Campus spaces and places: Impact on student outcomes

Review of evidence

Prepared for HEDQF, Willmott Dixon and AUDE
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Published February 2022
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Executive summary

This report presents a narrative overview of key international insights into the potential impact that the design and use of campus spaces and places can have on student outcomes. The report was conceived as part of a wider project to support the objectives of the Association of University Directors of Estates (AUDE) and the Higher Education Design Quality Forum (HEDQF) through funding provided by Willmott Dixon.

A core focus group was set up consisting of individuals from the following key stakeholder groups:

- University strategic planners and senior estates professionals
- Academic and research professionals undertaking the research, from one or more HE institutions
- Sector bodies including AUDE and HEDQF
- Built environment organisations - consultants, architects and contractors
- Employers and funding organisations

The report presents findings from the first part of the project (Part 1) as well as the initial thinking and approach developed for the second part of the project (Part 2), which will commence in early 2022.
Part 1 discusses the methodology undertaken to identify international evidence, along with the key findings on the effects of campus spaces and places on:

- Student engagement
- Quality of life
- Student satisfaction
- Student attainment
- Student retention

Most of the evidence reviewed is based on secondary data with a limited number of studies drawing on empirical research, which largely draws on undergraduate students’ outcomes. Most studies base evidence on limited sample sizes and draw on quantitative approaches focused on one course or one institution, with large-scale studies comparing multiple campus settings and drawing on qualitative insights largely missing. In addition, as shown in Figure 1, most studies are situated in a North American context with only six studies from the total sample based in the UK.

The sample studied indicates a range of different approaches taken to measuring student outcomes. This, together with under-defined terminologies related to the physical and social attributes of student outcomes, challenges cross-comparison of studies.

Overall, from a sample of 57, 12 studies reported on the effects that campus spaces and places have on student engagement (see Figure 2). The key insights in terms of engagement highlight the importance placed on the use, location and design of informal spaces, as well as the comfort of spaces supporting academic and social engagement and the role of institutions in designing socially orientated programmes. In 29 studies, the primary focus was on quality of life and student satisfaction. The majority of studies focusing on quality of life examined student outcomes at a campus-wide level, focusing on provision and use of green spaces. In total, 20 studies were dedicated to student satisfaction. The findings of these studies suggested that the physical architecture of a campus is much less important to students once they are settled, although it could have a significant impact on initial choices about where to study. The importance of flexibility, thermal comfort and adaptivity has also been recognised as contributing to student satisfaction. In addition, libraries are noted as still having an important role, and the effects of living spaces, while acknowledged as being of great importance, seem under studied, with no consistent themes emerging from the findings.

Finally, 16 studies examined retention and attainment. From the 11 studies with a prime focus on student retention, the emphasis was mainly placed on living and recreational spaces. The effects of campus design and use on student attainment are mainly discussed through the importance placed on informal and formal types of spaces, and on living arrangements. On the whole, evidence is limited, with only 8 studies examining ways that campus spaces and places contribute to attainment, 3 of which also examined retention. While it is suggested in most empirical studies that spatial attributes of campuses influence student outcomes, there is no indication of a clear hierarchy of the levels and extents to which these attributes affect student outcome (Lavy et al. 2019). This is due to the complex network that spatial attributes create with one another, interlaced with the background and characteristics of the study group (Costa and Steffgan 2020; Holt et al. 2019; Tinto 1975; Zegre et al. 2020).
In addition, the spatial attributes of campus spaces and places associated with different aspects of student outcomes could be categorised into three levels – macro, meso and micro – with most studies in this review focusing on meso and micro-level examinations. Meso-level studies focused on examining the effects of spatial attributes on student outcomes at a campus-wide and masterplan level. Micro-level studies, on the other hand, focused on examining the effects of the provision, use and spatial attributes of individual spaces on student outcomes. In these studies, four types of spaces were highlighted as having significant effects on some aspects of student outcome: formal learning spaces (e.g. classrooms), informal learning spaces (e.g. student lounges), living spaces (e.g. halls of residence) and recