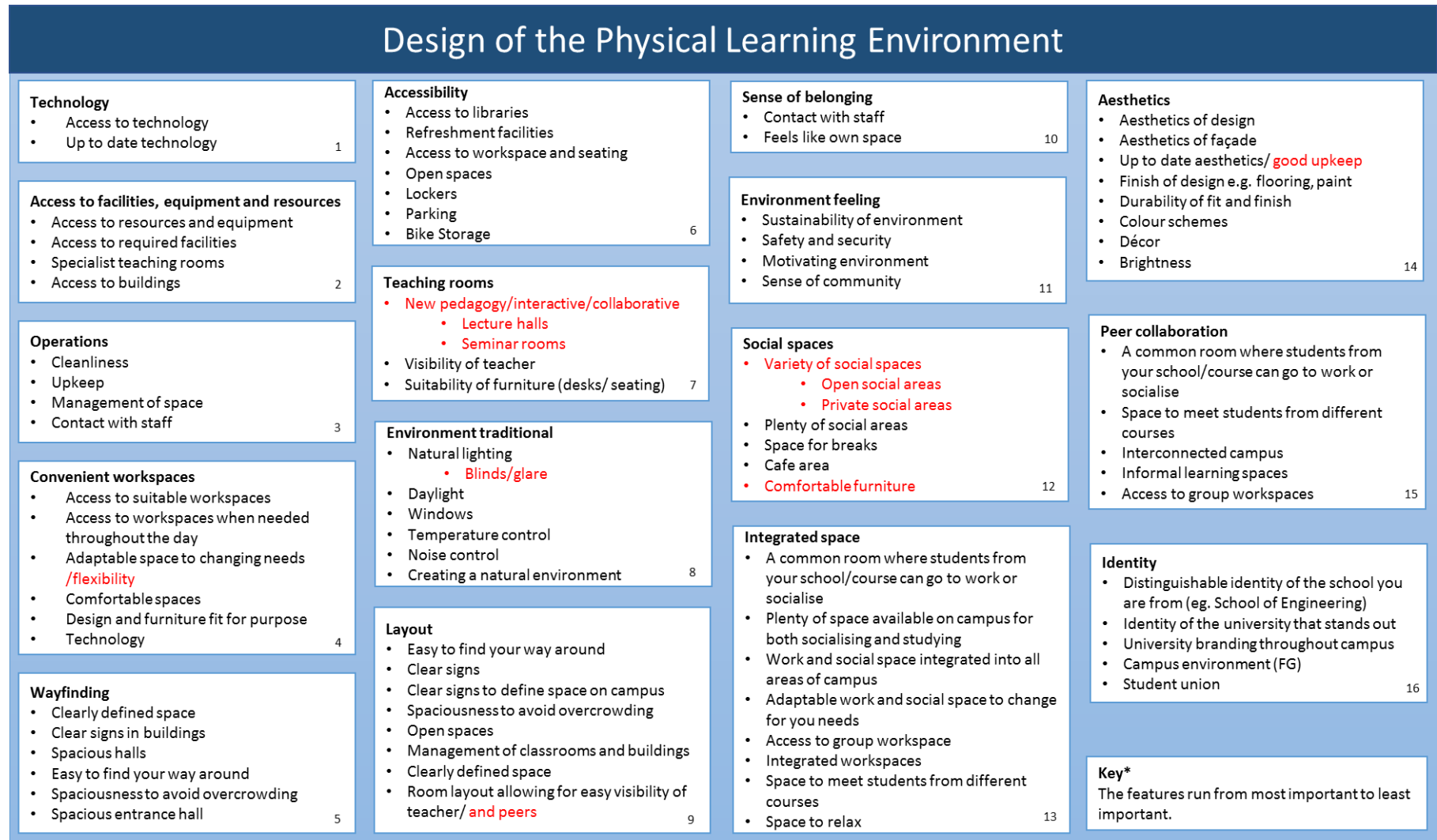


Figure 8.5 updated physical learning environment framework

## Discussion

### 8.3.2.2. School specific framework

The school specific frameworks discussed in section 7.4.2 were presented along with the following questions to the respondents.

*Question 3: To what extent do you think the specific framework could inform the students' preferences when designing Physical Learning Environments?*

The below rating scales demonstrate participants' responses to question three, framework three and framework four are the frameworks for the school specific design of the physical learning environment. From the figures, it can be seen that there was a lower extent to which the respondents thought the school specific frameworks could inform on the design process. Although some respondents identified the way in which these could support their design strategy, some did not understand the usefulness of such frameworks. This therefore demonstrates that there is a potential for this work to have an impact in estates strategy, however some of those in estates design do not yet see the potential in the current research. This research and current literature identifies the importance in considering students specific requirements therefore supporting estates in the benefit of incorporating this work could be an area for future development.

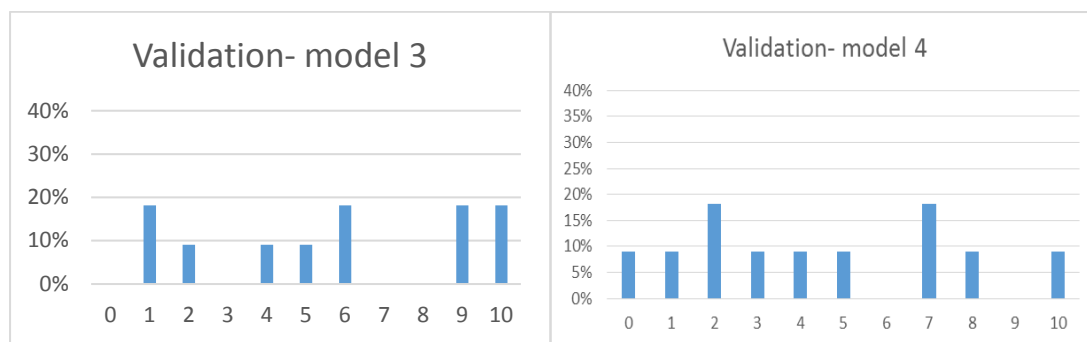


Figure 8.6 7 rating scale showing responses to extent to which the school specific framework could inform on the design process

*Question 4: Would you use the framework in the design process for Physical Learning Environments?*

The below rating scales demonstrate respondents' responses to question four, framework three and framework four are the frameworks for the school specific design of the physical learning environment. Once again, there were mixed responses in the

## Discussion

perceived use of this framework. The individual frameworks regarding the school specific frameworks appeared to be more useful, but some respondents did also identify that the combined practitioners framework would also be useful. Some of the respondents did not identify with the potential to design spaces specifically to the school who were going to use them, as in many instance this is difficult due to budgeting and space availability. Many of the respondents noted that it would be very useful in the design process. In one University in particular this idea of 'zoning' was something they were considering developing in their estates strategy, but the specific requirements was not something they had previously considered and therefore wanted the current research to support in this development. This is discussed further within the next question.

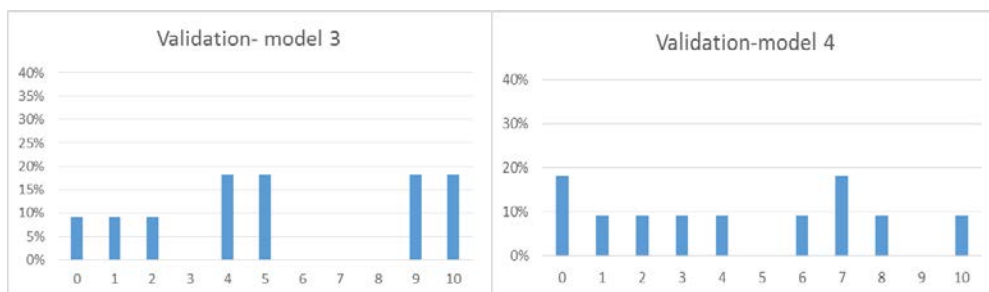


Figure 8.7 rating scale showing responses to respondents' use of frameworks in the design process- School specific

### Question 5: What are the barriers to the use of the framework?

For the school specific framework there appeared to be some disparity on responses, some respondents felt that the frameworks would be useful, however some noted that they may be generic or simplistic. One respondent noted that they may not be useful in the design process;

*“not necessary really, the briefing process will inform”*

However, another noted that understanding the school specific requirements was good and that they would very much use it in their design process as it fitted in with their aims. The framework provided additional information that they had not considered;

*“That’s really good. extremely likely..... I mean, a good example is the school of architecture, they are looking at digi-labs, fad-labs, art labs, modelling labs. A*

## Discussion

*laboratory to a psychologist is completely different to a laboratory to a material scientist.”*

It was noted that thinking about the specific requirements of the school can be a benefit when considering design strategy.

*“And a lot of people, if you don’t get that in the right order and you don’t do it, then if you immediately go to your tactic and your design without thinking properly through, well, actually what is your strategy, what do you want, and that’s what you’ve carefully thought through here. You’ve clearly thought through the strategy for how you’d deal with each of these schools.”*

It was also noted that it is important that consideration is given to these specific requirements of students in their learning environment as they are the ones who make the most use of the space.

*“I think what would be useful about this I suppose is a mechanism to actually get students’ views into the design of learning spaces and that’s the bit I don’t know really happens, which is ironic because they’re probably the ones who per capita spend a lot more time than anyone else in the university”*

This additionally supports the findings of this research. The four general school specific frameworks were considered to be useful in their format, therefore no changes will be made to this set of frameworks. However, the framework for practitioners that incorporated the four different school preferences was noted as being too complicated, and it was suggested it should be simplified. An additional point that had not been considered was how the framework could be used to inform how space should be managed.

*“If we’re having to reallocate space this model, I think, is more appropriate to us. Because this is probably more about designing multi-functional space”*

*“It’s the school of environmental sciences, like the material sciences, coming together in that kind of environment. And it’s got a great feel to it, a great vibe to it. As much as we want this zoning of the campus, there is an element of considered, site-wide”*

## Discussion

Therefore, this framework appears to be useful in the design process to consider the differences and similarities between schools. However because it was highlighted that it appears too complicated in the original format, it has been simplified. See framework below for simplified version of this framework (see Figure 8.8).



Figure 8.8 updated framework for practitioners

This framework operates as a simple guide identifying the features of the PLE, quality and community that should be considered in the design process. Alongside the specific features of the PLE that students from the four different schools identified as being most to least important.

## Discussion

Overall, there was discussion in regards to the applicability of the framework, how it would be used in the design process rather than the actual components in the framework. Therefore, this suggests that it would be useful to highlight how these specific modes could be incorporated into the existing design process and how they can actually beneficially inform on the design process.

*“The information you have gathered to generate the models is very interesting. However I’m not really sure how you envisage the models being implemented within the design process.”*

*“The research is useful to provide background information, but does not give clear direction as to how a design should be developed.”*

Therefore a simple framework has been identified through previous literature regarding the design process in HE buildings (Riley, 2013). This research identified three phases in the development in a function brief and this research has been incorporated into this to act as a guide in how to apply the current frameworks into the design process

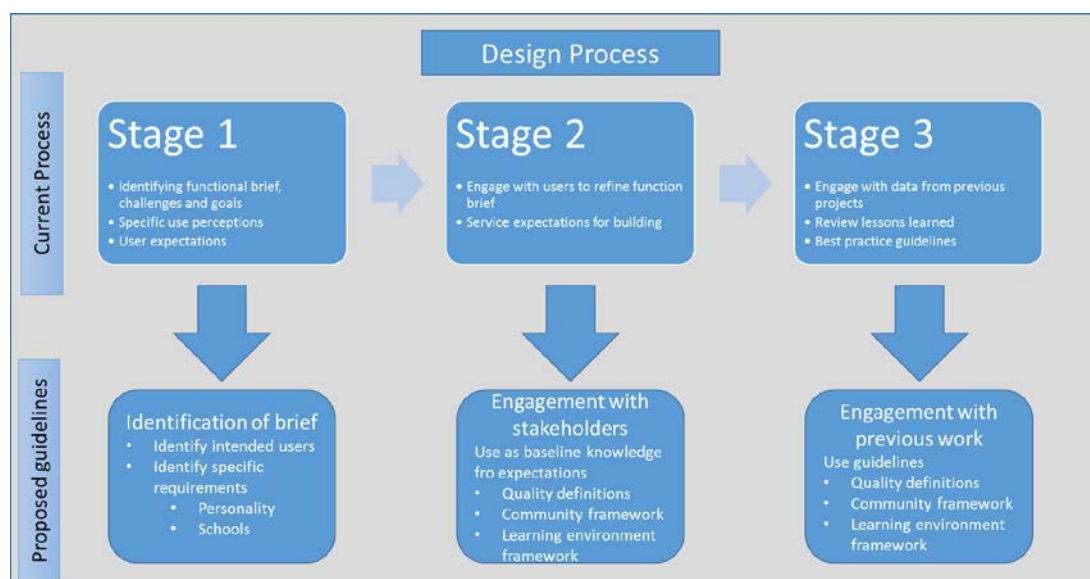


Figure 8.9 proposed implementation into design process

Although this is a simple outline of how the outcomes of this research may be incorporated into the current design process, further work could be conducted in the future. To develop this further this could be guided by working with estates managers



## Discussion

to develop an integrated framework using the current frameworks to implement in the design process. The final question that respondents were asked was about their feelings towards the contribution these frameworks could have on meeting students' requirements in the effective development of learning spaces.

*Question 6- To What extent do you feel the proposed findings will have on the effective development of Physical Learning Environments for the students?*

*"I think it would certainly help provoke people into thinking about the brief – you know, I suppose as a university if you sit down you'd develop a brief wouldn't you, in terms of the kind of spaces you'd need and that brief is the thing – you might develop it in conjunction with an architect or estates, probably with academics, and it's about thinking about the right questions."*

Another respondent stated;

*"I feel that they would [use them in the design process], as previously stated we need to design environments that are designed with the students in mind and not just build something, with a mote corporate slant and then try to fit the students and their activities into it."*

The use of a framework that identify students' specific requirements was noted as being useful because it can provide the base evidence to then develop a functional brief upon.

*"It's this kind of, it's this underpinning background, research and evidence that you've done today actually that can't be challenged. I said, "Well, how do you know that's what they're after?"... So it's just to be able to, just to underpin, just to demonstrate that this isn't a, either a singular or a group thought, they go, "That would be a great idea, it would work great there." No, this is what genuinely the customers are saying they would benefit from".*

Overall, these frameworks appear to have influenced some discussion and interest amongst the respondents in this validation phase of research. Many of the respondents requested the final draft of these frameworks to use within their current

or future design strategies. Therefore, this supports the development and use of the proposed frameworks into the design process.

### **8.4. Summary**

This chapter has highlighted how the objectives of this research have been met. It has reviewed each of the objectives and demonstrated how the findings of this research have contributed and explained the overall aim of this research. The research also identified that HE buildings are different from other educational buildings, as they must offer students more than regular spaces. Students have most often moved away from home and the space must offer support, engagement, community and the opportunity to meet others. This research has identified features that students regard as being important to their perceptions of their PLE and that may therefore influence their learning experiences. Furthermore, with the specific needs of the students in mind, this research identified that there are differences in requirements between groups of students in their PLE. It was found that students from different schools have differences in preferences, and that individual differences in personality traits have a relationship with features of the PLE. In conjunction with this, a specific requirement of students is the support that the university can provide. To support students with their transition to HE providing a sense of community can help students in many aspects of their university life and this research has offered solutions in the design of the PLE to enhance the psychological sense of community. Therefore, the research highlighted that identifying a specific framework of design should be considered in the design process of the development of HE PLEs.

This research has also demonstrated that the quality of the PLE is an integral part of the students' experiences of the learning environment and is highly influential on students' satisfaction. This research has identified the features of the PLE that students consider as important in their perceptions of the quality of the PLE. Therefore, by identifying the specific features of the PLE that students regard as contributing to a quality PLE, more suitable and satisfactory PLEs could be developed for students.

This chapter has also examined and evaluated the validation of the frameworks developed in this research. From this overall, the frameworks were supported by the

## Discussion

respondents of the validation phase of the research. Although some amendments were highlighted in this evaluation, many of them surrounded the interpretation of specific components or the frameworks as a whole. From this, the amendments have been implemented to simplify the frameworks to make them more user friendly in the design process. The validation also highlighted confusion regarding how the frameworks should be implemented; therefore, a brief framework was designed to highlight the potential application methods in the design process. The validation phase of research did however support the implementation of the proposed frameworks into the design process, as many of the respondents were interested in the final findings of this research. They would also like the final frameworks developed, to implement in the progress of their own estates strategies. From this, a guide has been developed to explain the process of implementing the frameworks into the design process (see appendix 21).

## 9. Conclusion



### **9.1. Introduction**

This chapter will present the main findings, contributions to knowledge and theory, limitations and recommendations for further work. In general terms, this research can draw several conclusions from its work. Firstly, although literature currently exists surrounding the design of the PLE it rarely informs the design process. The literature covers the areas of environmental psychology to building pathology and refurbishment and although both are important for efficient and appropriate design, further work should be aimed at incorporating both of these sources of information together. Therefore, it is important to draw the current knowledge together into a usable framework of information for practitioners in the design of PLE's.

### **9.2. Main findings**

Overall, this research has identified an overall framework for the design of the PLE considering students' specific preferences. This framework includes many features of the PLE that students require, which are important to their perceptions and satisfaction with the space. This framework includes features of the PLE as a whole and additional features regarding what students perceive to be a quality space as well as aspects that can develop their sense of community. Although due to budgeting restrictions within HEIs the utilisation of all of the framework's recommendations may not be exploited, it provides the opportunities for universities to identify areas of development most suitable for them. Furthermore, the consideration of the framework's recommendations would have additional benefits to the HEI beyond that of increasing general students' satisfaction.

In addition to the identification of a framework for the design of the PLE, this research has also provided recommendations for the specific design of space in the PLE for students within different schools. This research has identified four frameworks for HEI's to utilise in the development of specific spaces for the intended users of the space. As this research only sampled from four schools, it therefore has developed four frameworks for the different schools. It could be assumed that the frameworks may work for other groups of students, for example that the framework developed for Engineering students may be applicable for all strands of Engineering and similar

## Conclusion

technology based subjects. Additionally the framework that encapsulated all four sets of requirements in one may provide an opportunity for universities that do not have enough space for individual areas, to allow them to identify which subjects would work well together in the same space. For example, this research identified that the Engineering and Built Environment students have similar preferences and could therefore be assimilated into the same space to satisfy students' specific requirements. This offers the opportunity for universities to follow the framework's recommendations to design PLE specifically for the users of the space, therefore meeting the students' specific requirements, which consequently would positively influence students' satisfaction.

This research has identified, through the literature and through the validation, that the frameworks should be utilised by the estates departments and those within the university who are intending to develop HE buildings. The main target audience for these frameworks are as such, because each university has their own estates 'vision' and it is important for them to understand and identify what would work within their own plan. Utilisation of the frameworks would allow the universities to develop a function brief to then supply to the developers. Although these frameworks would also be useful for the architects and designers to utilise this should be only considered following and in support of the estates teams functional brief. This would allow students' requirements to be considered at the identification of the brief through the design conception to the design implementation.

Within the development of a specific framework of design for students within the HE PLE, it was important to consider factors that influence their satisfaction with the physical landscape of the environment. From the literature review this research identified that quality, individual differences in personality, differences in school and educational community may influence perceptions and requirements of the PLE. This research has expanded knowledge and understanding by identifying through extensive research, that students from different schools require different things from their PLE. Furthermore, it has highlighted that there are differences in personality traits between schools and that these differences affect preferences in features in the PLE. Therefore, the research has identified that consideration for the intended users of the

space is important in the design process to ensure that the buildings are designed correctly for those who are going to use them.

### **9.3. Contribution to knowledge**

This research project presents a unique appreciation of how students perceive the importance of the PLE. This research has identified one overall framework for the design of the PLE and four specific frameworks for the design of PLE for different schools.

Much of the current literature into students' learning experiences examines teaching practices, which without a doubt is important, however the literature suggests that the physical space has a significant influence on human behaviour and perceptions. Therefore, considering the design of the environment in HEI's was an important area to examine to identify features that influence students' satisfaction. Additionally current research had a limited focus on HEIs, as these spaces are distinct, and must provide different, supportive, environments this is an important area of building design that must be considered. This research has identified features of the PLE that students in HE regard as being important in their perceptions of the PLE and which consequently effect learning experiences within the space.

As identified throughout the literature two areas influential in students' satisfaction and learning experiences were perceptions of quality and sense of community. These areas however were limited in detail and required further understanding. Quality was identified as a consistent factor in student satisfaction with the PLE, however it was not identified what students' actual expectations of a quality space were. This research has identified a definition of quality within the PLE, with the intention to close the gap between the expectations of the users' perceptions of quality and the actual expectation of quality in the PLE, thereby enabling practitioners to identify features within the PLE to consider when designing spaces, to ensure the HE buildings meet students' expectations. Developing a sense of community was also identified as important; developing a sense of place for students can cultivate positive learning experiences. However, there was little understanding within the literature regarding how to develop a sense of community through the design of the PLE. This research

## Conclusion

has acknowledged this disparity in this literature by identifying features that should be considered in the development of a community in HE PLE's.

Although currently there is a body of literature that examines learning environment design, much of this research focuses upon specific features, such as temperature, flexibility or environments such as classrooms or libraries. However this research has not been drawn together to identify how to design HEIs in their entirety. This research has explored the university as a whole to bring together previous research to identify what features in the entirety of the HEI buildings students perceive to be most important in their learning experiences. The overall framework identified within this research therefore recommends features of the PLE that should be considered in the design process, to develop buildings suitable for the main users of the space, the students.

Identified in this research was the importance of design in HE buildings in its entirety to increase students' satisfaction and their learning experiences. Additionally, it was found that a consideration of the individual differences of students might influence their requirements in the PLE. The previous literature had not identified that students from different schools found different things within the PLE to be important in their perceptions of the environment which affected their learning experiences. This research identified that students from different schools do have preferences for different features within the PLE and which influence their satisfaction with the PLE. Therefore, this research developed frameworks for each of the sampled schools to identify their specific requirements in PLE design.

The overall framework identifies features of the PLE that students perceive as being important for their learning experiences within a University, which includes the identification of features that students perceive to develop a quality PLE and features that develop a sense of community. Overall, this framework identifies the features that should be considered in the design of the PLE to increase students' satisfaction with the space. Additionally, this research has identified a set of frameworks that identify students' specific requirements from four different schools. Therefore, being more



specific about requirements in the PLE according to the school that students are in will help in developing students' satisfaction and learning experiences

The current research has also had difficulties on actually informing the design processes in the HE sector, therefore this research has endeavoured to overcome this. Frameworks of the specific requirements for students in the PLE have been developed and validated that can inform the design process. These frameworks simply outline students' specific requirements and an additional framework was produced to outline where the research should be considered in the design process, therefore increasing the usability of frameworks in actual design decisions. Overall, this research offers a unique contribution to knowledge by identifying students' specific requirements of the PLE and developing simple frameworks to utilise in the design process of HEI buildings.

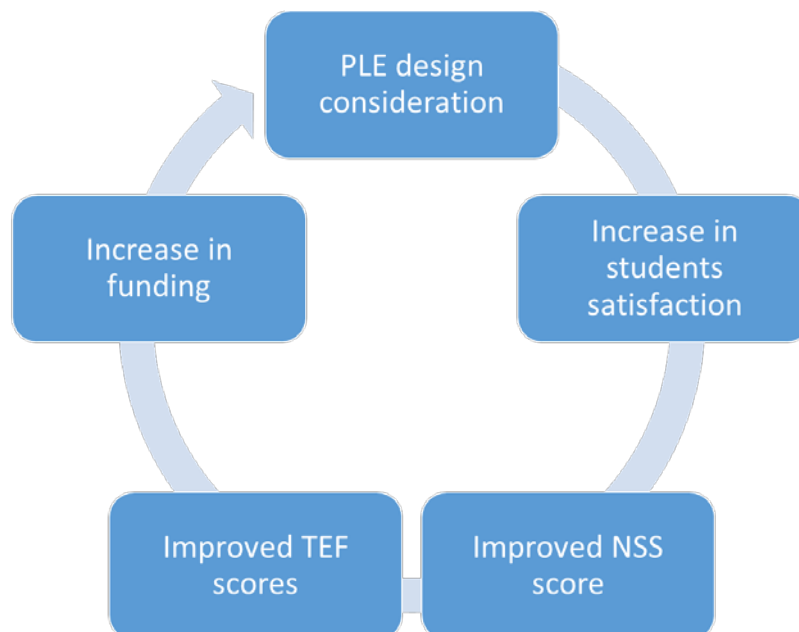
### **9.4. Contributions to practice**

This research has practical contributions to the development of HEIs. It has identified that the PLE can play an important role in students' perceptions of the environment and consequently their satisfaction and learning experiences. This can therefore influence their perceptions of the university as a whole. This research has also identified features of the PLE that can be developed to meet students' expectations and requirements and therefore if utilised will positively influence students' satisfaction and learning experiences. Meeting students' expectations and creating positive and satisfactory learning experiences is an important endeavour for all universities. Most notably currently is the impact of the National Students Survey (NSS), which each year gathers feedback from students about their experiences within university. The NSS then provides Universities with an understanding of the learning experiences of the students. This research has however suggested that the learning experiences of the students are influenced by the PLE and can influence their perceptions of teaching quality. Therefore, meeting students' expectations and requirements in the PLE may help to enhance the results of universities NSS scores.

Although in some situations there may be a restriction in funding available for such physical learning environment development, elements of the research may be

## Conclusion

beneficial in the universities' overall plans. The utilisation of the frameworks identified in this research would be highly beneficial according to future development and refurbishment plans in HE facilities. The HE landscape is set to change with the implementation of the Teaching Excellence Framework (TEF) (HEFCE, 2016). The TEF assessment criteria consists of three aspects; teaching quality, learning environment and students' outcomes/learning gain. This research therefore is highly important for consideration concerning the implementation of the TEF. The development in the TEF highlights the importance of designing appropriate PLEs to meet students' requirements, as universities should achieve higher TEF scores. As discussed, these will have an impact on the economic future of universities and it is a highly important aspect for consideration in future development. Figure 9.1 displays the practical impact that the consideration of the PLE in the design of HE buildings can have on universities. This is a cyclic process whereby developing appropriate spaces can increase students' satisfaction. This will then have a positive impact on the NSS and TEF, which would the consequently lead to an increase in funding.



*Figure 9.1 Practical impact*

This research can be used as a beneficial contribution to the design process. By designing the building with the student in mind, it would future proof the lifespan of the building. By considering, the specific users of the space the design could be effectively

and suitably conceptualised initially, which would minimise the need for future significant refurbishment. By providing environments that do not simply follow trends in design but consider the actual requirements of the users, this research could have a positive economic impact on HEI's.

This research could also see a commercial impact within the university sector. This research found that the PLE plays an important part in students' perceptions of the University. It was found that it could influence students' attendance at certain lessons and their choice of a university in the first place. Therefore, by designing physical learning environments that meet students' specific requirements it can help with the commerciality of the HEI and with the long-term experience of the students. Universities may be able to increase students' interest in attending the campus but it may also reduce attrition by providing appropriate, supportive environments.

### **9.5. Beneficiaries**

The beneficiaries of this research spans across many departments of the organisational structure of HEIs. Utilising this framework will not only benefit the design process, it can but the end users of the space and the university as a whole.

Firstly and most notably for this research is the benefit to students by implementing the framework identified in this research into the design process. By understanding students' specific requirements within the PLE, space can be designed to meet students learning needs and enhance their learning experiences. Providing spaces for students in general around the university that are nice places and students consider to be quality PLEs, provides students with spaces to not only learn, but also interact with other students and develop themselves as individuals. Facilitating a sense of community within the PLE can support this meeting of other students and can help in providing students with a sense of belonging which can support their learning. This can also support in their development beyond learning, meeting new people and supporting their well-being.

The design team can also benefit from the integration of the framework into the process. This benefits the estates team as it allows them to understand the specific requirements of the main end users of the space, the students. This allows them to

identify specific areas to focus upon in the design making planning and progress more efficient and space requirements are understood from the outset. By understanding students' needs in design conception the space can meet the demands of the students and therefore requires less attention once the building is completed.

Another beneficiary of the implementation of the current framework is the university as a whole. By meeting students, specific requirements the university can offer facilitates that meet students expectations therefore are more attractive to new students. By meeting students, learning needs through the design of the space can also enhance students learning and therefore improving students capacity to learn. Furthermore, facilitating a sense of educational community and meeting students learning requirements can help with attrition as students would be less likely to feel lonely and like their needs were not being met.

### **9.6. Research limitations**

With any research there are certain limitations that a project can suffer from, to acknowledge this it is important to consider the limitations relevant to this research.

A limitation of this research is the sample chosen. This research examined only four schools from a university, therefore, it would be important to expand this research into more schools across a university to identify all differences that may occur across a university campus. This research has however laid a foundation for work of this kind to continue, it has also clearly identified that there is a requirement to understand students' specific requirements from the PLE.

Another limitation of this research is also in regards to the sample of this research. This research was conducted in Liverpool John Moores University and therefore may be biased to the set of students that attend the University. Although this sample was chosen to allow for identification of specific schools, as all universities have different structures, this may have influenced specific requirements set out by this research. Therefore, to develop this research further, it could be expanded to examine different kind of universities, for example, campus based universities or smaller universities, where fewer subjects are offered.

This research also has a limitation in the buildings that were chosen for this research. Students within this sample were chosen partly due to the buildings that they mainly reside in. Although this was done with the aim to explore difference in perceptions, this may have influenced the students' perceptions of quality. Different features of the PLE may have been in the forefront of different students' discussions due to the buildings' features that they use. Therefore, this may have influenced the findings of this research. Consequently, this is further support for the expansion of this research into other universities to broaden the sample.

### **9.7. Recommendations for future work**

The validation of this research identified that although the frameworks identified from the research are useful and provide a good framework of the background information, further work should be conducted regarding their implementation into the design process. Therefore, further developments should be made in conjunction with architects and estates managers to develop the work, with the consideration of external factors such as economic factors, into a fluid set of guidelines that can be developed with changing technologies. This research could also focus on how this work could be adapted to different environments, for example, refurbishments versus new buildings, or universities with limited resources and space versus those with plentiful resources and space.

The validation also identified that the current frameworks may need to be simplified in the future to ensure that they are efficiently and appropriately used within the design process. Therefore, future work could develop the current frameworks into simplified versions. This work may be appropriate to do in conjunction with estates managers and architects to ensure that they are appropriately developed in line with their processes to ensure usability is suitably maintained.

Identified in this final chapter is the introduction of TEF into HE quality assessment. The year four plan is to have a specific TEF score for postgraduates. Similarly, to the university as a whole and subject specific scores, they will be analysed on the learning environment and teaching quality which are both influenced by the PLE. Therefore,

future developments of this work should identify postgraduates' specific requirements of the PLE.

This research has made significant steps in understanding how personality may influence preferences for different features within the PLE. However, supplementary work needs to be conducted on a large sample across different universities and geography, to identify personality profiles for different subjects to further identify differences in personality traits. This will allow for the more efficient identification of preferences from the PLE so environments can be developed accordingly. This research has identified that there are individual differences in preferences for features within the PLE and furthermore that students recognise what they do and do not like from their PLE. Therefore, further work could be conducted in how to incorporate students more within the design processes. Additionally, and perhaps more pertinent is, when considering students in the design process, to then work with them to ensure they understand how the PLE can affect their learning experiences and ensure they choose the correct spaces to support their requirements.

### **9.8. Summary**

Overall, this research has identified what features of the PLE students consider important in their PLE. The research has identified that there are many contributions to current knowledge, providing understanding of students' preferences in the design of their PLEs, identifying a definition of quality, identifying features that students think could support and sense of community and identifying differences in preferences for the PLE between personality traits and schools. This research has also identified many beneficiaries to this research, such as the estates team, the academics and most importantly the students' experiences. The research has also highlighted that the current research is highly important due to the changing landscape of the higher education system, with the introduction of TEF, considering students satisfaction is being put in the spotlight. The PLE has found to have an influence on students satisfaction in many ways, therefore the identification of the current research is vital to HEIs strategies.

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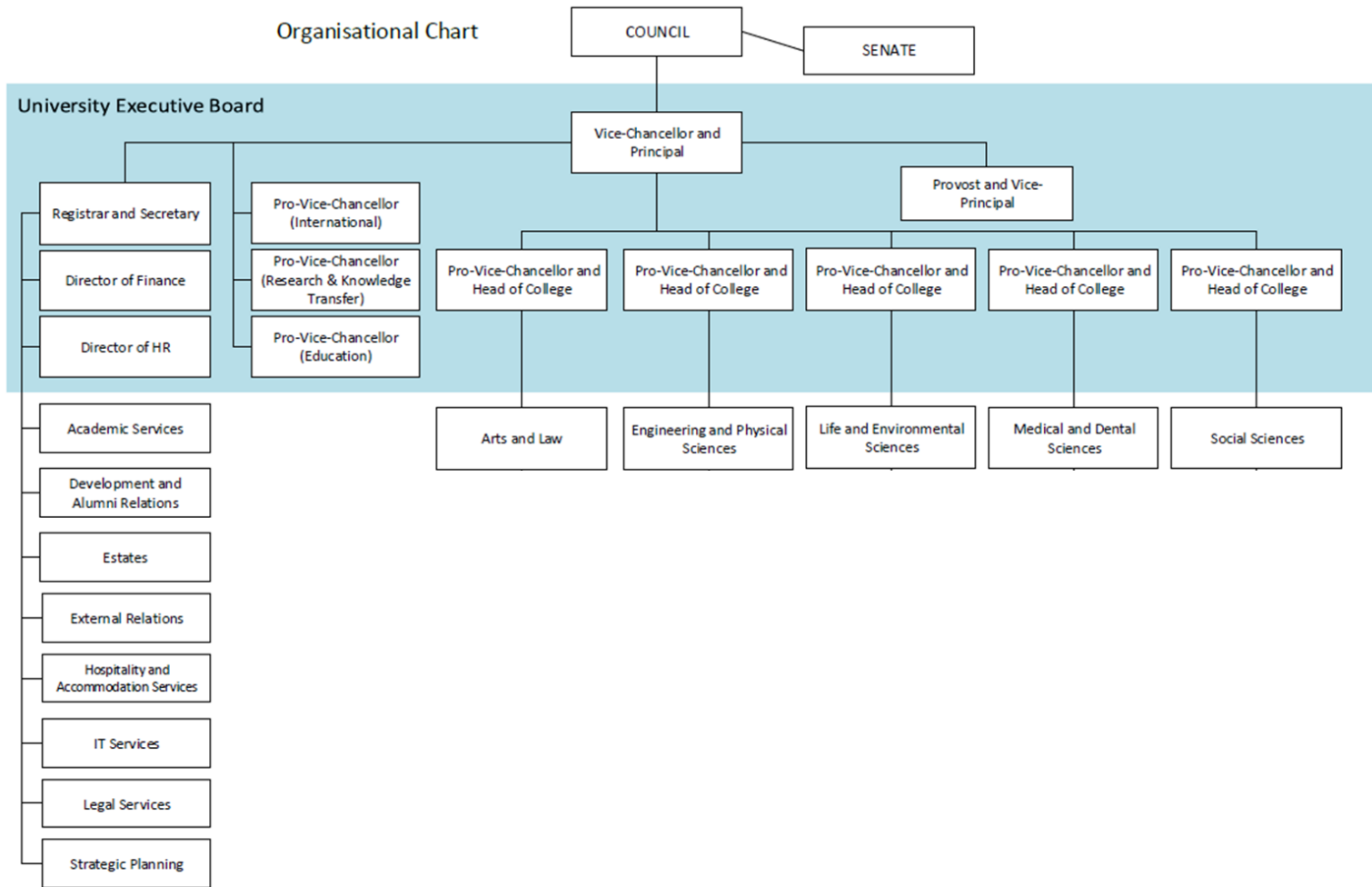
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## 11. Appendices

## Appendices

### Appendix 1 Example of University Organisational structure

# Appendices



<http://www.birmingham.ac.uk/Documents/university/org-chart.pdf>



## Appendices

Appendix 2- Examples of Participant information sheet, bio demographic questions and debrief for survey

**LIVERPOOL JOHN MOORES UNIVERSITY**

**PARTICIPANT INFORMATION SHEET**



**Title of Project: AN INVESTIGATION OF PERSONALITY TRAITS AND EDUCATIONAL COMMUNITY IN HIGHER EDUCATION LEARNING ENVIRONMENTS**

**Researcher: Hannah Crawford**

You are being invited to take part in a research study. Before you decide if you would like to take part it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Ask us if there is anything that is not clear or if you would like more information. Take time to decide if you want to take part or not.

**1. What is the purpose of the study?**

The purpose of this study is to identify if there are personality differences between academic schools, and secondly if there are factors of the built environment that contribute towards a positive educational community.

**2. Who can take part?**

You can take part if you are a full time, undergraduate or a Master's degree student in Liverpool John Moores University. Also you must be part of the school of Art and Design, the school of Built Environment or the school of Engineering.

**3. Do I have to take part?**

No. It is up to you to decide whether or not to take part, participation in the study is completely voluntary and non-participation will not affect you in any way. If you do you will be given this information sheet and asked to sign a consent form. You are still free to withdraw at any time and without giving a reason. A decision to withdraw will not affect your rights/any future treatment/service you receive.

**4. What will happen to me if I take part?**

You will be asked to sign or initial the participant consent form. You will then be asked to complete the questionnaire which will take no longer than 10 Minutes. The questionnaires will include a personality section, a section on your preferences to higher education buildings and a quality subsection. You will then be given a debrief sheet that will inform you of the study you have taken part in and make you aware of any contact numbers.

**5. Are there any risks / benefits involved?**

There are no risks associated with taking part in this study. However there may be several benefits in taking part in this study, although the outcomes of this study they may not directly affect you they could affect future students by improving their university environment.

### **6. Will my taking part in the study be kept confidential?**

Any information you provide will be kept strictly confidential. You do not have to provide a name, (you can just initial) on any surveys or information sheets. A number will be applied to the consent form and the survey instead of names therefore the information you provide cannot be identified with your name. You are requested to provide the researcher with a signed or initialled consent form. Researchers will be able to identify what answers were given, as access to codes will be available, however, this will be kept confidential and separate from the any other information you provide and no one outside of the research team will be able to access this information.

You will also be asked if you would like to participate in future focus group research and asked to leave your email address as a point of contact, you do not have to leave your email address, if you do this information will be kept separate from any other information you provide. If you leave your contact email address you will be under no obligation to volunteer at the later date to attend the focus groups. This will be stored securely and destroyed within 24 months of completion of the study.

### **7. Has this study been approved by an ethics committee?**

LJMU Research Ethics Panel has assessed the research study and approved it.

### **8. Who to contact with enquires about this study?**

For any further information or further enquires please contact Hannah Crawford  
[H.K.Crawford@2010.ljmu.ac.uk](mailto:H.K.Crawford@2010.ljmu.ac.uk)

### **9. Further support.**

If any part of the study has harmed you in any way please contact the LJMU support services

LJMU Counselling service  
Aquinas Building  
Maryland Street  
Liverpool  
L1 9DE

[counselling@ljmu.ac.uk](mailto:counselling@ljmu.ac.uk)

### **10. Continuing on to the questionnaire.**

I have read the information sheet provided and I am happy to participate. I understand that by completing and returning this questionnaire I am consenting to be part of this research study and for my data to be used as described in the information sheet provided.

## Appendices

### **Debrief**

Thank you for participating in this survey. The aim of this research was firstly to identify personality differences between academic schools and secondly factors of the built environment that contribute towards a positive educational community. This research was conducted with the aim to build up a model of the specific design of space in higher education facilities to aid in a positive student experience.

From the findings of this research focus groups will be conducted to refine the findings, you may be contacted about voluntary participation in this part of the research. If you wish to find out about the overall finding of the study please feel free to contact Hannah Crawford ([H.K.Crawford@2010.ljmu.ac.uk](mailto:H.K.Crawford@2010.ljmu.ac.uk))

If any part of the study has harmed you in any way please contact the LJMU support services

LJMU Counselling service

Aquinas Building

Maryland Street

Liverpool

L1 9DE

[counselling@ljmu.ac.uk](mailto:counselling@ljmu.ac.uk)

## Appendices

### **Bio-demographics**

I have read the information sheet provided and I am happy to participate. I understand that by completing and returning this questionnaire I am consenting to be part of this research study and for my data to be used as described in the information sheet provided.

Please enter age:

Age	
-----	--

Please *circle* the following which apply

Year of study:

Undergraduate year 1	Undergraduate year 2	Undergraduate year 3	Masters
-------------------------	-------------------------	-------------------------	---------

Gender:

Male	Female
------	--------

School:

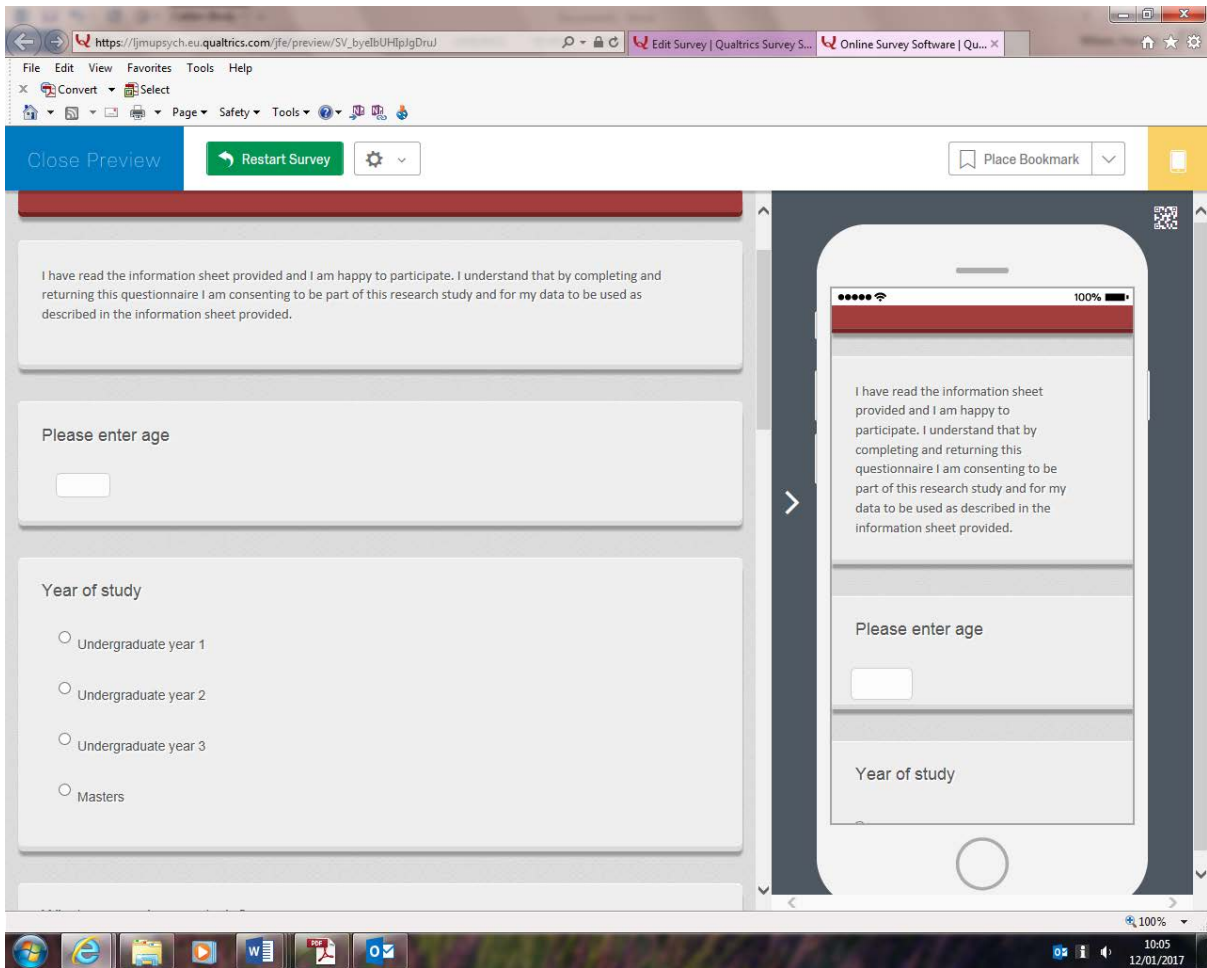
Art and Design	Built Environment	Engineering
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## Appendices

Appendix 3 - Example of online questionnaire- Qualtrics

## Appendices

Below is an example of the phase one survey as seen by participants both via computer and mobile device.



## Appendices

### Appendix 4 - Example of raw data- phase 1



## Appendices

### Raw data- Example for phase one factor analysis

#### KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.845
Bartlett's Test of Sphericity	Approx. Chi-Square
	1583.279
	df
	276
	Sig.
	.000

#### Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.121	33.840	33.840	8.121	33.840	33.840
2	2.371	9.880	43.719	2.371	9.880	43.719
3	1.624	6.766	50.486	1.624	6.766	50.486
4	1.270	5.290	55.776	1.270	5.290	55.776
5	1.156	4.815	60.591	1.156	4.815	60.591
6	.988	4.116	64.707			
7	.891	3.713	68.420			
8	.851	3.546	71.966			
9	.763	3.178	75.144			
10	.686	2.858	78.002			
11	.662	2.757	80.760			
12	.598	2.491	83.250			
13	.534	2.225	85.475			
14	.502	2.090	87.565			
15	.454	1.890	89.455			
16	.419	1.745	91.200			
17	.394	1.641	92.841			
18	.374	1.558	94.399			
19	.326	1.358	95.757			
20	.259	1.078	96.835			
21	.241	1.003	97.838			
22	.213	.887	98.725			
23	.180	.752	99.477			
24	.126	.523	100.000			

Extraction Method: Principal Component Analysis.

## Appendices

**Component Matrix<sup>a</sup>**

	Component				
	1	2	3	4	5
Spaciousness to avoid overcrowding	.731				
Natural lighting	.730				
Comfortable temperature	.725				
Comfortable furniture	.712				
Access to technology (eg. plugs, computers etc.)	.706				
Control of environmental factors eg. Noise, lighting	.647				
Access suitable and clean toilets	.637				
Access to refreshments	.635				
Access to libraries	.631				
Open social areas	.611				
Up to date technology	.600				
Creating a natural environment eg. Plants, plenty of windows	.594				
Ability to adjust furniture to meet your needs	.584				
Clear signs in buildings	.573				
Room layout allowing for easy visibility of teacher	.544				
Layout of room allowing for both group and independent learning	.542				
Private social areas	.536				
Informal learning spaces					
Colour and textures of flooring furniture and surface finishes		.698			
Motivating environment eg. Bright colours		.663			
View out of windows	.531	.554			

## Appendices

Specialist teaching rooms (eg. labs)					
Lecture halls			.716		
Formal learning spaces			.506		

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

**Component Matrix<sup>a</sup>**

	Component				
	1	2	3	4	5
Spaciousness to avoid overcrowding	.731				
Natural lighting	.730				
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Clear signs in buildings	.573				
Room layout allowing for easy visibility of teacher	.544				
Layout of room allowing for both group and independent learning	.542				
Private social areas	.536				

## Appendices

Informal learning spaces					
Colour and textures of flooring furniture and surface finishes		.698			
Motivating environment eg. Bright colours		.663			
View out of windows	.531	.554			
Specialist teaching rooms (eg. labs)					
Lecture halls			.716		
Formal learning spaces			.506		

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

### Total Variance Explained

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.121	33.840	33.840	3.865	16.104	16.104
2	2.371	9.880	43.719	3.249	13.537	29.641
3	1.624	6.766	50.486	3.216	13.402	43.043
4	1.270	5.290	55.776	2.271	9.464	52.506
5	1.156	4.815	60.591	1.940	8.085	60.591

Extraction Method: Principal Component Analysis.

### Rotated Component Matrix<sup>a</sup>

	Component				
	1	2	3	4	5
Control of environmental factors eg. Noise, lighting	.693				
Comfortable temperature	.666				
Room layout allowing for easy visibility of teacher	.638				
Clear signs in buildings	.616				
Spaciousness to avoid overcrowding	.610				
Layout of room allowing for both group and independent learning	.556				
Up to date technology		.862			

## Appendices

Access to technology (eg. plugs, computers etc.)	.786				
Comfortable furniture	.550				
Access to libraries					
Access suitable and clean toilets					
Colour and textures of flooring furniture and surface finishes			.819		
Motivating environment eg. Bright colours			.804		
View out of windows			.755		
Creating a natural environment eg. Plants, plenty of windows			.730		
Natural lighting					
Informal learning spaces				.708	
Open social areas				.570	
Private social areas				.517	
Ability to adjust furniture to meet your needs					
Access to refreshments					
Lecture halls					.756
Formal learning spaces					.692
Specialist teaching rooms (eg. labs)					.570

**Rotated Component Matrix<sup>a</sup>**

	Component				
	1	2	3	4	5
Control of environmental factors eg. Noise, lighting	.693	.299	.254	-.181	.143
Comfortable temperature	.666	.460	.079	.067	.114
Room layout allowing for easy visibility of teacher	.638	.166	-.101	.199	.158
Clear signs in buildings	.616	.046	.156	.208	.120
Spaciousness to avoid overcrowding	.610	.410	.144	.185	.084

## Appendices

Layout of room allowing for both group and independent learning	.556	.003	.302	.259	-.123
Up to date technology	.146	.862	.031	.131	.061
Access to technology (eg. plugs, computers etc.)	.275	.786	.097	.231	.060
Comfortable furniture	.488	.550	.271	-.049	.183
Access to libraries	.310	.448	.027	.368	.296
Access suitable and clean toilets	.419	.422	.091	.326	.024
Colour and textures of flooring furniture and surface finishes	.147	-.096	.819	.115	.038
Motivating environment eg. Bright colours	-.012	-.031	.804	.187	.123
View out of windows	.182	.169	.755	.115	-.118
Creating a natural environment eg. Plants, plenty of windows	.149	.259	.730	.081	.160
Natural lighting	.395	.417	.481	.216	-.035
Informal learning spaces	-.027	.197	.116	.708	.105
Open social areas	.276	.111	.241	.570	.311
Private social areas	.343	-.074	.248	.517	.287
Ability to adjust furniture to meet your needs	.375	.254	.256	.488	-.306
Access to refreshments	.429	.236	.176	.473	-.001
Lecture halls	.000	.070	.014	.255	.756
Formal learning spaces	.336	.050	.161	.023	.692
Specialist teaching rooms (eg. labs)	.021	.494	-.038	.002	.570

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

## Appendices

### Quality

**Rotated Component Matrix<sup>a</sup>**

	Component						
	1	2	3	4	5	6	7
Décor	.885						
Finish of flooring furniture and surfaces	.879						
Colour schemes	.845						
Up to date aesthetics	.798						
Environmentally friendly View	.554						
Durability							
Adaptable space to changing needs		.730					
Well-designed space		.728					
Adaptable learning spaces to suit lessons		.705					
Simple layout		.681					
Easy to find your way around		.616					
Refreshment facilities		.595					
Plenty of suitable learning spaces		.536	.524				
Access to building			.809				
Up to date technology			.724				
Cleanliness of buildings			.675				
Access to resources			.670				
General maintenance			.628				
Open spaces to avoid over crowding			.570				
Fresh air							
Outside space				.780			
Local space around the campus				.736			
Plenty of social areas				.645			
Plenty of social areas so space is always available				.549			
Comfortable temperature					.755		
Noise					.685		

## Appendices

Control of environmental conditions (eg. temperature)					.678		
Comfort of seating							
Spacious halls and entrances						.812	
Spacious entrance hall						.761	
Clearly defined space						.542	
Natural lighting							.569

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.<sup>a</sup>

a. Rotation converged in 7 iterations.

**Rotated Component Matrix<sup>a</sup>**

	Component						
	1	2	3	4	5	6	7
Décor	.885	.067	-.065	.209	.088	.084	-.044
Finish of flooring furniture and surfaces	.879	.062	.121	.058	.036	.199	.086
Colour schemes	.845	.090	-.045	.226	.154	.132	-.021
Up to date aesthetics	.798	.146	.104	.031	.176	.227	.018
Environmentally friendly	.554	.129	.289	.195	.021	.129	.273
View	.495	.228	-.013	.196	.111	.126	.402
Durability	.463	.397	.222	.172	.172	-.032	.310
Adaptable space to changing needs	.173	.730	.082	.119	.166	.105	.031
Well-designed space	.116	.728	.308	.201	-.017	-.012	.206
Adaptable learning spaces to suit lessons	.037	.705	.314	.084	.153	-.026	.107
Simple layout	.117	.681	.122	.059	-.014	.188	-.112
Easy to find your way around	.162	.616	.254	-.177	.321	.309	.059
Refreshment facilities	.108	.595	.149	.250	.272	.232	.288
Plenty of suitable learning spaces	.059	.536	.524	.226	.238	.155	-.018
Access to building	.019	.073	.809	.088	.248	.110	-.046
Up to date technology	-.041	.200	.724	-.020	.056	-.005	.062



## Appendices

Cleanliness of buildings	.171	.087	.675	.146	.243	.237	.353
Access to resources	.017	.327	.670	.000	.227	.045	.063
General maintenance	.272	.347	.628	.221	.143	.064	.172
Open spaces to avoid over crowding	.150	.395	.570	.090	.227	.225	-.160
Fresh air	.347	.274	.411	.248	.405	-.195	.162
Outside space	.248	.120	.100	.780	.108	.099	.228
Local space around the campus	.247	.048	.058	.736	.134	.310	.217
Plenty of social areas	.263	.273	.061	.645	.284	.133	-.353
Plenty of social areas so space is always available	.179	.421	.302	.549	.032	.180	-.125
Comfortable temperature	.066	.163	.306	.164	.755	.134	.302
Noise	.246	.170	.204	.097	.685	-.085	-.116
Control of environmental conditions (eg. temperature)	.167	.109	.371	.075	.678	.201	.183
Comfort of seating	.028	.380	.388	.240	.445	.107	-.072
Spacious halls and entrances	.320	.236	.069	.125	.125	.812	.036
Spacious entrance hall	.255	.145	.166	.308	.024	.761	.088
Clearly defined space	.377	.257	.268	.324	.024	.542	.076
Natural lighting	.393	.169	.268	.131	.343	.171	.569

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

## Appendices

### Appendix 5- Open questions from phase 1 survey

## Appendices

A university environment should be up to date more importantly with society than fashion, it should be environmentally friendly and include recycling facilities. There should be sustainable durable interior with areas for healthy food and drink that is affordable to ensure all students are able to eat and drink.
Spacious, comfortable environment with many places for individual study and group study. Availability of food and drink and easy accessibility to other areas of the university.
A building that has features that are well maintained and made to last. It is pointless spending money on making something look aesthetically pleasing if it is going to be in ruins before the end of the year. Technology goes a long way to adding a sense of quality: Having the latest technology integrated properly makes the university seem more "up market" when compared to other institutions.
good resources and good services
Clean, spacious with a comfortable temperature and minimal noise pollution. Temperature is almost always wrong at LJMU. An independent, solid and spacious working environment is vital for me to work at a high performance level. There are not enough silent working conditions that fit this criteria. Everyone asks for the big expensive social hubs for procrastination and they are simply not needed. I am a very social person and it is just not necessary for such a continued effort to add more and expand these spaces. I currently know of 2 points in the entire university where I can sit and actually be productive.
Comfortable and well lit. Up to date technology. Open spaces and well maintained
Light and comfortable with lots of space
Somewhere that promotes the most efficient learning environments for the needs of many different types of learners. I don't believe the socialising spaces are imperative, having such spaces takes away from learning space and contributes to overcrowding.
Spacious, lots of facilities, access to many resources and tech. Environment must be clean and built to last.
The main entrance of the Byrom Street building is far too small. It is visible most mornings that people are struggling to bypass each other through the door!
I think a bright and colourful spacious building is key, keeps you awake and sharp the bright colour scheme makes you more alert in contrast to that of somewhere like a coffee shop. Also just varied types of space time to relax time to work and group work maybe an improvement that could be made is something like a roof top garden which could provide views and also fresh air.
A quality university environment is one which has a large social space close to the entrance. It will also have good IT facilities, and common room for each faculty. Lecturers offices located on the same floor as the lecture theatres/classrooms.
Well lit, averagely temperatured (not too hot, not too cold) area where all students have space to work and use equipment at ease.
In my opinion a quality university environment is a clean and healthy place, with natural lighting and nice surroundings. It must be functional and have all the up to date technology that students require, however it should have separate areas for people wanting to work alone or as groups
A space that can be easily adapted to meet need. Natural ventilation and lighting, a sustainable environment. Up to date with all technology.
plenty of natural light and greenery
Functional for a, different types of learning etc, plenty of lighting.n
Generally comfortable although space seems to be an issue. Over crowding in social and study areas seems to be problematic.
Environmentally sustainable, the building should be future-proofed for carbon emissions as opposed to trying to make it as stylish as possible- it will no doubt look dated in 5-10 years anyway. Probably better to make the outside in keeping with the rest of the city and stylise the inside. Good quality tech and up to date teaching environments are key for me.
Excellent teaching and up to date technology facilities
easy to get around and good standard of facilities
Well ventilated and naturally lit open space with purpose appropriate fixtures and furniture that makes the user feel comfortable and proud of the environment.
Focused.
Comfortable with up to date technology
Warm and well lit
spacious and adaptable environment with plenty of access to technology.

## Appendices

Lights are constantly turned on, even during holidays and nights. The temperature is different depending on where in the building you are. Some rooms seem to have no fresh air.
A quality university environment facilitate to its students all the required things to support their education and it always makes a better surrounding environment also. It makes the students' mind in a better level in the satisfaction and it leads to a btter gain in their lives too.
Very good quality university environment. Never been to a university before where people are so focused on doing well.
One which allows maximum amount of natural daylight while allowing complete control of the environmental conditions
Our studios are quality spaces however they could be improved by having personal spaces within the larger communal space. There is plenty of natural light, simple design and clean surfaces
Lots of good external space, a few key internal social spaces and lots of well organised learning space.
The environment is satisfactory.
Spacious
Warm, Light and silent
Ability to get a good, cheap lunch when in all day so don't have to walk to town. Enough access to computer (the rooms are ALWAYS booked!!) Social areas and rooms which you can control environment.
Again very good .
Mostly sufficient
A place with enough space for the students & up to date technology and facilities
To be honest, the John Lennon building ticks off all of my boxes except maybe for the environmentally friendly aspect, i feel very comfortable with the aesthetics, space and lighting etc as they are. My social area is the studio space i also work in, as a artist it is good to get input from those around you and also being able to give input is important too.
One which is basically a classroom with no lecturer or desk, a room full of large desks which people can sit around. Oblong desks. No round tables. No low seats. Properly arched seat backs, No high seats. Chairs whose wheels lock when they are sat in, sothey don't move around. Temporary lockers.
Avril Roberts library" some classrooms in the Byron street campus.
Every aspect listed above should require a good quality, if little quality is inputted within the spaces, then merely form of dedication from students will be outputted.
Contemporary functional space - if you desire to undertake quiet study their should be easily accessed facilities to provide this.. And that if you require social interaction.
A building which is fairly neutral in terms of colour scheme and decor, but not stark or made from entirely hard surfaces. Organisation and clearly defined layout is essential when you first enter the building in terms of quickly finding each courses doman, but once this is found a variety of spaces makes for a more interesting and comfortable environment.
One in which investment has been wisely allocated to ensure availability of a wide range of facilities and resources
Juxtaposition of subjects, to see people studying totally unrelated things. Definite thresholds between serious study zones, which should be airy and open until at least 12.00. Plants would be nice. And carpets; the world needs more carpets.
The decor and furnishings are functional but help to stimulate the brain (perhaps with colours/textures), there are lots of areas for students to wait for a lecture between lectures (fighting over a small number of seats doesnt help) and there are plenty f plants within the building (perhaps not in lecture halls by the front because that might be distracting).
Bright, clean, adaaptable
An environment that caters plenty social areas with up to date technology <input type="checkbox"/> Well maintained appropriate atmosphere not suitable only for studying but also for socializing.
Making sure there is a large space for crowds of people to walk through is very important because sometimes it can take a good couple of minute to gain access to the exit which isnt helpful when you have another class to go to within a short amount of tim!
Don't really have an oppinion
with up to date technology and facilities.
not the best, more computers that are free
Good quality

## Appendices

One with bright open spaces and plenty of resources for everyone
Cleanliness of the building is important. Definitely temperature, natural light and air helps me work better. I don't feel decor is necessarily key but clean, pure not too bright as it's an art building it could be too much for your brain.
Decent Temperature, Art and Design building often has AIR CON on, yes AIR CON during winter months and its just idiotic really.
Inviting, friendly environment that inspires individuals to learn and be part of a growing successful and talented community, with up to date technology and renowned reputation
comfortable enough to work in but not so comfortable that you feel at home
Clean air and comfortable temperature with happy people!
I am being asked the same question on each section, they are just worded differently.
Clean air, spacious and inspiring
- Up to date maintenance work - if something is broken it is quickly sorted - modern design both inside and out - quality resources - not cheap alternatives
Clean, fresh and modern
Nature
Art and design building, its easy to move around, full of natural light. has a simple and adaptable decor and its generally a nice space to be in.
Comfortable, 'friendly', warm, cosy, as well as clear, usable but not bland - too easily adaptable means boring and empty. More spaces adapted to certain aspects of teaching are most certainly more beneficial than less spaces with more adaptable features this means the building and the spaces within it have no personality and don't provide a comfortable working environment, instead it is alien and cold
The most important factor for a working space is the harnessing of natural light. Fresh air and access to refreshments helps for comfort and hydration. Access to building - particularly after hours for intensive courses such as the arts is imperative.
Open, fresh, natural lighting. Comfortable seating, plain decor so not to get distracted.
Bright, spacious, welcoming, lively, comfortable and usable
<b>UP TO DATE TECHNOLOGY AND COMFORTABLE ROOMS/FURNITURE</b>
One with good access to resources, space to working independently and in groups e.g. the library and up to date tech.
It should be of a high quality as many students will be using the areas and in order to allow a longer lasting area for easy maintenance and durable equipment so that they will last.
modern and up to date on materials and furniture with the feeling of comfort.
A place that you are able to socialise in your first and second year away from nights out. Final year areas to isolate yourself and crack on with studies

## Appendices

Appendix 6 - participant information sheet and consent form for Focus groups

**LIVERPOOL JOHN MOORES UNIVERSITY  
PARTICIPANT INFORMATION SHEET  
FOCUS GROUP RESEARCH**



**AN INVESTIGATION OF PERSONALITY TRAITS AND  
EDUCATIONAL COMMUNITY IN HIGHER EDUCATION  
LEARNING ENVIRONMENTS**

**Name of Researcher: Hannah Crawford**

You are being invited to take part in a research study. Before you decide if you would like to take part it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Ask us if there is anything that is not clear or if you would like more information. Take time to decide if you want to take part or not.

**What is the purpose of the study?**

The purpose of this study is to identify if there are personality differences between academic schools, and secondly if there are factors of the built environment that contribute towards a positive educational community.

**Do I have to take part?**

No. It is up to you to decide whether or not to take part, participation in the study is completely voluntary and non-participation will not affect you in any way. If you do you will be given this information sheet and asked to sign a consent form. You are still free to withdraw at any time and without giving a reason. A decision to withdraw will not affect your rights/any future treatment/service you receive.

**What will happen to me if I take part?**

You will be asked to sign or initial the participant consent form. The focus group discussion should take about 1 hour. You will then have a brief introduction on the topics that you should keep in mind in your discussion. Throughout the discussion you will be free to discuss, with others in the room, any topics that you feel are important to the research. The researcher will be in the rooms and will ask questions if clarification is needed or to suggest other topics for discussion.

You will then be given a debrief sheet that will inform you of the study you have taken part in and make you aware of any contact numbers.

**Are there any risks / benefits involved?**

There are no risks associated with taking part in this study. There is limited inconvenience to you partaking in this research, however giving up an hour of your time may cause some disruption. However there may be several benefits in taking part in this study, although the outcomes of this study they may not directly affect you they could affect future students by improving their university environment.

## Appendices

### **Will my taking part in the study be kept confidential?**

Any information you provide will be kept strictly confidential. You do not have to provide a name, (you can just initial) on any surveys or information sheets. A number will be applied to the consent form and the survey instead of names therefore the information you provide cannot be identified with your name. You are requested to provide the researcher with a signed or initialled consent form. Researchers will be able to identify what answers were given, as access to codes will be available, however, this will be kept confidential and separate from the any other information you provide and no one outside of the research team will be able to access this information.

You will also be asked if you would like to participate in future focus group research and asked to leave your email address as a point of contact, you do not have to leave your email address, if you do this information will be kept separate from any other information you provide. If you leave your contact email address you will be under no obligation to volunteer at the later date to attend the focus groups. This will be stored securely and destroyed within 24 months of completion of the study.

### **Contact Details of Researcher**

For any further information or further enquires please contact Hannah Crawford  
[H.K.Crawford@2010.ljmu.ac.uk](mailto:H.K.Crawford@2010.ljmu.ac.uk)

If any part of the study has harmed you in any way please contact the LJMU support services

LJMU Counselling service  
Aquinas Building  
Maryland Street  
Liverpool  
L1 9DE

[counselling@ljmu.ac.uk](mailto:counselling@ljmu.ac.uk)





**Project title: AN INVESTIGATION OF PERSONALITY TRAITS AND EDUCATIONAL COMMUNITY IN HIGHER EDUCATION LEARNING ENVIRONMENTS**

**Focus Group Research**

**Researcher:** Hannah Crawford

1. I confirm that I have read and understand the information provided 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 a reason and that this will not affect my legal rights.
3. I understand that any personal information collected during the study will be anonymised and remain confidential
4. I agree to take part in the above study
5. I agree for the above study to be audio/video recorded
6. I agree to the use of anonymised quotes using in publications

Name of Participant

Date

Signature

Name of Researcher

Date

Signature

## Appendices

### Appendix 7 - Focus group schedule

## Appendices

Introduction.

- Welcome to focus group
- Description of researcher
- Overview of the topic (why they are here)
- Guidelines of focus groups e.g. Phones on silent/ let each other talk

**Introduction to topic (Set 1) pictures of the LJMU buildings and discussion of the facilities.  
Classrooms buildings furniture design of the space**

- 1 What do you think of the universities buildings and learning environments?
- 2 What features of spaces do you like best about the learning spaces?
- 3 What do you like least about the learning spaces you use?
- 4 What are the most important aspects of the physical environment of the learning spaces?  
For learning in or socialising?
- 5 How do you think the learning environments in the universities buildings could be improved? What features or spaces could be added or changed?

**Brief discussion of what we think quality is in environments that they are all familiar with eg. Home, city, gym? (Set 2)**

- 6 What aspects of the University suggests it is a quality environment?  
(How does the condition of the university buildings effect your feelings towards them? So how good they look and how well kept they are?)
- 7 How do you think the university environment could improve its feeling of quality?  
(Are there any parts of the building that do not look well maintained or in good condition?)
- 8 Overall what do you think are the most important aspects of a university campus that suggests quality to you?  
(How do you think the university environment could improve the condition of the buildings?)

**Introduction to discussion topic (Set 3)**

- 9 Does LJMU develop a sense of community for you? If so how?
- 10 How does the University campus itself develop your sense of community, does it make you feel like you belong?
- 11 How could the physical environment be redesigned (enhanced) to increase your feeling of community and sense of belonging within the university?

Closing statement/ Thank you for participation

## Appendices

### Appendix 8- Discussion aids- Vignettes

## Appendices

### Set 3



1. <http://www.rpparchitects.co.uk/portfolio/portfolio/tree-house-student-centre-queens-university-belfast/>
2. <https://www.uts.edu.au/future-students/find-a-course/courses/c10383/experience> : "University of Technology Sydney, Australia, credit: Anna Zhu".
3. <http://www.beds.ac.uk/about-us/locations/luton>
4. Rosan Bosch Studio// Photographer Kim Wendt

## Appendices

### Appendix 9 - example of note taking for focus groups

## Appendices

Focus group number and date-					
Question	Quote	Key theme	Any follow up questions?	Big ideas?	Other factors? E.g. body language
1					
2					
3					
4					
5					

## Appendices

Appendix 10 - example of focus groups transcript



# Focus Group 9 Transcript

- R: Okay, so um what do you think of these, like, pictures? Is there anything that stands out to you really?
- P: The Middlesex University is quite nice. The way it's quite open and like, the way like they have used lighting is quite, it's not too intense. So you can quite happily sit there for a while.
- R: So what is it about the light?
- P: It's not intense. It's not too bright. So you feel like the focus isn't on you too much. So you could quite comfortably work there for a long time.
- P: Yeah, cos' compared to the Manchester one it's quite like white and stark. So it'll probably be, it's not very, like compared to the Strathclyde one it's really colorful. So I'd probably prefer working in that sort of environment.
- P: Yeah
- P: Yeah
- P: And the Manchester one kind of looks like a museum. And to be honest, I wouldn't want to sit in a museum.
- P: It does look like that doesn't it.
- R: Yeah, I've never thought of that but it does doesn't it.
- P: Like when I first looked at this I thought it was a museum. And I, it just wouldn't appeal to me. Where the Middlesex one and the University of Strathclyde, they are like colourful and you kind of feel more relaxed rather than like forced to sit and do work.
- R: Yeah, yeah definitely. Okay, so um what do you think of the University's buildings and learning environments?
- P: I think this building's nice; the Redmonds building. Because it's quite new. So um, like it's the ground floor is like there's a basement level. Like we went down there once but it was just sort of.
- R: I have no idea what's down there; I didn't really know this building.
- P: There are showers. Yeah, there are showers. They are really nice showers, compared to my accommodation.
- R: Really?
- P: Yeah. And there's other lecture rooms which are kind of small. Smaller than the large lecture theatre. I just saw this when I was on open day. And, yeah yeah, it does feel, it looks kind of like the Middlesex University. Do you know what I mean. You feel kind of, I don't know. Like compared to the John Foster building, whenever we went there for one time, no I didn't feel like I wanted to learn.
- P: Yeah it was awful, the John Foster building.
- P: I don't like the John Foster building.
- P: I felt like I was back in school.
- R: What about the John Foster building do you not like?
- P: It was dull.
- P: It's really like old.
- P: The lecture theatres are awful. They are too big, so if you are sat near the back you can't hear for the life of you. And they're just, they're like, just like stark. Again the lights are horrible aren't they.

## Appendices

P: It's weirdly laid out as well, because if you want to get from one end to the other you've got to go through like about 15 doors and it's like corridors this way and that way so it is quite hard just to even find the lecture theatre. We were all lost, weren't we the first time and we'd been here for like 2 months.

P: Yeah

R: I've just gone over there before this. Got completely lost. Was looking for one room. Couldn't find it at all. So I completely get that now. I've never been in there before and I was like "what is this building!", so I walked out. Couldn't find it.

P: Yeah, yeah.

P: It's not appealing at all. But although it's, I don't know, I just couldn't, I feel like I'm back in school. It does remind me, it's very similar to one of my school's buildings. Yeah.

R: So what about it reminds you?

P: The corridors.

R: Yeah.

P: It's just old and tired.

P: And the windows. This sounds really silly but, do you know the way that, I think they have wooden things on the walls, like, with posters and stuff on it. That is just like my school, and I just didn't really like that to be honest.

R: Yeah. Okay so what features of spaces do you like the best about the learning environments?

P: I really like how there is a lot of open windows in all of them. Like in Giuseppe's class on the top floor, the entire like walls are windows. It's really nice.

P: Yeah

R: Yeah

P: Like that's my favourite bit. And if you notice every room in the building has like lots of windows. I really like that. So they are all really bright.

P: Yeah.

R: Why do you like having lots of windows?

P: It's the natural light.

P: It's quite nice because you don't feel like you're trapped inside. It's quite nice to be. I don't know it's just like a nice environment. You don't feel like confined, do you.

P: I think it's a psychological thing whereas if we are trapped, if those windows are good there, but if we were trapped in kind of where you have just your basic small windows you feel.

P: A bit caged in.

P: You just feel paranoid, and I'd rather have the open space.

P: Yeah, and then I think that even if it's raining and there's something outside, at least you know what it's doing. So when you go out it's not a complete shock. You know what I mean, especially in the summer months. Like say if you've been stuck in a nice, no horrible, building all day and you go out and it's been like a really lovely sunny day and you haven't been able to like experience that. It's not nice.

P: Yeah I do quite like that. Like the University has a lot of, um like, even a lot of the staff rooms are like windowed so they are like see through, and I quite like it.

P: Yeah.

P: And every room has a bit of colour in it.

## Appendices

P: Yeah.

P: And I know the walls are white, but if they have just your basic like dull chairs you'd kind of feel like a bit weird. But now they have the green chairs and the blue chairs, just kind of feel.

P: Yeah because that room hasn't really got much colour in it but like all the computers, like I quite like the library because it is quite colourful isn't it. It's really nice.

P: The top floor with the natural light is actually, is in the library as well.

P: Yeah.

P: I couldn't sit, for instance yesterday I sat for hours in the library. But I couldn't sit on the first floor to do my work because it is quite dark and there are a lot of people there. Whereas the top floor there is a lot of natural light and you just feel like you're in your own room because everything is to your own level, if that makes sense.

P: Yeah.

R: Is there anything else that you really like when you walk into a room?

P: It's good to have space. Like good space. Like good use of space sometimes, because like in the Alden library some of the group rooms they are quite small. So if you've got like 3 or 4 people in there then it's a bit of a squash, and some of the furniture is a bit big and stuff. But, if you've got like a nice space like this then definitely makes it easier.

R: So is that like to do with the spaciousness or the better room layout?

P: A bit of both really. Because you could still have a good room layout but if the room is a bit small then you can feel a bit caged in, and especially if you've got a whole seminar group, like even the noise of everyone in a small room it can feel like a bit, it's louder isn't it really.

R: Yeah. It's really warm in here.

P: Yeah the temperature is not good in the building.

P: That's the other thing. The temperature, once its been adjusted, like I don't know who does it, but, for instance if we were really warm in here. Polly wouldn't really be able to change the temperature.

R: Oh really.

P: It's like a master setting. You can't override it, so if its

P: It does it to the kind of environment.

P: So she could switch it off for like 10 minutes but it automatically, you can't control the temperatures in the building. So like when we all first started it was freezing. Like to the point where we were all like wearing coats and hats inside and everything, and the teachers were like its fine. but now it's really hot.

P: Yeah it was bad wasn't it Yeah.

P: We were in one room, and you know the air conditioning was quite noisy so we tried to turn it off and then like within 5 seconds it came back on again, and carried on making a noise. So we were sat there thinking we can't concentrate because the air conditioning is like whistling.

R: Yeah. Good control! Okay so kind of leading on to that, what do you like least about the learning spaces you use?

P: Umm, there's not a lot of like privacy in the University. Like the computer rooms and stuff, I know it's silly, but like on the first floor we got sent to do group

## Appendices

work the other day, wasn't it, and they literally like they are squashed next to each other so you were like impossible to do work. There's not a lot of privacy in like, I know it's sill, but just to do group work and anything like everyone looking.

P: Yeah. And like there are people coming out of the lecture theatre and there is like 200 people coming out and you are trying to do an essay.

P: I don't think this building is the best for like considering it's our university building there is not a lot of workspace here. Like we have to go to the library to do anything don't we.

P: Like for instance you needed a room, all the rooms were taken for seminars or lectures, umm, but if you even have a small room like you do in the library, or different areas that are not open spaced that would probably be better I think.

P: Yeah.

P: Yeah, that's the thing. There is literally nothing. We all have to go to the library don't we. Yeah. There's nothing here.

P: Yeah the library is like 30 seconds away.

P: Yeah.

P: Starbucks downstairs, but that's not really where you work, and the Student Union that's where no one really works there either. You have to, cos there's no. Like we all needed just a group space to go over the presentations the other day, like before our lectures. There's nowhere. You can't do it. It's impossible. There's nothing here.

P: Yeah.

P: And when we do go to the library the group rooms, you have to book them, but there isn't any group rooms that you cannot book so you quite often get moved on and it's hard to book them in advance because so many people are looking for them.

P: There's only like 12 group rooms.

R: Yeah.

R: Also, quite a lot of these rooms were empty. There's bookable rooms here were empty, but you have to book them and then it seems.

P: Yeah. Cos we had that problem. Polly, we need computers to do our finance module, and we can't do it without it and last week we got kicked out of our room because they had an exam in there, and we had to come into just like a normal room and Polly went into our room and there was no one in there. So it's made us all behind now because we can't, she was just bringing worksheets, but you can't do it because you need Excel

P: We all lost out on our work.

P: You physically cannot teach that module without being on a computer.

P: The bookings not very good.

P: It was daft wasn't it.

R: Okay, great. So what are the most important aspects of the physical environment of the learning spaces? So this is either learning or the social side. So what are the most important aspects do you look for?

P: Ummm. I don't quite understand.

R: So when you're coming into University, what do you really need? What do you... how could we design this place best for you?

## Appendices

P: I'd say more open spaces. In the library sometimes it can be feeling quite fragmented because you can be in one part of the library but it's on the same floor but you can walk all the way around. Also, like a lot of it looks the same, and I quite often get lost in the library, and I know that sounds stupid, but it's because like one lot of bookshelves look the exact same as like another place. So it could be designed in more of a distinct way so you were clearly in the business zone or the music. Like for books.

P: Yeah, like if each one had a different kind of colour code or...

P: Yeah

P: Well to be honest we're basing that on Alden library but I'm sure that Avril... No.

R: No, it's the same.

P: It's really big. I didn't go exploring. I just had to go in one day and even just walking through the barrier it showed you how many spaces were available and I was like I'm not gonna actually experience what that's like. I was scared.

R: So that was like... I was just going to say in the Alden Roberts, was that the big one that you use, or which is the one you use?

P: We use, yeh that Alden one. But the Avril one is further away which we don't use. It's more kind of for, that would be for like specialising in Business and Law and I don't actually know what else. But I know that the Avril one does like Nursing and stuff like that. So for instance in the Avril one each, I don't know if each floor is designated to kind of different subjects.

R: Oh I get what you mean. Yeah that's what I was saying, no it's not. It's the same as the other one.

P: It's the same. Which would be good because if you had like. Like for instance in here has green seats, and I know it sounds really silly, but if you had a kind of colour code different on each floor to make you kind of feel "Oh this is where I can sit". I know it sounds silly, But...

R: It is a good idea though. I like that.

P: Yeah.

P: Because then you'd have all your business ones, and I know you can't just go and build a new library but just each floor is designated as kind of specialised and...

R: Yeah.

P: But even if you just, if it was just rearranged. Because the operations business box and the organisational behaviour box were in 2 completely different places on the same floor. So it wasn't just one big block of Business where you could just find everything; you have to go walking around the library to find things.

P: I much prefer the environment in there like it's more colourful and it's a bit more relaxed. Like you get a choice of like seats and things and they're quite like how environments where you can tell that you need to like designated computer areas. I quite like that. But then there's areas where you can like do work calmly just with your friends, have a chat at the same time. I quite like how there's different spaces in the library.

P: Although it's a bit cramped if you're doing work with your friends. I you think these computers aren't like cramped together, the ones in the library are like this here.

## Appendices

P: I quite like how, you know how when you first walk in, and then there's the round sofas that go right around, and then there's tables. I really like that. It just the sort of, we are doing group work but we are sort of doing our own thing. We are all still sat together but it was nice because we were all still, just like, I could put my feet up, chill out. I liked it in there, it was nice.

P: Yeah.

R: Yeah.

P: It is just a bit more colourful. I think this is very corporate as you walk in. Do you know what I mean? It's not the most inviting building I don't think personally

P: No.

P: I think the floors are like black isn't it, and then it's quite dark in the main corridor.

P: Yeah, it's quite dingy.

P: But I know it's designed to have a lot of light and stuff but I think it is quite dark I think personally. And I don't think it's like, like we all personally are like 50/50 on whether the building is ugly or not.

R: Oh really?

P: From the outside?

P: Personally I think it's really ugly but then others are like oh no it's really nice.

P: No, I kind of like when I chose to come here I like, it sounds really silly, but I had like a specification of which University that I wanted to go to. For instance it got down to the point where I wanted to go to Northumbria or else here and it was because the buildings, they were modern and I felt comfortable here. Whereas if I went to, for instance University of Ulster back home, the main reason I wouldn't go there was just it was ugly

P: Yeah.

P: It was just like school. it was like you were going back to school. So that was the reason I was choosing between John Moores and Northumbria cos it was a new state of the art building. But then obviously I chose here because I like the tutors better.

***An example of one section of one transcript has been included in the appendices in order to demonstrate the transcription of the data but not to unnecessarily increase the size of the appendices as overall the transcripts come to over 60000 words.***

## Appendices

Appendix 11 - example coding reports for focus groups

# report for focus group learning environments

Name	Name	Coded Text
access to buildings	Focus group 4 bue level 5 10 students 2 females 8 males	yeah you have to wait at the door like can you let me in
access to buildings	Focus group 4 bue level 5 10 students 2 females 8 males	P yeah like a back entrance
access to buildings	Focus group 4 bue level 5 10 students 2 females 8 males	I think accessibility as well like that's the main entrance off the main road where I park I park on great Richmond street so there is not side access so I have to walk all the way around and then if you walk from the train station as well you've not really got I mean it's nothing to do with the university like the fly over
access to buildings	Focus group 4 bue level 5 10 students 2 females 8 males	some of the access as well it is a little strange because like with the Tom Reilly one some people forget their cards and you need it to get through any way of the building but you can sign on to the attendance machines without your card so it doesn't really make sense so if you forget your card you cant go to your lecture
access to buildings	Focus group 4 bue level 5 10 students 2 females 8 males	well what the uni does offer is the other side of town so all of the facilities and services are the other side of town from us so we can't really access that and if we do you are talking like a 20 30 minute walk
access to buildings	Focus Group 9 Transcript business	And it's annoying as well cos you've got to use your ID card to get into everywhere. Cos you'd have to sign out here then if you're going to go to the library you'd have to go through the John Foster Building, so you'd have to sign in, the sign out, then sign back in at the library.
access to buildings	Focus Group 9 Transcript business	Cos I was trying to get in the other day and it just said ID refused
access to buildings	Focus Group 9 Transcript business	No, you are allowed to use that now cos if it was staff, you would get access denied.
access to buildings	Focus Group 9 Transcript business	So that takes time, and some of the doors don't even work do they.
access to buildings	Focus Group 9 Transcript business	That's because, do you know why? Staff access. That's another thing. There's one door in here that would make me a bit earlier for Uni every day. The back door. But it seems to be staff only. Which doesn't make sense.
access to buildings	Focus Group 9 Transcript business	The one on the left is just staff only, and the one on the end...
access to buildings	Focus Group 9 Transcript business	There's two, there's the ones in the middle are all staff, cos I went through the middle one once and I got told to go around
access to resources	Focus group 1 architecture 10 students 3 females 7 males in studio	get stuff like drawing boards
access to resources	Focus group 10 2 female	there are not the resources we need really because we are limited to space I think
access to resources	Focus group 4 bue level 5 10 students 2 females 8 males	just have like your real concrete you need these books for sure you're going to have to read these one and just have like a couple in the room that



## Appendices

		like everyone in the lifetime is going to have to refer to at some point and then have all of your other ones in the library that if you want to go the
access to resources	Focus group 4 bue level 5 10 students 2 females 8 males	yeah not allow people to take them out they are just for there for people who are there as well and then you can use them after
access to resources	Focus group 4 bue level 5 10 students 2 females 8 males	and if you had all like specific books from the built environment were in a particular space was in a room like that
Reports\\report for focus gorup learning environments		Page 1 of 109
openness	Focus group 7 engineering level 6	I think there needs to be more open space because when I came to this Uni from college I thought wow everything is juts proper closed off because we just got like a new school building and you could just walk between classes and you could see teachers and stuff, I don't know I am just used to having a different environment its juts better
openness	Focus Group 9 Transcript business	better use of space probably in most places because like the Redmonds building is quite good but then when you get into the library and the John Foster building, it's a lot of things squished together and there's big open spaces, and if they set everything out a bit bigger, if you know what I mean, it'd be a bit better. If they spaced everything out more.
openness	Focus Group 9 Transcript business	Because there are like... it's more of an open plan layout.
openness	Focus Group 9 Transcript business	I would rather have this here because it's open space
openness	Focus Group 9 Transcript business	It's quite nice because you don't feel like you're trapped inside. It's quite nice to be. I don't know it's just like a nice environment. You don't feel like confined, do you.
openness	Focus Group 9 Transcript business	The Middlesex University is quite nice. The way it's quite open
openness	Focus Group 9 Transcript business	Yeah I do quite like that. Like the University has a lot of, um like, even a lot of the staff rooms are like windowed so they are like see through, and I quite like it.
openness	Focus Group 9 Transcript business	You just feel paranoid, and I'd rather have the open space.
Operations		
other facilities		
outside space	Focus group 1 architecture 10 students 3 females 7 males in studio	think there should be more shelter space outside rather than just seats because I am not going to be using them without shelters because these are the few days of the year that we can go with the right atmosphere outside and we cannot do it during the next few four or five month so we will need shelters
outside space	Focus group 1 architecture 10 students 3 females 7 males in studio	well I was thinking more externally if the put something more outside there then it would probably encourage students to get outside and do stuff allow them to be there

## Appendices

outside space	focus group 2 level 4 engineering	I was so annoyed when they built that building (NEW social space) because we used to play football and rugby out the with formula student and then they built that and we were like we can't do anything now
outside space	focus group 2 level 4 engineering	it's alright really I think people would prefer to sit outside really
outside space	focus group 2 level 4 engineering	put a canopy over the top that would be great
outside space	focus group 2 level 4 engineering	there are new benches in that new building but I went outside and it was just like wet and I don't want to sit out side
outside space	Focus group 3 Level 4 Architecture	adding another space external one like by the garden what we have at the back of the university
outside space	Focus group 3 Level 4 Architecture	there's not much outdoor space

Reports\\report for focus group learning environments

Page 66 of 109  
28/10/2016 16:19

Name	Name	Coded Text
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***Two pages of coding transcripts have been chosen (as seen in NVIVO analysis) as an example as overall there are 109 pages of coding data.***

## Appendices

Appendix 12- development of second survey for phase 3 data collection

## Appendices

<b>Question</b>	<b>Focus groups</b>	<b>Literature review</b>
Access to required facilities and equipment		
Access to workspaces when needed throughout the day	There would be multiple locations with various hours of access	
Comfortable spaces		There would be informal, comfortable spaces
Safety		There would be a feeling of safety
Contact with university	“if you want to speak to someone you can” “you can join anything like literally there are so many society so there are so many things on social media and emails”	
Ability to control environmental features (eg. lights, temperature)		There would be flexibility and choice
Natural light		There would be access to natural light
Access to suitable workspaces		There would be a variety of spaces for a variety of needs: protected spaces, active/passive spaces, prospect spaces (where you can look out over others)
Access to private work areas		There would be a variety of spaces for a variety of needs: protected spaces, active/passive spaces, prospect spaces (where you can look out over others)
Sustainability of environment		Green, sustainable features would be foregrounded
Welcoming environment		
Don't have to travel far to sessions		
Access to group work areas		There would be a variety of spaces for a variety of needs: protected spaces, active/passive spaces, prospect spaces (where you can look out over others)
Open and spacious environment	“you know the central entrance there everybody meets everybody there but once you go beyond that like the cafe downstairs it's just a cramped space, everything is just crammed in”	
Access to workspace integrated into all areas on campus	“more open hallways would like make it rooms to go off the hallways with like social spaces with maybe sofas and stuff in”	There would be multiple locations with various hours of access

## Appendices

Plenty of space available on campus for both socialising and studying	There would be a variety of spaces for a variety of needs: protected spaces, active/passive spaces, prospect spaces (where you can look out over others)	
Cafe area		There would be flexibility and choice- There would be a variety of spaces for a variety of needs: protected spaces, active/passive spaces, prospect spaces (where you can look out over others)
A common room where students from your school/course can go to work or socialise	“it would be good to have a common room that is across courses where we could go” “if we had an engineering common room and then like other people had their own common room like psychology”	
Adaptable work and social space to change for you needs		There would be flexibility and choice
Connected university campus	“if you look at Liverpool Uni then you see that everything is just sort of like in the area” “it would be good if all of the buildings were closer because my friends are in IM marsh and they get a train every morning”	
Open work areas		There would be a variety of spaces for a variety of needs: protected spaces, active/passive spaces, prospect spaces (where you can look out over others)
Clear signs to define space on campus	“I don't really know where the lecture theatres are and how to get all the way to them” (FG 2) “there isn't a sign that says Tom Reilly though” (FG 2) “it was only a few days ago that I realised there was a bottom floor to the Alden library” (FG 9)	
Space to relax	“or a pool table or something I know it brings I don't know about you but a bit of competition it goes into your work as well to compete about getting the best grades” (FG 4) “It would be nice if there was just a chill zone” (FG 9)	
Outside space		There would be a variety of spaces for a variety of needs: protected spaces, active/passive spaces, prospect spaces (where you can look out over others) There would be informal, comfortable spaces—plants,

## Appendices

<p>A clearly named 'home building' for your school</p>	<p>"the Westminster one is classed as a business building its not classed as a business and architecture because I looked there as well it just classed as a business school so you are just like shoved in there" (FG 5)</p> <p>"Yeah, like, I was in work the other day and this guy come up and had this thing on, and I was like "What do you study?", and he was like "Oh I do writing". I was like "what building are you in?", and he was like "Oh I'm in this building". I wouldn't know there was a writing, like an English bit in this building. You'd think this is a business building. Make it more like a business building." (FG 9)</p>	
<p>Identity of the university that stands out</p>	<p>"yeah promoting the uni yeah its not like super necessary but its not a bad thing like this here has Liverpool jmu written on it to show you to show what" (FG 8)</p> <p>"Yeah, if you're going to call it a business school like have a theme. Don't make it similar to every other one otherwise you're going to be... if you want a different kind of University." (FG 9)</p>	
<p>Student Union</p>	<p>"that's another thing we don't have a student union bar we just have a SU building" (FG 2)</p> <p>"it could do with a student union like pub not just a place to drink in but all other universities have a student union but we don't" (FG 4)</p>	
<p>Distinguishable identity of the school you are from (eg. School of Engineering)</p>	<p>"I don't know if there is any sort of built environment sort of area we are sort of situated everywhere we are thrown around everywhere so one definite place we could go to would be" (FG 4)</p> <p>"here it is all done by sort of floors and the by faculty so we are all like all their offices" (FG 5)</p>	
<p>Space to meet students from different courses</p>	<p>"It's quite hard to meet people in our environment because we are always just in lectures we don't have any workshops or things where we can chat to each other its always just we have to just sit and listen so like I know these two because they are from my halls but that is the only reason I know them" (FG 2)</p> <p>"in a way but then you never integrate with other people" (FG 5)</p>	

## Appendices

<p>Having work displayed</p>	<p>“I think and also like showing not like artwork but showing past students work and what there accomplishing now and showing that inspiration that type of motivation as well” FG 4)          “Pictures. Not like old pictures kind of more like modern pictures like maybe for instance third floor is business, and maybe there are other floors as well, each floor kind of has a designated kind of thing to it.          P:Yeah.          P:Even student stuff or something.” (FG 9)</p>	<p>There would be a program mix – art,          There would be artefacts the connect students to space/community</p>
<p>University branding throughout campus</p>	<p>“they straight up get a hoodie that instantly gets them into the feeling of oh I am part of this university”          “if you’re doing themes with colours and stuff, do it with like the tops and hoodies, so everyone knows “Oh business is blue”, and obviously make music more colourful or whatever, but do you know what I mean, make more of a theme definitely.”</p>	<p>There would be branding in spaces</p>

## Appendices

Features of quality in the PLE	Additions
Daylight	Suggested by meeting with architect
Windows	<p>“it’s just so dark in there in this one there’s all windows and stuff it’s like all high windows” (FG 6)</p> <p>“love widows im obsessed with windows like big floor to ceiling” (FG 6)</p> <p>Like that’s my favourite bit. And if you notice every room in the building has like lots of windows. I really like that” (FG9)</p>
Durability of fit and finish	<p>“its all just rubbish like little old stools and stuff” (FG8)</p> <p>you think old buildings are built to last but these aren’t because they are so cheap and rubbish “ (FG 6)</p> <p>“on the Redmond’s building is the bolts the have got all over the facade because it was falling apart if it was higher quality it would do that” (FG 1)</p>
Sustainability of environment	“is it sustainable” (FG 7)
General maintenance and up keep (FM)	<p>“there is also like behind the boards there is like massive pile or crap built up like if you go behind there for a board or a ruler it is just an absolute hazard isn’t it” (FG 5)</p> <p>“we go to john fosters it’s like urgh but it isn’t that bad it’s just like when you are speaking about it and comparing it it’s just it smells in there it smells a little bit old” (FG 6)</p> <p>“if a room is old that annoys me if it just looks rubbish it just make you feel sad” (FG 6)</p>
Cleanliness of buildings	<p>“think it’s just a nice building it like always clean like when we came up here we were like oo it smells like bleach it is always clean” (FG 6)</p> <p>“it just needs to look clean for me” (FG 7)</p> <p>“if nothing had been cleaned in ages that wouldn’t be high quality to me” (FG 8)</p>
Welcoming entrance	<p>“when you get inside in like the foyer it quite nice as a drop off before you get into the room and that”</p> <p>“yeah like the lead up to our campus isn’t very nice is it, like the lead up to our front you think you could actually put a park there well just a bit of grassed area and people can sit there in the summer that kind of thing it would look a lot better”</p>
Motivating environment	“And the Manchester one kind of looks like a museum. And to be honest, I wouldn’t want to sit in a museum.”
Sense of community	“I think it facilitates a sense of community” (FG 7)
Creating a natural environment eg. plants	<p>“where there is a few trees and grass in the middle, but they haven’t really done anything with it. If that was landscaped and it had benches and little areas and it was properly maintained.” (FG 9)</p> <p>“leafy and nice buildings” (FG 4)</p>
Work and social space integrated into all areas of campus	<p>“I think if the just scattered them around a bit more like it’s quite nice if you just find some in a room and you are just like because it is quite quiet or maybe some in the studio” (FG 5)</p> <p>“For instance a bit like the library but you can have room if you have time between your seminars just to go in and get a bit of work done and know that you don’t have to travel around the place just to do it.” (FG 9)</p>
Interconnected university buildings	<p>“if you look at Liverpool uni then you see that everything is just sort of like in the area” (FG 3)</p> <p>“it’s like they have got their own village or their own little town in the city where as john Moores is just like spaced put” (FG 3)</p>



## Appendices

Clearly defined space	<p>“you walk up a corridor and look at the rooms in order and they are not because the numbers don't make any sense” (FG 2)</p> <p>“you think its floor 2 but it's actually like floor three because the basement is on the ground floor or some mad situation like that” (FG 4)</p>
Spacious halls	<p>“Even just in the corridor, the corridors are wider.” (FG 9)</p> <p>“you have narrow corridors” (FG 1)</p>
Aesthetics of design	<p>“I would say if it looks nice to me if I see somewhere that looks nice I am going to use it, if it just looks horrible and uninviting I am not going there”</p>
Aesthetics of façade	<p>“making the buildings look nice because I think that when people want to, when they come to the Uni they look at what the buildings look like that was the first think I looked at if it doesn't look nice then I don't really want to be here”</p>
Adaptable learning spaces to suit lessons	<p>“maybe like a foldable wall possible so that in case you just want to close off one part of the room just to box yourself off then that would be quite nice” (FG 1)</p> <p>“you can just spin your chair around and speak to every one like because you are in little rows you can just turn around and talk to everyone who is there if you are struggling or what not and then you can just wheel over and help them or someone can wheel over and help you” (FG 7)</p>
Access to required facilities	<p>“think a range of facilities is a major thing” (FG 5)</p> <p>“clearly the library facilities aren't very good because solid works doesn't work” (FG 7)</p>
Access to workspace and seating	<p>“there is computers and desks but it's not a big room though you just sat in a corner” (FG 2)</p> <p>“yeah there's nowhere round here where you could just go sit and do work” (FG 2)</p> <p>“it isn't necessarily a place where people can interact for study purposes its just that cafe” (FG 4)</p>
Contact with staff (FM)	<p>“always someone on reception”</p>
Safety and security (FM)	<p>“and literally anyone can walk into our building onto any floor well into any room and I think that should be looked at”</p>
Management of classrooms and buildings (FM)	<p>“for the rooms to be prepared for before for as soon as we are arrived there because when we arrive there they turn on the heaters at the last second”</p>
Design and furniture fit for purpose	<p>“I need a proper table to work at” (FG 2)</p> <p>“being so close to other people no like in some of the computer rooms I have literally like this much space and then the next person is more or less on top of me so I feel quite compact in this area” (FG 10)</p> <p>“yeah that have just got to be big and they are all covered in scratches and scalpel marks and ink and stuff so I don't really know if the furniture should be that nice because it is an art building” (FG 5)</p>

## Appendices

Appendix 13 - raw data for phase three analysis

## Appendices

### Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings <sup>a</sup>
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	21.443	27.848	27.848	20.772	26.976	26.976	14.903
2	4.848	6.296	34.145	4.136	5.372	32.348	12.554
3	2.996	3.890	38.035	2.468	3.205	35.553	8.849
4	2.535	3.292	41.328	2.019	2.622	38.175	12.140
5	2.282	2.964	44.291	1.777	2.308	40.483	7.200
6	2.011	2.611	46.903	1.564	2.031	42.514	10.633
7	1.832	2.379	49.282	1.424	1.849	44.363	11.923
8	1.774	2.304	51.586	1.324	1.719	46.083	10.072
9	1.697	2.204	53.790				
10	1.532	1.989	55.779				
11	1.465	1.902	57.681				
12	1.414	1.837	59.518				
13	1.378	1.789	61.307				
14	1.272	1.652	62.960				
15	1.215	1.578	64.538				
16	1.179	1.532	66.070				
17	1.111	1.443	67.513				
18	1.026	1.332	68.845				
19	.992	1.288	70.133				
20	.967	1.255	71.389				
21	.914	1.187	72.576				
22	.902	1.172	73.747				
23	.862	1.120	74.867				
24	.812	1.055	75.922				
25	.775	1.006	76.928				
26	.748	.971	77.899				
27	.701	.911	78.810				
28	.691	.898	79.708				
29	.670	.870	80.578				
30	.657	.854	81.431				
31	.642	.834	82.266				

## Appendices

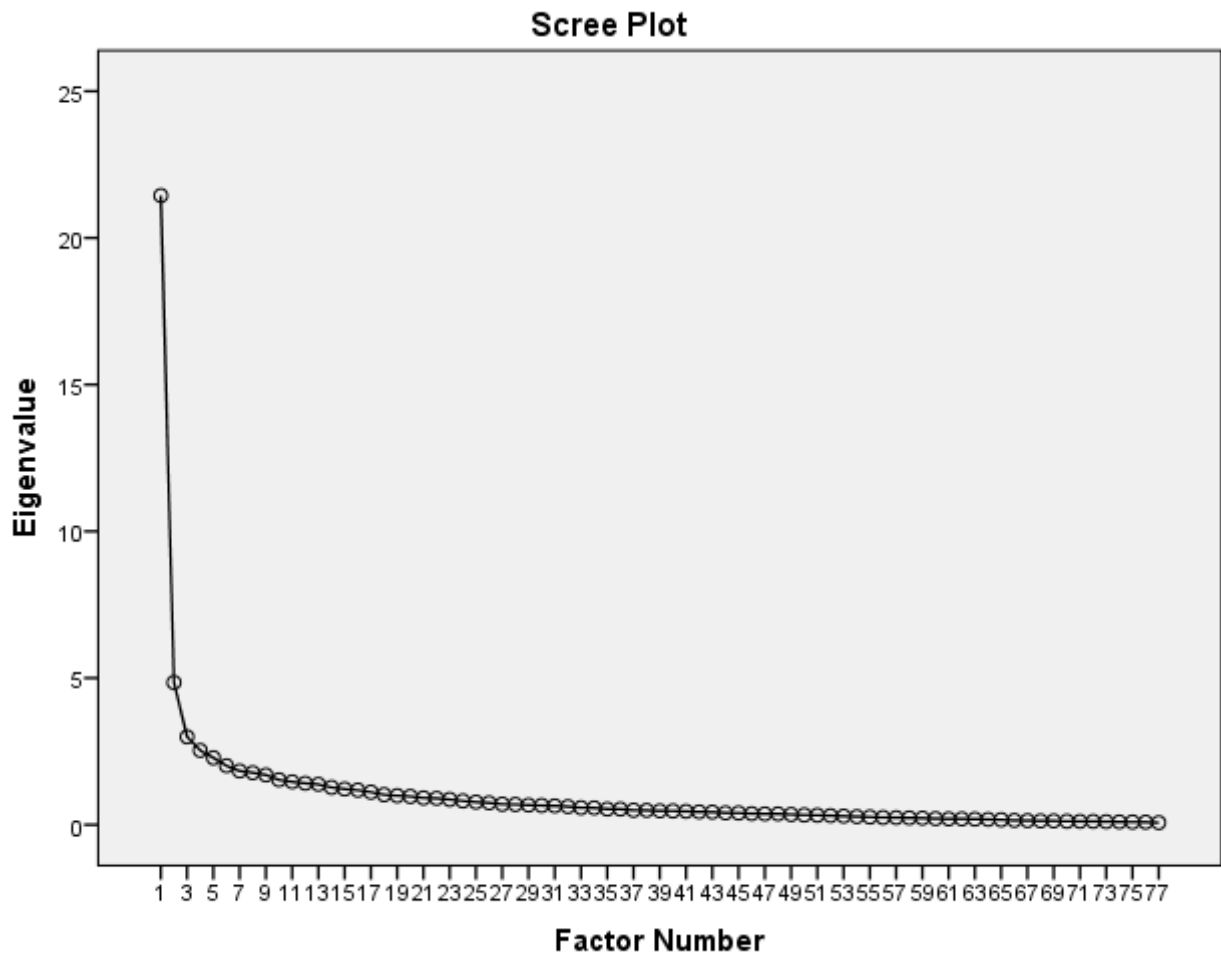
32	.618	.802	83.068
33	.581	.754	83.822
34	.577	.749	84.571
35	.536	.696	85.268
36	.532	.690	85.958
37	.497	.645	86.603
38	.491	.637	87.241
39	.474	.616	87.857
40	.471	.611	88.468
41	.459	.596	89.064
42	.442	.575	89.638
43	.432	.561	90.199
44	.405	.526	90.725
45	.400	.520	91.245
46	.381	.494	91.739
47	.372	.483	92.222
48	.369	.480	92.701
49	.350	.454	93.155
50	.332	.432	93.587
51	.324	.421	94.008
52	.309	.402	94.409
53	.296	.385	94.794
54	.275	.358	95.152
55	.265	.344	95.496
56	.247	.321	95.817
57	.241	.313	96.130
58	.233	.303	96.433
59	.226	.293	96.726
60	.208	.270	96.996
61	.202	.262	97.258
62	.199	.259	97.516
63	.191	.248	97.765
64	.184	.239	98.004
65	.169	.220	98.224
66	.152	.198	98.421
67	.144	.186	98.608
68	.134	.173	98.781
69	.130	.169	98.950
70	.121	.157	99.107
71	.117	.152	99.259
72	.113	.147	99.406

## Appendices

73	.106	.138	99.544			
74	.098	.127	99.671			
75	.093	.120	99.791			
76	.088	.114	99.905			
77	.074	.095	100.000			

Extraction Method: Maximum Likelihood.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.



### KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.889
Bartlett's Test of Sphericity	Approx. Chi-Square
	10493.884
	df
	2926
	Sig.
	.000

10	Factor							
	1	2	3	4	5	6	7	8
Open social areas	.905							
Plenty of social areas	.798							
Private social areas	.718							
Work and social space integrated into all areas of campus	.692							
Access to group work areas	.608							
Access to group workspace	.582						.431	
Plenty of space available on campus for both socialising and studying	.564							
Informal learning spaces	.530							
A common room where students from your school/course can go to work or socialise	.503							
Space to relax	.492							
Space to meet students from different courses	.468					.414		
Open work areas	.422							
Adaptable work and social space to change for you needs	.404							
Easy to find your way around		.733						
Clear signs in buildings		.683						
Spaciousness to avoid overcrowding		.537						
Clear signs to define space on campus		.499						
Clearly defined space		.493						
Don't have to travel far to sessions		.487						
Spacious halls		.451						
Open spaces to avoid over crowding		.421						
Aesthetics of design			.869					
Aesthetics of façade			.811					
Up to date aesthetics			.694					
Finish of design eg. flooring, paint			.610					
Décor			.527					
Durability of fit and finish			.442					
Colour schemes			.410					
Design and furniture fit for purpose				.553				
Up to date technology				.545				

## Appendices

Access to workspaces when needed throughout the day				.542				
Access to suitable workspaces				.536				
Access to workspace and seating				.491				
Comfortable spaces				.456				
Access to workspace integrated into all areas on campus				.442				
Access to technology (eg. plugs, computers etc.)				.417				
Access to resources and equipment					.872			
Access to required facilities					.863			
Access to building					.523			
Specialist teaching rooms (eg. labs)					.436			
Distinguishable identity of the school you are from (eg. School of Engineering)						.813		
University branding throughout campus						.782		
Identity of the university that stands out						.754		
Student Union						.438		
Motivating environment							.693	
Sense of community							.424	
Natural light								.917
Daylight								.806
Windows								.658
Creating a natural environment eg. plants								.473
Open and spacious environment								.421

Extraction Method: Maximum Likelihood.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 17 iterations.

## Appendices

Appendix 14 - descriptive statistics phase three data collection



## Appendices

Feature	Mean	SD	Skewness	Kurtosis
View from building	3.07	1.114	.175	-.824
Spacious entrance hall	3.14	1.093	.098	-.668
Finish of design eg. flooring, paint	3.362	1.0597	-.188	-.668
Spacious halls	3.37	1.007	-.437	-.177
Plenty of social areas	3.38	1.079	-.190	-.570
Décor	3.39	1.097	-.194	-.730
Colour schemes	3.40	1.073	-.146	-.656
Up to date aesthetics	3.42	1.035	-.270	-.476
Aesthetics of façade	3.43	.987	-.302	-.168
Private social areas	3.45	1.192	-.387	-.710
Welcoming entrance	3.48	1.081	-.285	-.635
Interconnected university buildings	3.49	1.090	-.333	-.583
Outside space	3.55	1.097	-.299	-.798
Creating a natural environment eg. plants	3.56	1.176	-.342	-.783
Clearly defined space	3.64	1.002	-.384	-.463
Aesthetics of design	3.66	.994	-.480	-.242
Open social areas	3.68	1.045	-.556	-.148
Durability of fit and finish	3.68	1.027	-.554	-.136
Sense of community	3.71	1.168	-.654	-.470
Adaptable space to changing needs	3.73	.857	-.145	-.658
Work and social space integrated into all areas of campus	3.75	1.009	-.627	-.023
Seminar rooms	3.76	.917	-.389	-.293
Cafe area	3.80	1.025	-.665	-.047
Informal learning spaces	3.89	.920	-.586	-.082
Sustainability of environment	3.89	1.100	-.684	-.390
Layout of room allowing for both group and independent learning	3.90	.953	-.594	-.247
Refreshment facilities	3.92	.811	-.367	-.375
Adaptable learning spaces to suit lessons	3.97	.871	-.731	.443
Access to group workspace	3.99	.892	-.594	-.015
Specialist teaching rooms (eg. labs)	4.00	1.138	-1.055	.307
Management of classrooms and buildings	4.00	.798	-.488	.096
Natural lighting	4.04	.948	-1.009	.820
Clear signs in buildings	4.07	.910	-.757	.124
Ability to control of environmental factors eg. lighting, noise	4.07	.803	-.655	.359
Lecture halls	4.10	.834	-.655	-.162
Daylight	4.11	.923	-1.128	1.109
Design and furniture fit for purpose	4.11	.851	-.656	-.292
Motivating environment	4.12	.975	-1.041	.529
Windows	4.15	.820	-1.130	2.015
Open spaces	4.16	.785	-.800	.727
Easy to find your way around	4.21	.799	-.663	-.354
Contact with staff	4.21	.887	-1.062	.834
Safety and security	4.22	.873	-1.059	1.108
Access to workspace and seating	4.23	.685	-.416	-.489
General maintenance and up keep	4.25	.803	-1.182	2.171
Room layout allowing for easy visibility of teacher	4.26	.799	-.877	.203
Spaciousness to avoid overcrowding	4.26	.710	-.734	.850
Access to building	4.33	.717	-.820	.195
Temperature	4.38	.707	-.851	.052
Access to suitable toilets	4.43	.786	-1.421	1.960
Access to resources and equipment	4.47	.760	-1.656	3.100
Access to required facilities	4.49	.658	-1.021	.322
Comfort of seating	4.49	.665	-1.129	.869
Up to date technology	4.52	.630	-.942	-.159
Cleanliness of buildings	4.52	.665	-1.435	2.852
Access to libraries	4.57	.626	-1.259	1.004
Access to technology (eg. plugs, computers etc.)	4.57	.701	-1.829	3.821

## Appendices

	School of Art and Design		School of Engineering		School of Built environment		School of Law and business	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Natural lighting	4.37	0.81	4.06	0.87	4.11	0.91	3.6	1.13
Daylight	4.43	0.82	4.13	0.87	4.18	0.87	3.7	1.07
Ability to control of environmental factors eg. lighting, noise	4.13	0.78	4.15	0.78	4.03	0.83	3.95	0.82
Windows	4.43	0.57	4.17	0.73	4.11	0.88	3.97	0.98
Colour schemes	4	0.83	3.21	1.1	3.43	1.03	3.25	1.13
Décor	3.87	0.94	3.19	1.13	3.39	1.04	3.37	1.17
Temperature	4.33	0.66	4.36	0.66	4.43	0.73	4.35	0.80
Up to date aesthetics	3.6	0.93	3.37	1.00	3.39	1.06	3.43	1.15
Finish of design eg. flooring, paint	3.63	0.93	3.29	1.14	3.35	1.00	3.3	1.11
Durability of fit and finish	3.83	0.87	3.62	1.09	3.78	1.06	3.48	0.93
Sustainability of environment	4.27	0.91	3.83	1.06	3.9	1.18	3.67	1.10
Comfort of seating	4.5	0.51	4.54	0.7	4.44	0.68	4.48	0.64
General maintenance and up keep	4.4	0.68	4.22	0.86	4.2	0.72	4.3	0.94
Cleanliness of buildings	4.7	0.60	4.46	0.77	4.47	0.64	4.6	0.55
View from building	3.63	1.07	2.93	1.11	2.99	1.08	3.08	1.14
Welcoming entrance	3.9	0.89	3.15	1.16	3.47	1.02	3.78	1.03
Motivating environment	4.37	0.85	4.1	0.92	4.04	1.06	4.13	0.99
Sense of community	4.2	0.71	3.64	1.17	3.42	1.21	4.03	1.21
Creating a natural environment eg. plants	3.6	1.10	3.72	1.14	3.57	1.21	3.22	1.21
Seminar rooms	3.6	0.86	3.74	0.93	3.62	0.97	4.18	0.71
Lecture halls	3.93	0.87	4.1	0.84	4.04	0.85	4.32	0.73
Informal learning spaces	4.13	0.94	3.9	0.81	3.85	0.88	3.75	1.15
Access to group workspace	4.37	0.81	4.04	0.70	3.89	0.95	3.8	1.07
Specialist teaching rooms (eg. labs)	4.07	1.17	4.32	0.98	3.87	1.16	3.6	1.22
Access to libraries	4.63	0.56	4.54	0.67	4.51	0.66	4.68	0.53
Access to suitable toilets	4.63	0.62	4.42	0.84	4.33	0.81	4.48	0.75
Open social areas	4	0.79	3.67	0.99	3.57	1.11	3.68	1.16
Private social areas	3.63	1.07	3.43	1.20	3.33	1.19	3.57	1.30
Work and social space integrated into all areas of campus	3.97	0.81	3.75	0.87	3.68	1.03	3.7	1.31
Cafe area	4	0.91	3.57	1.15	3.96	0.88	3.75	1.08
Plenty of social areas	3.57	0.86	3.29	1.03	3.43	1.16	3.3	1.16
Interconnected university buildings	3.63	1.03	3.46	1.10	3.52	1.06	3.4	1.19
Outside space	3.8	0.99	3.61	0.99	3.42	1.18	3.5	1.18
Spacious entrance hall	3.17	1.02	2.94	0.99	3.15	1.15	3.45	1.18
Clearly defined space	3.83	1.02	3.47	0.96	3.68	1.01	3.73	1.04
Spacious halls	3.43	0.68	3.31	1.00	3.33	1.05	3.5	1.16
Aesthetics of design	4.23	0.77	3.44	0.92	3.73	0.98	3.48	1.13
Aesthetics of façade	3.97	0.81	3.24	0.85	3.54	1.05	3.18	1.06
Spaciousness to avoid overcrowding	4.4	0.68	4.18	0.66	4.23	0.77	4.38	0.71
Room layout allowing for easy visibility of teacher	4.33	0.66	4.14	0.84	4.19	0.85	4.55	0.64
Layout of room allowing for both group and independent learning	4.5	0.63	3.64	0.92	3.76	1.02	4.2	0.82
Clear signs in buildings	4.03	0.93	3.97	0.96	4.09	0.89	4.23	0.83

## Appendices

Adaptable learning spaces to suit lessons	4.23	0.77	3.99	0.74	3.89	0.96	3.9	0.96
Access to resources and equipment	4.8	0.41	4.49	0.79	4.32	0.84	4.5	0.68
Access to required facilities	4.87	0.35	4.44	0.71	4.38	0.69	4.5	0.60
Access to building	4.57	0.68	4.25	0.80	4.32	0.65	4.35	0.70
Up to date technology	4.57	0.57	4.56	0.63	4.54	0.62	4.35	0.70
Access to technology (eg. plugs, computers etc.)	4.67	0.55	4.61	0.62	4.52	0.78	4.55	0.78
Refreshment facilities	4	0.70	3.89	0.83	3.9	0.76	3.95	0.96
Adaptable space to changing needs	4.03	0.72	3.67	0.84	3.68	0.87	3.7	0.94
Access to workspace and seating	4.33	0.61	4.17	0.69	4.18	0.71	4.38	0.67
Open spaces	4.2	0.55	4.15	0.73	4.1	0.89	4.25	0.84
Easy to find your way around	4.23	0.73	4.07	0.88	4.16	0.78	4.53	0.68
Contact with staff	4.67	0.61	4.1	0.89	4.09	0.94	4.32	0.86
Safety and security	4.5	0.57	4.19	0.91	4.09	0.87	4.3	0.97
Management of classrooms and buildings	4.03	0.72	3.96	0.81	3.92	0.80	4.2	0.82
Design and furniture fit for purpose	4.53	0.57	4.04	0.88	4.1	0.86	3.93	0.89

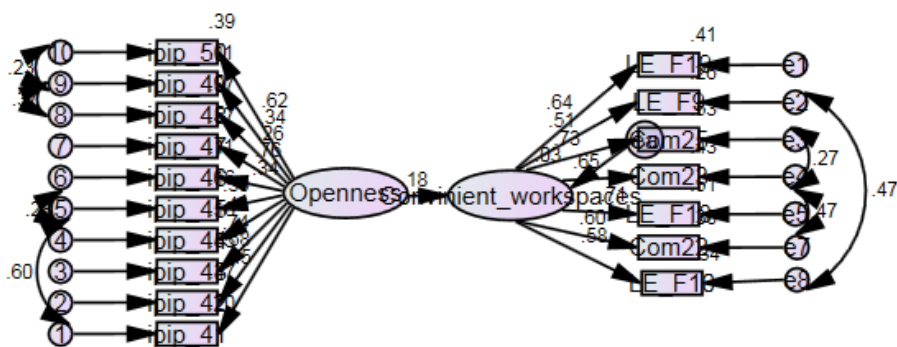
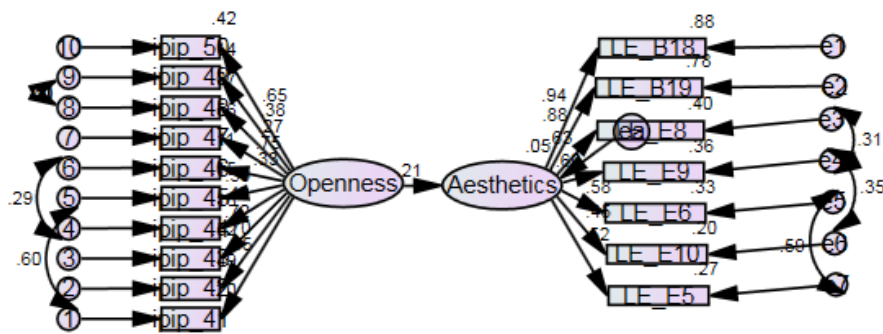
## Appendices

Appendix 15 - standardised regression weights for the SEM models

## Appendices

	Estimate
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ipip_42 <--- Openness	.699
ipip_43 <--- Openness	.723
ipip_44 <--- Openness	.420
ipip_45 <--- Openness	.392
ipip_46 <--- Openness	.332
ipip_47 <--- Openness	.746
ipip_48 <--- Openness	.266
ipip_49 <--- Openness	.376
ipip_50 <--- Openness	.649
LE_B18 <--- Aesthetics	.940
LE_B19 <--- Aesthetics	.885
LE_E8 <--- Aesthetics	.631
LE_E9 <--- Aesthetics	.602
LE_E6 <--- Aesthetics	.575
LE_E10 <--- Aesthetics	.446
LE_E5 <--- Aesthetics	.519

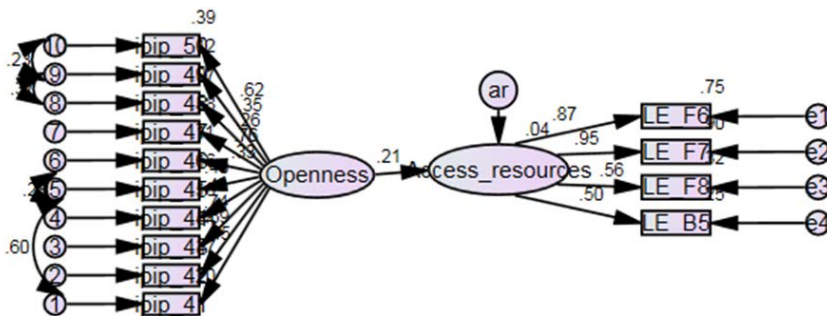
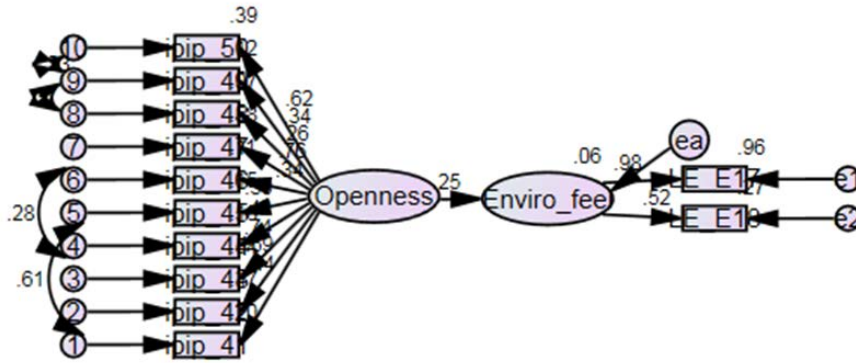
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ipip_46 <--- Openness	.335
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ipip_49 <--- Openness	.339
ipip_50 <--- Openness	.624
LE_F19 <--- Convenient_workspaces	.639
LE_F9 <--- Convenient_workspaces	.509
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Com23 <--- Convenient_workspaces	.654
LE_F13 <--- Convenient_workspaces	.714
Com22 <--- Convenient_workspaces	.600
LE_F10 <--- Convenient_workspaces	.579



## Appendices

	Estimate
Enviro_feel <--- Openness	.246
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ipip_42 <--- Openness	.686
ipip_43 <--- Openness	.737
ipip_44 <--- Openness	.423
ipip_45 <--- Openness	.391
ipip_46 <--- Openness	.338
ipip_47 <--- Openness	.761
ipip_48 <--- Openness	.264
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ipip_50 <--- Openness	.624
LE_E17 <--- Enviro_feel	.981
LE_E18 <--- Enviro_feel	.524

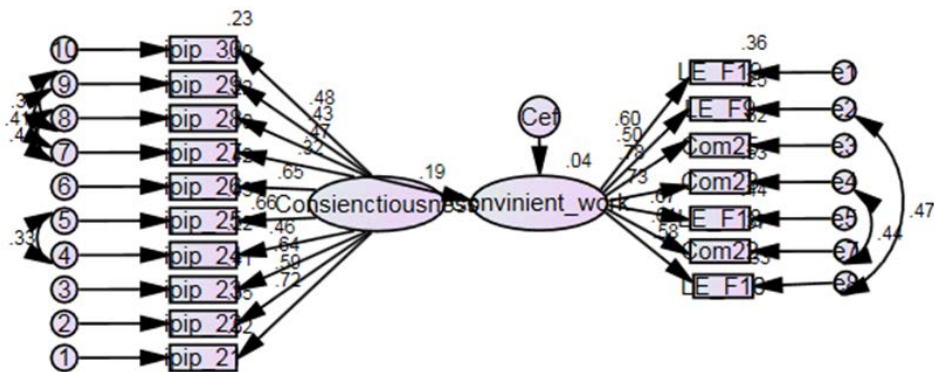
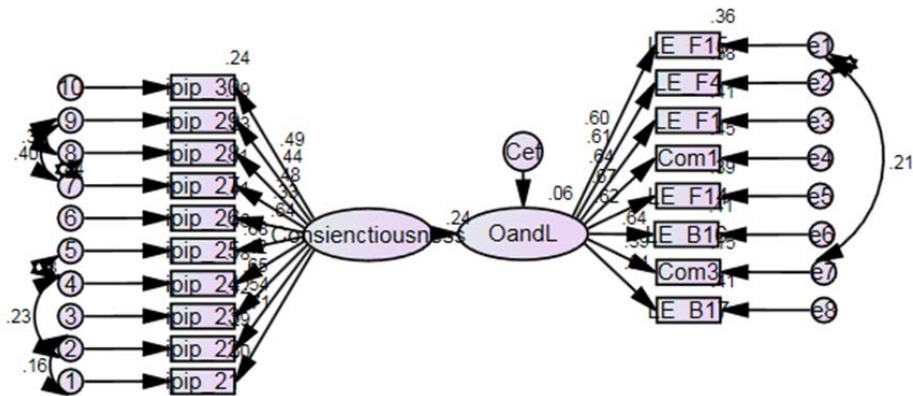
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ipip_43 <--- Openness	.737
ipip_44 <--- Openness	.428
ipip_45 <--- Openness	.396
ipip_46 <--- Openness	.335
ipip_47 <--- Openness	.759
ipip_48 <--- Openness	.263
ipip_49 <--- Openness	.346
ipip_50 <--- Openness	.622
LE_F6 <--- Access_resources	.865
LE_F7 <--- Access_resources	.946
LE_F8 <--- Access_resources	.565
LE_B5 <--- Access_resources	.500



## Appendices

		Estimate
Convinient_work <---	Consienctiousness	.193
ipip_21 <---	Consienctiousness	.721
ipip_22 <---	Consienctiousness	.593
ipip_23 <---	Consienctiousness	.642
ipip_24 <---	Consienctiousness	.464
ipip_25 <---	Consienctiousness	.655
ipip_26 <---	Consienctiousness	.646
ipip_27 <---	Consienctiousness	.317
ipip_28 <---	Consienctiousness	.474
ipip_29 <---	Consienctiousness	.431
ipip_30 <---	Consienctiousness	.482
LE_F19 <---	Convinient_work	.598
LE_F9 <---	Convinient_work	.501
Com25 <---	Convinient_work	.785
Com23 <---	Convinient_work	.729
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Com22 <---	Convinient_work	.611
LE_F10 <---	Convinient_work	.576

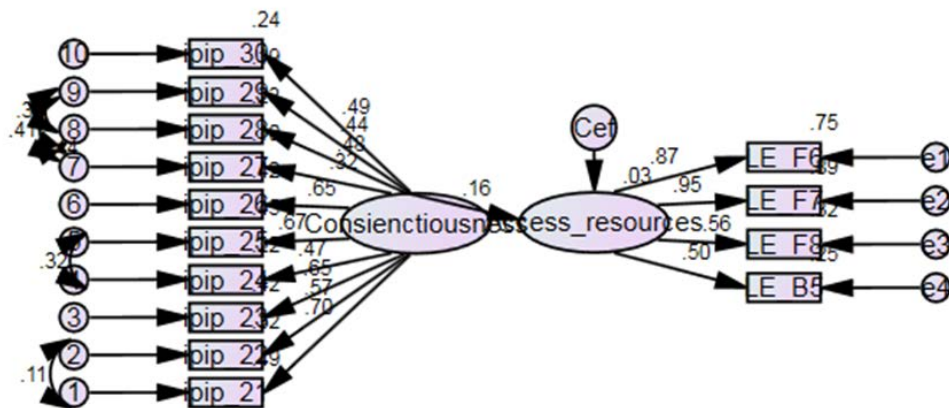
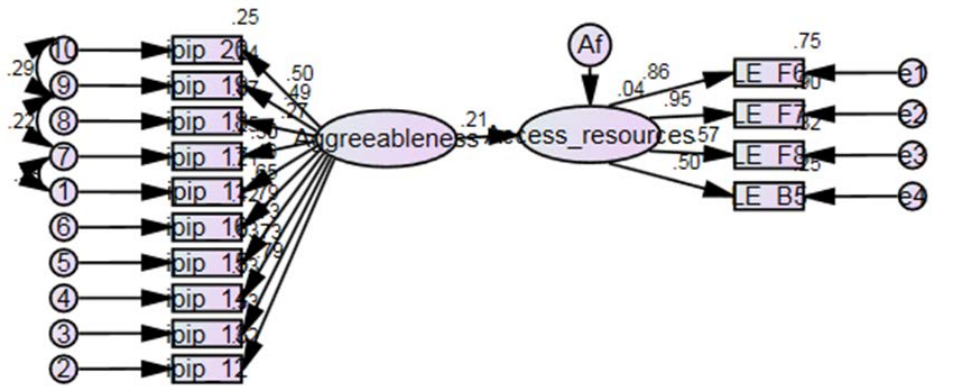
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ipip_23 <---	Consienctiousness	.649
ipip_24 <---	Consienctiousness	.420
ipip_25 <---	Consienctiousness	.678
ipip_26 <---	Consienctiousness	.637
ipip_27 <---	Consienctiousness	.327
ipip_28 <---	Consienctiousness	.483
ipip_29 <---	Consienctiousness	.439
ipip_30 <---	Consienctiousness	.488
LE_F15 <---	OandL	.602
LE_F4 <---	OandL	.613
LE_F1 <---	OandL	.637
Com1 <---	OandL	.672
LE_F14 <---	OandL	.623
LE_B16 <---	OandL	.641
Com3 <---	OandL	.391
LE_B17 <---	OandL	.641



## Appendices

		Estimate
Access_resources	<--- Conscientiousness	.162
ipip_21	<--- Conscientiousness	.697
ipip_22	<--- Conscientiousness	.569
ipip_23	<--- Conscientiousness	.645
ipip_24	<--- Conscientiousness	.473
ipip_25	<--- Conscientiousness	.668
ipip_26	<--- Conscientiousness	.648
ipip_27	<--- Conscientiousness	.317
ipip_28	<--- Conscientiousness	.479
ipip_29	<--- Conscientiousness	.438
ipip_30	<--- Conscientiousness	.490
LE_F6	<--- Access_resources	.866
LE_F7	<--- Access_resources	.946
LE_F8	<--- Access_resources	.565
LE_B5	<--- Access_resources	.499

		Estimate
Access_resources	<--- Agreeableness	.208
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ipip_13	<--- Agreeableness	.730
ipip_14	<--- Agreeableness	.731
ipip_15	<--- Agreeableness	.795
ipip_16	<--- Agreeableness	.647
ipip_11	<--- Agreeableness	.459
ipip_17	<--- Agreeableness	.505
ipip_18	<--- Agreeableness	.273
ipip_19	<--- Agreeableness	.494
ipip_20	<--- Agreeableness	.496
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LE_F8	<--- Access_resources	.565
LE_B5	<--- Access_resources	.498

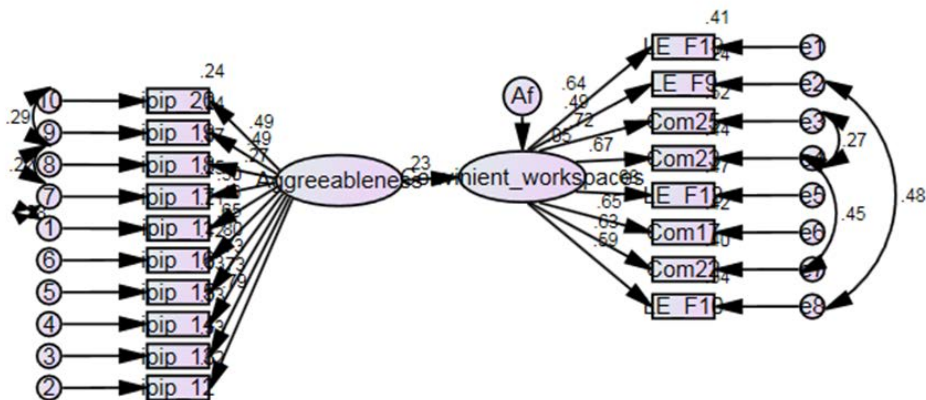
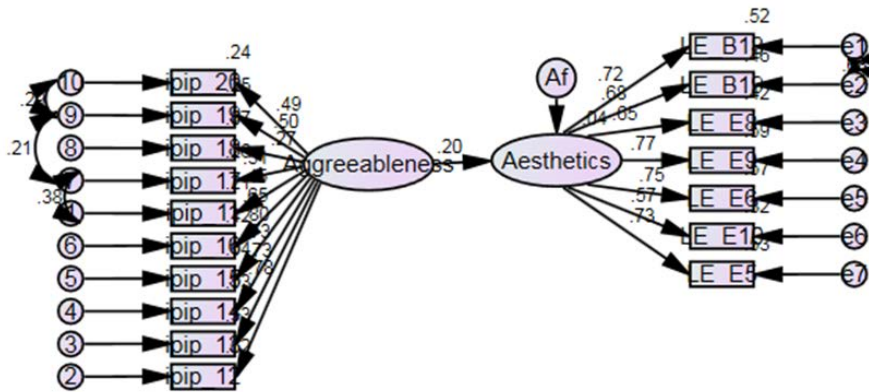




## Appendices

	Estimate
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ipip_13 <--- Agreeableness	.731
ipip_14 <--- Agreeableness	.730
ipip_15 <--- Agreeableness	.796
ipip_16 <--- Agreeableness	.650
ipip_11 <--- Agreeableness	.457
ipip_17 <--- Agreeableness	.504
ipip_18 <--- Agreeableness	.271
ipip_19 <--- Agreeableness	.492
ipip_20 <--- Agreeableness	.493
LE_F19 <--- Convinient_	.641
LE_F9 <--- Convinient_	.488
Com25 <--- Convinient_	.724
Com23 <--- Convinient_	.665
LE_F13 <--- Convinient_	.684
Com17 <--- Convinient_	.649
Com22 <--- Convinient_	.633
LE_F10 <--- Convinient_	.587

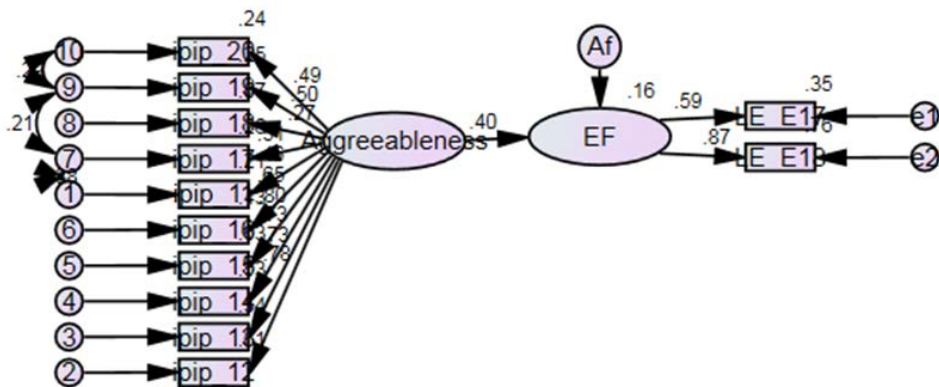
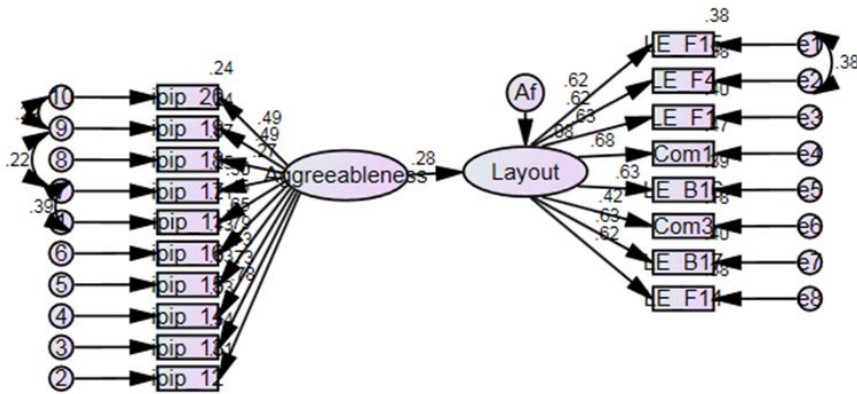
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ipip_16 <--- Agreeableness	.649
ipip_11 <--- Agreeableness	.455
ipip_17 <--- Agreeableness	.508
ipip_18 <--- Agreeableness	.270
ipip_19 <--- Agreeableness	.495
ipip_20 <--- Agreeableness	.493
LE_B18 <--- Aesthetics	.721
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LE_E9 <--- Aesthetics	.769
LE_E6 <--- Aesthetics	.753
LE_E10 <--- Aesthetics	.566
LE_E5 <--- Aesthetics	.728



## Appendices

	Estimate
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ipip_15 <--- Agreeableness	.795
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ipip_11 <--- Agreeableness	.454
ipip_17 <--- Agreeableness	.501
ipip_18 <--- Agreeableness	.269
ipip_19 <--- Agreeableness	.493
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LE_F4 <--- Layout	.619
LE_F1 <--- Layout	.629
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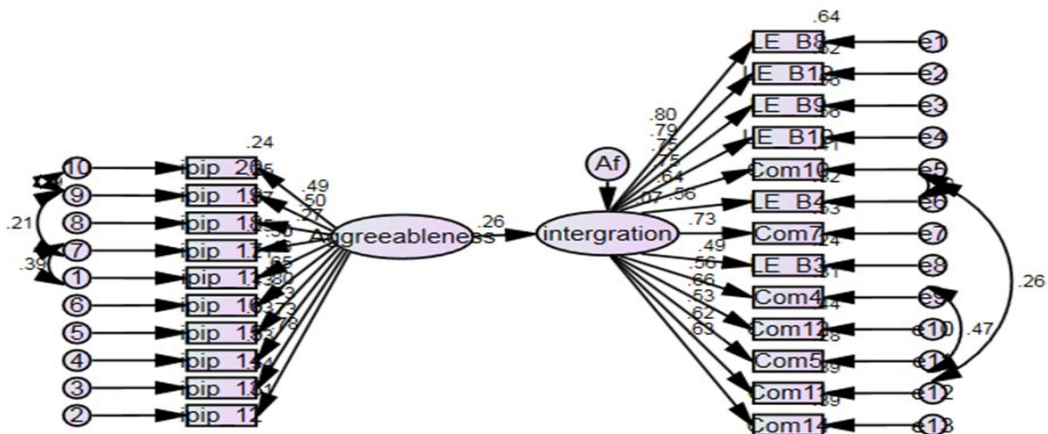
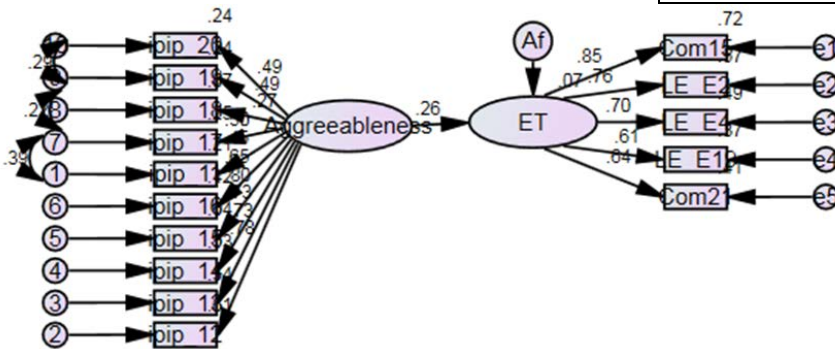
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ipip_17 <--- Agreeableness	.509
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ipip_19 <--- Agreeableness	.497
ipip_20 <--- Agreeableness	.493
LE_E17 <--- EF	.591
LE_E18 <--- EF	.870



## Appendices

		Estimate
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ipip_13	<--- Agreeableness	.732
ipip_14	<--- Agreeableness	.729
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ipip_16	<--- Agreeableness	.651
ipip_11	<--- Agreeableness	.454
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ipip_18	<--- Agreeableness	.269
ipip_19	<--- Agreeableness	.493
ipip_20	<--- Agreeableness	.491
Com15	<--- ET	.848
LE_E2	<--- ET	.758
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LE_E19	<--- ET	.605
Com21	<--- ET	.637

		Estimate
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ipip_13	<--- Agreeableness	.733
ipip_14	<--- Agreeableness	.728
ipip_15	<--- Agreeableness	.796
ipip_16	<--- Agreeableness	.652
ipip_11	<--- Agreeableness	.455
ipip_17	<--- Agreeableness	.504
ipip_18	<--- Agreeableness	.270
ipip_19	<--- Agreeableness	.495
ipip_20	<--- Agreeableness	.494
LE_B8	<--- intergration	.797
LE_B12	<--- intergration	.790
LE_B9	<--- intergration	.750
LE_B10	<--- intergration	.749
Com10	<--- intergration	.638
LE_B4	<--- intergration	.564
Com7	<--- intergration	.730
LE_B3	<--- intergration	.488
Com4	<--- intergration	.558
Com12	<--- intergration	.664
Com5	<--- intergration	.527
Com11	<--- intergration	.624
Com14	<--- intergration	.628



## Appendices

Appendix 16 - Email to estates managers

## Appendices

I am contacting you regarding my PhD research entitled “Personality Traits, Community and Quality in Space Design in the Higher Education Physical Learning Environment”. You have been chosen to participate in the proposed research due to your position as Estate Managers of Higher Education Institutions, as your knowledge will be invaluable to the outcomes of the research. Your contact details have been accessed via your universities web page.

I have explored students feeling towards their physical learning environment and have identified features of the environment that, from their point of view, are required for a positive learning experience.

I am currently in the final phase of my research and have developed a set of models to support in the design process of higher education institution, and this is consequently why am I contacting you. I would like to conduct some validation interviews with Estate Managers from different Universities to review the validity and usability of my models. Therefore, I am inviting you to participate in an interview at a time that would suit you.

Please read Participant Information sheet that has been attached to this email to help you decide if you would like to participate in the current research.

I am looking to conduct the interviews as soon as possible and should take around 45 minutes to 1 hour. The interview will focus on exploring the models I have identified and your feelings and knowledge of the physical learning environments designed for students within the university.

If you have any further questions, please do not hesitate to contact me.

Kind regards,

Hannah Wilson

## Appendices

Appendix 17 – participant information sheet and consent form for validation interviews



**Title of Project: “Perceptions of Quality in Higher Education Learning Environments and the Impact of Personality Types on Satisfaction”.**

**Researcher: Hannah Wilson**

You are being invited to take part in a research study. Before you decide if you would like to take part it is important that you understand why the research is being done and what it involves. Please take time to read the following information. Ask us if there is anything that is not clear or if you would like more information. Take time to decide if you want to take part or not.

**9. What is the purpose of the study?**

The purpose of this study is to identify if a framework identifying student’s specific preferences within the Physical Learning Environment would be useful and applicable in the design process of Higher Educational Institutions Physical learning environment.

**10. Who can take part?**

You can take part in the current research if you a member of the Estates Management team in a Higher Education Institution across the United Kingdom. If you are not part of the Estates Management team in Higher Education Universities, then unfortunately you cannot participate in this current research.

**11. Do I have to take part?**

No. It is up to you to decide whether or not to take part. If you do you will be given this information sheet and asked to sign a consent form. You are still free to withdraw at any time and without giving a reason. A decision to withdraw will not affect your rights/any future treatment/service you receive.

**12. What will happen to me if I take part?**

You will be asked to sign or initial the participant consent form. You will then be asked to participate in an interview which should take up to 1 hour. The interviews will be recorded by an audio recorder. The interviews will consist of discussion surrounding how the Physical Learning Environment is currently designed and what can be implemented to enhance the design for the students’ benefit. Additionally, frameworks for the design of the Physical learning environment have been developed through PhD research and the appropriateness of these will be discussed.

**13. Are there any risks / benefits involved?**

There are no risks associated with taking part in this study. However, there may be several benefits in taking part in this study, although the outcomes of this study they may not directly affect you they could affect future students by improving their university environment.

**14. Will my taking part in the study be kept confidential?**

## Appendices

All members taking part in the interviews will be kept confidential. Pseudonyms will be given on the transcripts and reports to help protect the identity of individuals and organisations. The recordings of the interviews will be recorded and kept on a password protected device until transferred to a secure university network drive. At this time the recording will be deleted from the recording device.

**15. Has this study been approved by an ethics committee?**

This study has received ethical approval from LJMU's Research Ethics Committee 16/BUE/008

**16. Who to contact with enquires about this study?**

**Contact Details of Researcher-** [H.K.Crawford@2010.ljmu.ac.uk](mailto:H.K.Crawford@2010.ljmu.ac.uk)

**Contact Details of Academic Supervisor –** [A.J.Cotgrave@ljmu.ac.uk](mailto:A.J.Cotgrave@ljmu.ac.uk)

If you any concerns regarding your involvement in this research, please discuss these with the researcher in the first instance. If you wish to make a complaint, please contact [researchethics@ljmu.ac.uk](mailto:researchethics@ljmu.ac.uk) and your communication will be re-directed to an independent person as appropriate.



## Appendices

### CONSENT FORM: Interviews

**Title of Research: “Perceptions of Quality in Higher Education Learning Environments and the Impact of Personality Types on Satisfaction”.**

**Researcher’s Name:**

Hannah Wilson- School of Build Environment

- 7. I confirm that I have read and understand the information provided for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily
- 8. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and that this will not affect my legal rights
- 9. I understand that the Interview will be audio recorded and direct quotes may be used in future publications or presentations, however, these will be anonymised.
- 10. I understand that any personal information collected during the study will be anonymised and remain confidential
- 11. I agree to take part in the above study

All information collected about you during the course of the research will be kept **strictly confidential**. Any information about you will not be disclosed to anyone. If the results of this study are published no reference will be made to those individuals who took part. **However, should you suggest, imply or state that you are involved in specific serious criminal activities (i.e. acts of terrorism, offences against children) then the researcher will inform the necessary authorities.**

Name of Participant

Date

Signature

Name of Researcher

Date

Signature

Name of Person taking consent  
*(if different from researcher)*

Date

Signature

## Appendices

Appendix 18 – questions for validation interview

## Appendices

### Questions for Interviews

#### ***Contextual questions***

What are the current design processes for developing new Physical Learning Environments for students?

Do you think that currently the students' preferences for the design of their learning spaces are considered? And if so how?

#### ***Model validation questions***

To what extent do you think the specific model could inform on the students' preferences when designing Physical Learning Environments?

Would you use the model in the design process for Physical Learning Environments?

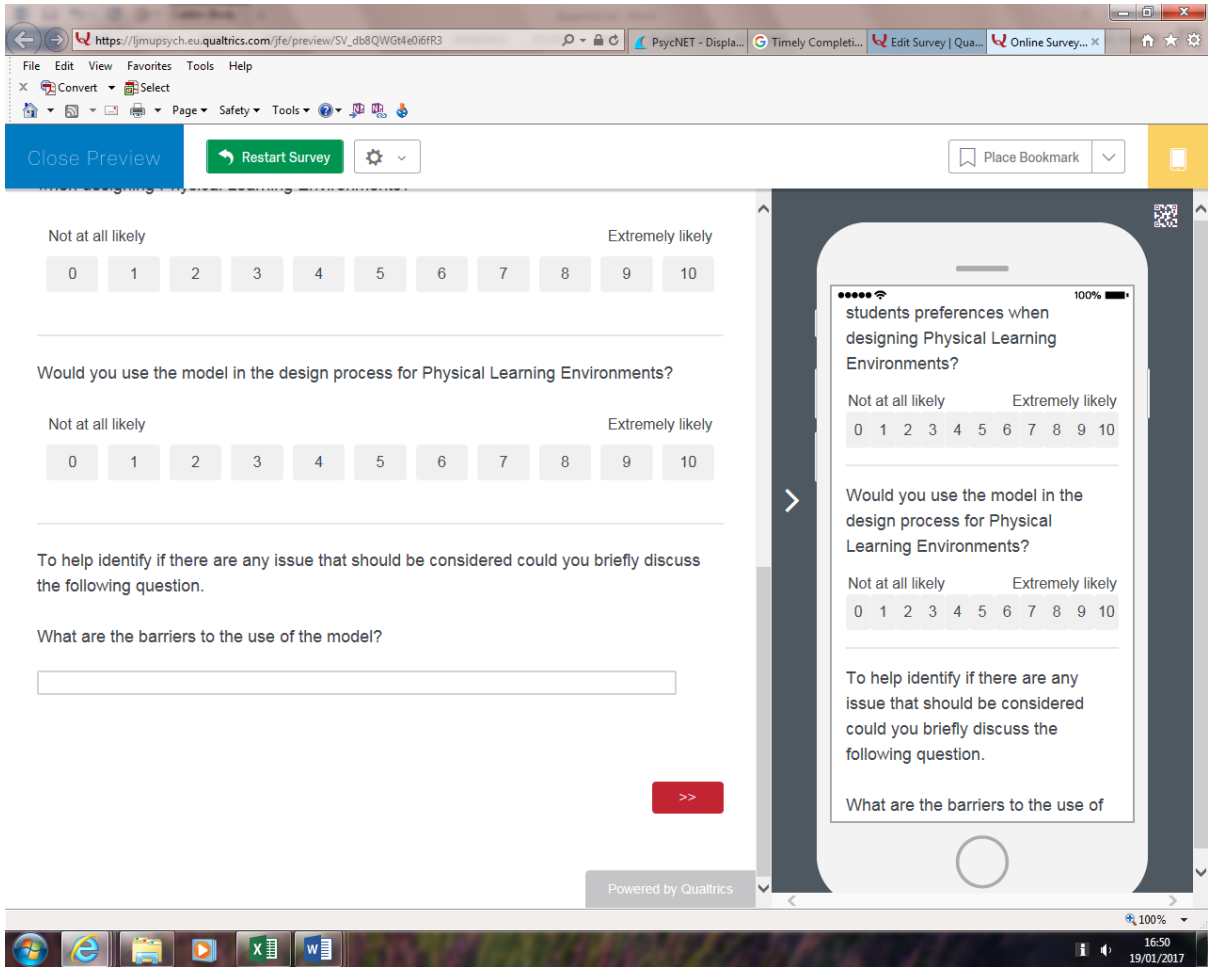
What are the barriers to the use of the model?

To what extent do you feel the proposed findings will have on the effective development of Physical Learning Environments for the students?

## Appendices

Appendix 19 - Example of pragmatic survey

# Appendices



## Appendices

Appendix 20 - Example of interview transcript

## Appendices

I: So, I looked at these three areas of psychological sense of community, so how we can develop a sense of community. But I looked at it from the physical learning requirement, so all my work is about the built environment rather than teaching and learning practices. I looked at quality of the learning environment because we looked at some post-occupancy evaluation work and identified that quality was a consistent factor in student satisfaction of the environment, but there wasn't actually any definition of what quality actually meant in terms of students' perceptions of the environment.

And then I also looked at individual differences in preferences, so I used a personality measure, which is where my psychology background comes from. And then I looked at different schools as well. So from that I did focus groups and two sets of questionnaires in John Moore's University and I came up with these sets of models. So I've done a questionnaire online as well, and to keep the interviews and the surveys consistent with each other I thought it would be good to do the rating scales that have been done along with the models online. So first of all I have a couple of questions generally about your experience of designing environments. So first of all, could I ask what position you hold? Just so that I can use it as part of my (...).

R: Yeah, I'm director of capital projects and estate strategy for the University of Liverpool. So I've been in post for two years, I used to have a similar position within the NHS as head of estates at Central Manchester Hospitals. So what may help you is that the experience that I brought from there was that we've just developed our estate strategy, which is ES2026-plus. It's a 20 year strategy, well, a 10 year strategy, that's why it has the plus behind it. And we've also got, we've been working on a specific area behind that, a number of sub-strategies, one of which is looking at the learning and teaching environment. So, if you like, at a stage of this I can talk you through our estate strategy, which isn't public, and I can talk you through what we're doing on the learning and teaching environment as well. I've got some visuals here that I can show you.

I: Oh great. Well, that would probably be, actually that would work well with my first lot of questions, maybe if we...

R: Do you want me to just go on to that then?

I: Yeah, that would be great, because it was going to be what are the current design processes? Yeah, so...

R: This will lead through to what the design process is. So what I got charged with was when I joined the university is how you would develop an estate strategy and a masterplan. And the answer to that is that you could ask 100 different people the same question and you'd get 100 different answers. So I presented my thoughts on it, is that the estate strategy shouldn't be estates led. And what I mean by that, ultimately there will be a point in time where you need to think about the estate, and the physicality and the geography, and the land locking issues and the fixed points, and the likes. But to begin with you don't start with that, where you start from is where you're going as an entity in terms of what are your operational issues, what are your strategic look ahead, where's your vision, what's your growth trajectory, what your modelling and utilisation is, and carrying out a real in depth thorough consultation exercise with key stakeholders. And then bringing that to some kind of scenarios as to how the estate could react to meet the growing demands and pressures. So for us that's what I presented as my estate strategy.

## Appendices

If you look at some of the key cities across the world have gone through a kind of renaissance and reinvention, Barcelona is a classic. Barcelona 30, 40 years ago is a completely different city to the one that it is now, and they have the 22 Barcelona project. The west coast of America, which is California, fantastic universities over there, all integrated with the city make-up and landscape. The Boston innovation district, how they link in with research, the hospitals and the universities together. So we're now in a world globalisation, although globalisation you could argue is being redefined, I wouldn't say it's dead, it's certainly not dead, I think it's being redefined. I hope that it'll be redefined again, not in the way it's being currently redefined.

And so that's a quick canter through our estate strategy then. So Liverpool, seen as a really a world urban waterfront centre, recognised internationally. The university sits within the city landscape, it is a suburb of the city, and therefore it can act as a city regenerator with the knowledge quarter. Our campus is in the heart of the city, there, we also have campuses off site, sport facilities and residences, and we also have campuses at the Wirral, and a botanical gardens. We're the sixth largest veterinary school in the world.

I: Oh, that's over there.

R: That's over there on the Wirral. We've got two farms, two 200 acre farms with the cattle and the sheep. It all links in with the idea of veterinary, and we've got a botanical gardens at Ness. We also have strong links, we act as the spine for the knowledge quarter with Paddington Village, the NHS, a very strong brand for Liverpool is this knowledge quarter, it's now been relaunched. And that has influencing factors in terms of we look at our periphery of the site, and we can talk about that in a minute, and we're working with the knowledge quarter of how we can call benefit from that. We've opened up a campus, a significant investment, in London, about £12 million investment. People say, "Why have you done that, it's in London?" Well, London's an international global city, we run postgraduate courses, people like yourself now who aren't satisfied with just, if you like, doing a degree, they're going on and furthering their careers to whole other level. We offer that skill base and upskilling base in London itself.

***A sample of the transcripts have been used as overall there is over 100 pages of transcript***



## Appendices

Appendix 21- Guide to implementing framework into the design process

# Guide to.. The design of the higher education physical learning environment framework

Hannah Wilson

## Introduction

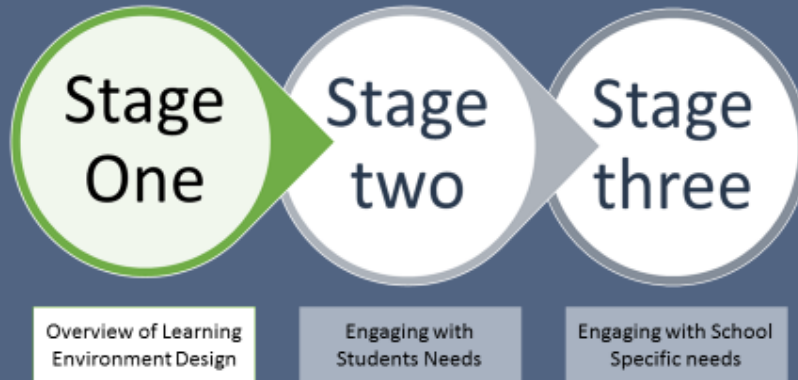
Welcome to the first edition of the 'design of higher education physical learning environment model'. The aim of this model is to support in the design process of new and existing higher education facilities.

This framework is targeted at the estates teams to understand students specific requirements of their physical learning spaces. With better understanding of students requirement spaces can be designed to enhanced students satisfaction in their university space.

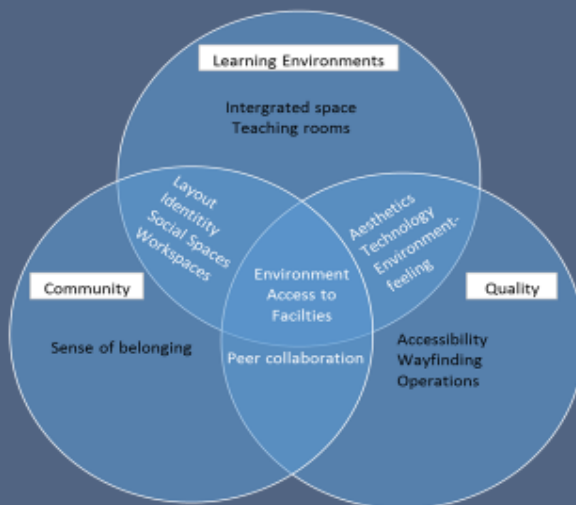
With measures such as the National Student Survey and the introduction of the Teaching Excellence Framework (HEFCE, 2016), the consideration of students satisfaction is a highly important direction for future development.

This framework comprises factors that have been found to effect students satisfaction within the learning spaces; personality, quality and educational community. This framework also breaks down specific requirements of students from different schools. By considering these factors spaces can be designed for students specific requirements.

## Identification of Brief



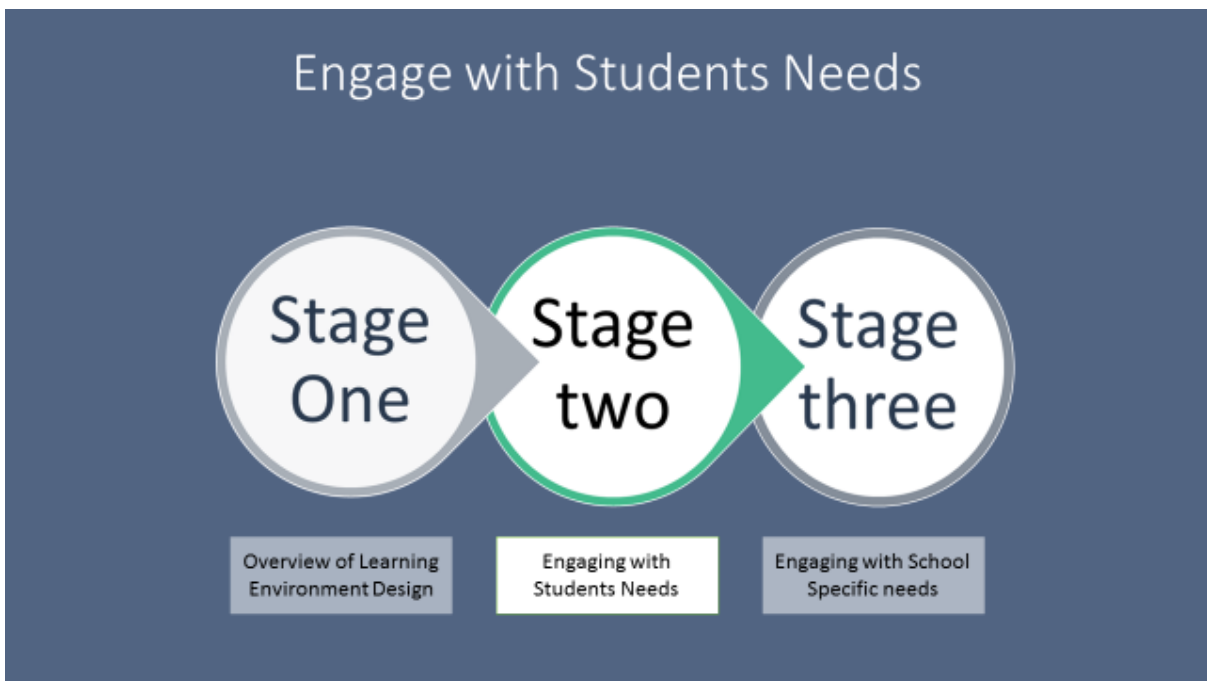
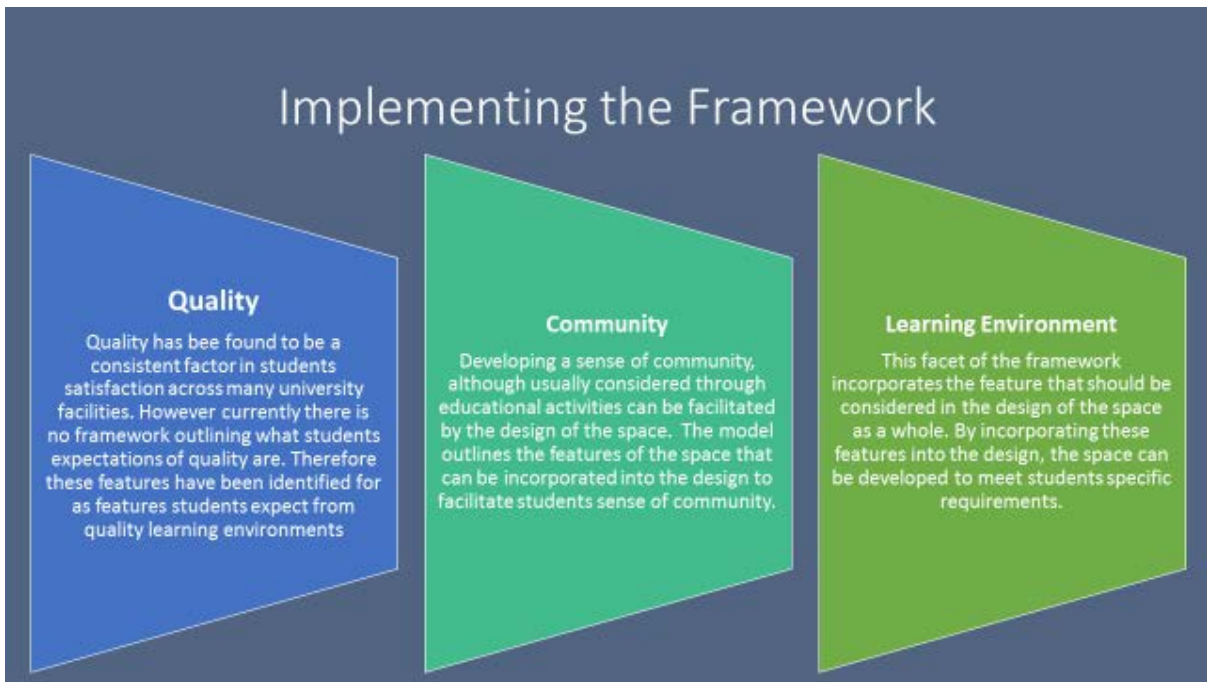
## Overview of Learning Environment Design



Integrating the elements; community, quality and learning environments provides us with a detailed view of the suggested development of HEI PLEs for students. The factors community and quality have been integrated together to identify how to design the learning environment as a whole.

This model provides an overview of the features of the physical space. With the specific feature that are important to consider when facilitating the design process

It is suggested that a bottom up approach should be used to attend to the two fundamental features, identified through the literature in the design of the PLE, community and quality, as this allows a progressive approach within the design phase.



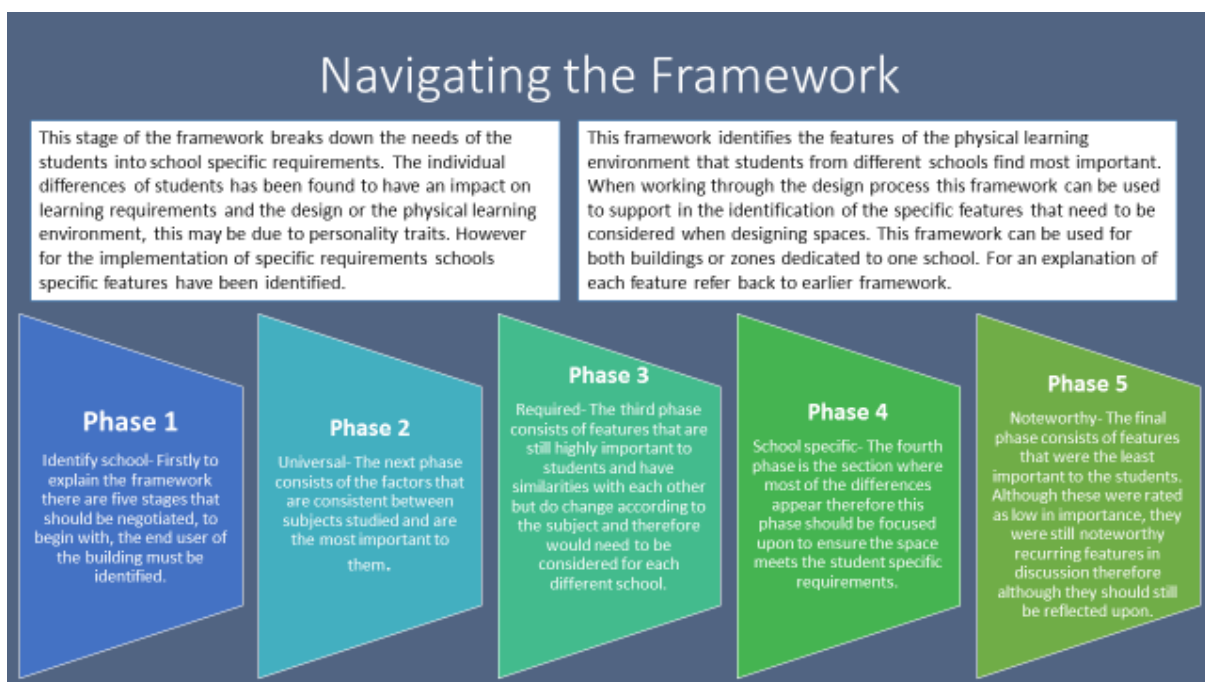
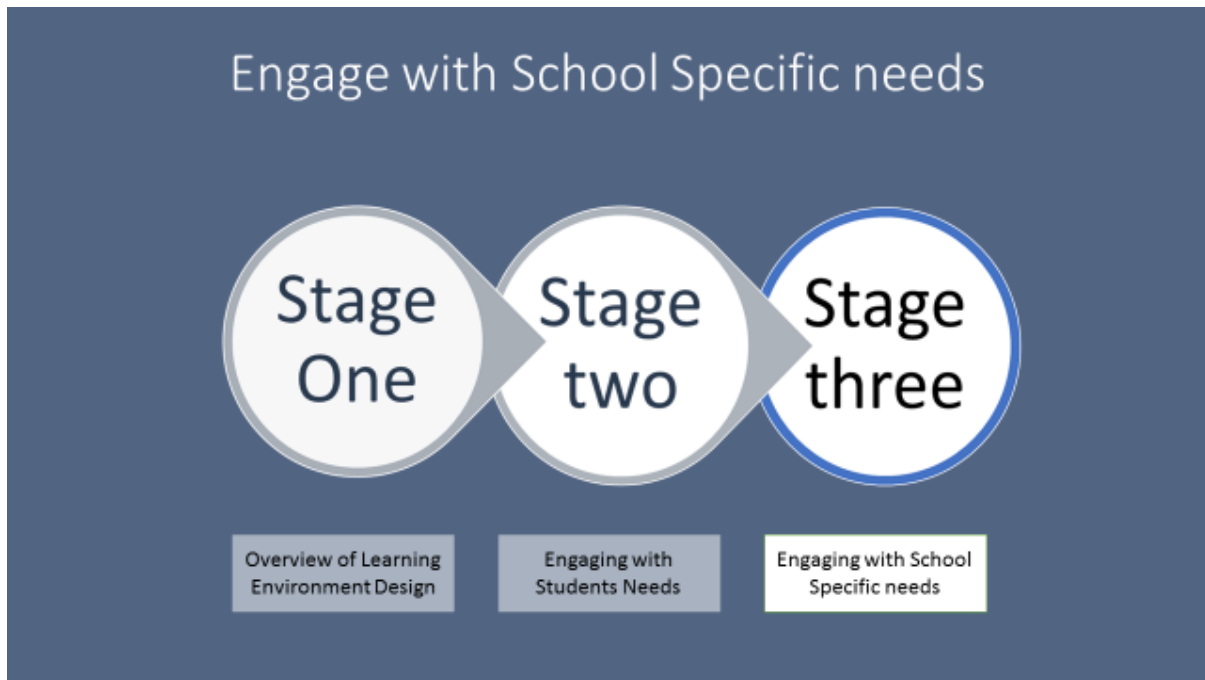
## Appendices

# Learning Environment Framework

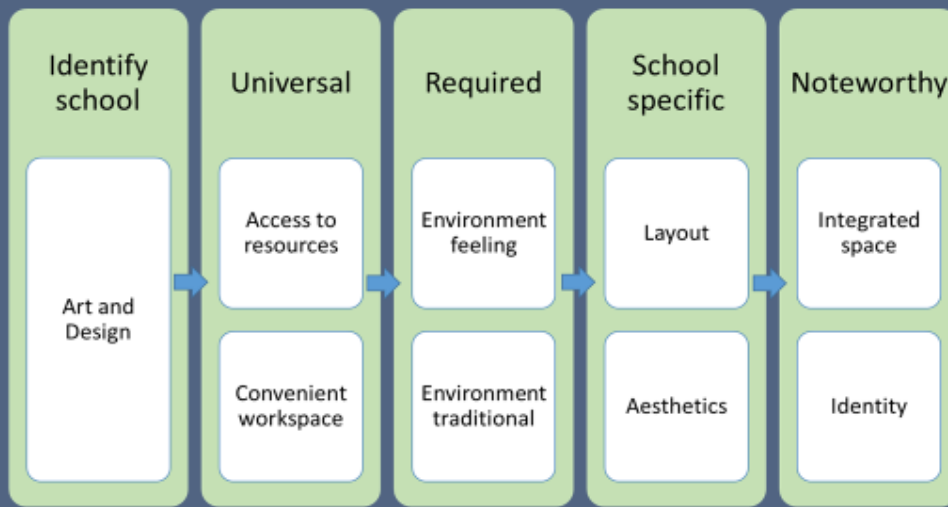
<b>Technology</b> <ul style="list-style-type: none"> <li>Access to technology</li> <li>Up to date technology</li> </ul> <p>1</p>	<b>Accessibility</b> <ul style="list-style-type: none"> <li>Access to libraries</li> <li>Refreshment facilities</li> <li>Access to workspace and seating</li> <li>Open spaces</li> <li>Lockers</li> <li>Parking</li> <li>Bike Storage</li> </ul> <p>6</p>	<b>Sense of belonging</b> <ul style="list-style-type: none"> <li>Contact with staff</li> <li>Feels like own space</li> </ul> <p>10</p>	<b>Aesthetics</b> <ul style="list-style-type: none"> <li>Aesthetics of design</li> <li>Aesthetics of facade</li> <li>Up to date aesthetics/good upkeep</li> <li>Finish of design e.g. flooring, paint</li> <li>Durability of fit and finish</li> <li>Colour schemes</li> <li>Decor</li> <li>Brightness</li> </ul> <p>14</p>
<b>Access to facilities, equipment and resources</b> <ul style="list-style-type: none"> <li>Access to resources and equipment</li> <li>Access to required facilities</li> <li>Specialist teaching rooms</li> <li>Access to buildings</li> </ul> <p>2</p>	<b>Teaching rooms</b> <ul style="list-style-type: none"> <li>New pedagogy/interactive/collaborative                             <ul style="list-style-type: none"> <li>Lecture halls</li> <li>Seminar rooms</li> </ul> </li> <li>Visibility of teacher</li> <li>Suitability of furniture (desks/ seating)</li> </ul> <p>7</p>	<b>Environment feeling</b> <ul style="list-style-type: none"> <li>Sustainability of environment</li> <li>Safety and security</li> <li>Motivating environment</li> <li>Sense of community</li> </ul> <p>11</p>	<b>Peer collaboration</b> <ul style="list-style-type: none"> <li>A common room where students from your school/course can go to work or socialise</li> <li>Space to meet students from different courses</li> <li>Interconnected campus</li> <li>Informal learning spaces</li> <li>Access to group workspaces</li> </ul> <p>15</p>
<b>Operations</b> <ul style="list-style-type: none"> <li>Cleanliness</li> <li>Upkeep</li> <li>Management of space</li> <li>Contact with staff</li> </ul> <p>3</p>	<b>Environment traditional</b> <ul style="list-style-type: none"> <li>Natural lighting                             <ul style="list-style-type: none"> <li>Blinds/glare</li> </ul> </li> <li>Daylight</li> <li>Windows</li> <li>Temperature control</li> <li>Noise control</li> <li>Creating a natural environment</li> </ul> <p>8</p>	<b>Social spaces</b> <ul style="list-style-type: none"> <li>Variety of social spaces                             <ul style="list-style-type: none"> <li>Open social areas</li> <li>Private social areas</li> </ul> </li> <li>Plenty of social areas</li> <li>Space for breaks</li> <li>Cafe areas</li> <li>Comfortable furniture</li> </ul> <p>12</p>	<b>Identity</b> <ul style="list-style-type: none"> <li>Distinguishable identity of the school you are from (eg. School of Engineering)</li> <li>Identity of the university that stands out</li> <li>University branding throughout campus</li> <li>Campus environment (FG)</li> <li>Student union</li> </ul> <p>16</p>
<b>Convenient workspaces</b> <ul style="list-style-type: none"> <li>Access to suitable workspaces</li> <li>Access to workspaces when needed throughout the day</li> <li>Adaptable space to changing needs/flexibility</li> <li>Comfortable spaces</li> <li>Design and furniture fit for purpose</li> <li>Technology</li> </ul> <p>4</p>	<b>Layout</b> <ul style="list-style-type: none"> <li>Easy to find your way around</li> <li>Clear signs</li> <li>Clear signs to define space on campus</li> <li>Spaciousness to avoid overcrowding</li> <li>Open spaces</li> <li>Management of classrooms and buildings</li> <li>Clearly defined space</li> <li>Room layout allowing for easy visibility of teacher/ and peers</li> </ul> <p>9</p>	<b>Integrated space</b> <ul style="list-style-type: none"> <li>A common room where students from your school/course can go to work or socialise</li> <li>Plenty of space available on campus for both socialising and studying</li> <li>Work and social space integrated into all areas of campus</li> <li>Adaptable work and social space to change for you needs</li> <li>Access to group workspace</li> <li>Integrated workspaces</li> <li>Space to meet students from different courses</li> <li>Space to relax</li> </ul> <p>13</p>	<b>Key*</b> The features run from most important to least important.
<b>Wayfinding</b> <ul style="list-style-type: none"> <li>Clearly defined space</li> <li>Clear signs in buildings</li> <li>Spacious halls</li> <li>Easy to find your way around</li> <li>Spaciousness to avoid overcrowding</li> <li>Spacious entrance hall</li> </ul> <p>5</p>			

# Implementing the Framework

Using the framework	Feature	Required	Partially required	Not required
<p>The second stage of the framework is to engage with students specific requirements of their learning spaces. The framework develops the model in the previous stage by providing an explanation of each of the features. This framework can be used in conjunction with the first to identify the specific requirements of each feature for quality, community and the learning environment as a whole.</p> <p>This framework should be used a guide to identify what features of the physical space would be most appropriate in the development of your own estates strategy. It can therefore be adapted to your own individual project. To support in this the checklist opposite can be used to identify what elements you would like to incorporate into your worn design plans.</p>	Technology	○	○	○
	Access to facilities, equipment and resources	○	○	○
	Operations	○	○	○
	Convenient workspaces	○	○	○
	Wayfinding	○	○	○
	Accessibility	○	○	○
	Teaching rooms	○	○	○
	Environment traditional	○	○	○
	Layout	○	○	○
	Sense of belonging	○	○	○
	Environment feeling	○	○	○
	Social spaces	○	○	○
	Integrated space	○	○	○
	Aesthetics	○	○	○
	Peer collaboration	○	○	○
	Identity	○	○	○



## Designing for Art and Design Students

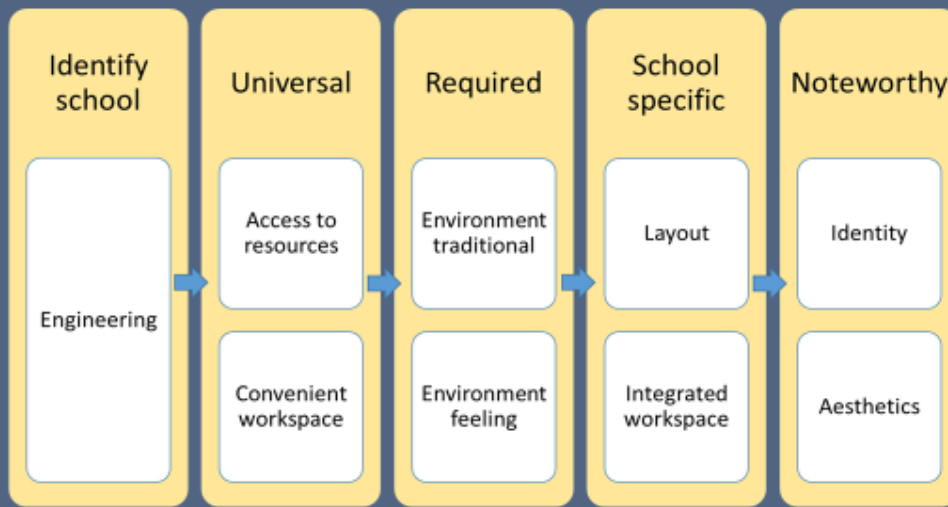


## Implementing the Art and Design Framework

When conceptualising the design of space for Art and Design students it is important to facilitate a positive learning experience by considering their specific requirements within the space. This guide will allow you to work through each feature and identify where this framework can be used in your estates strategy.

Features	Required	Partially required	Not required
Access to resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenient workspace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment traditional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Layout	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aesthetics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrated space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Designing for Engineering students



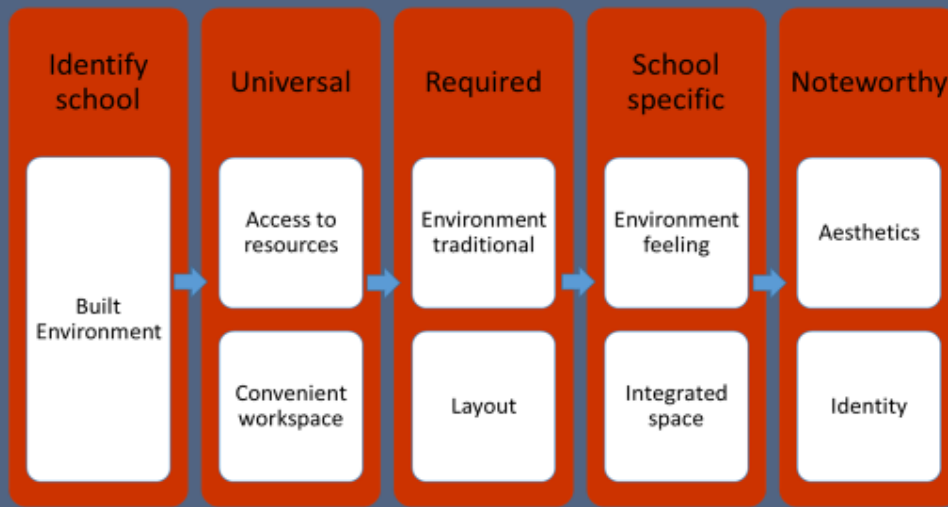
## Implementing the Engineering Framework

When conceptualising the design of space Engineering students it is important to facilitate a positive learning experience by considering their specific requirements within the space. This guide will allow you to work through each feature and identify where this framework can be used in your estates strategy.

Features	Required	Partially required	Not required
Access to resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenient workspace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment traditional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Layout	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrated space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aesthetics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## Designing for Built Environment Students

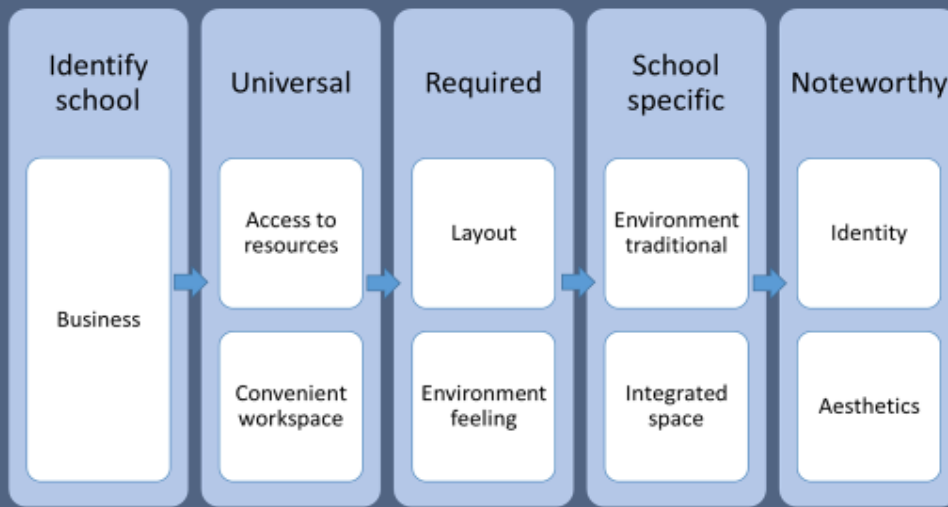


## Implementing the Built Environment Framework

When conceptualising the design of space for Built Environment students it is important to facilitate a positive learning experience by considering their specific requirements within the space. This guide will allow you to work through each feature and identify where this framework can be used in your estates strategy.

Features	Required	Partially required	Not required
Access to resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenient workspace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment traditional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Layout	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrated space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aesthetics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Designing for Business Students



## Implementing the Business Framework

When conceptualising the design of space for Business students it is important to facilitate a positive learning experience by considering their specific requirements within the space. This guide will allow you to work through each feature and identify where this framework can be used in your estates strategy.

Features	Required	Partially required	Not required
Access to resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convenient workspace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Layout	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environment traditional	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrated space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aesthetics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Framework for Practitioners



		Identification of school			
		A&D	ENG	BUE	BUS
Importance ↓	1	Access to resources	Access to resources	Access to resources	Access to resources
	2	Convenient workspace	Convenient workspace	Convenient workspace	Convenient workspace
	3	Environment feeling	Environment traditional	Environment traditional	Layout
	4	Environment traditional	Environment feeling	Layout	Environment feeling
	5	Layout	Layout	Environment feeling	Environment traditional
	6	Aesthetics	Integrated space	Integrated space	Integrated space
	7	Integrated space	Identity	Aesthetics	Identity
	8	Identity	Aesthetics	Identity	Aesthetics

This framework provides an overview for the current guide. It demonstrates the features of the learning space that can be considered in the development of your estates strategy to enhance students satisfaction with their university space. The framework also outlines the school specific requirements of four different schools moving from the most important features to consider in the design process, to noteworthy for consideration, but less important features.

This tools is useful to implement into the design process as it allows an overview of the current frame work so comparisons can be made between schools. Therefore this may enable to zones to be merged or have similar areas for students for the different students.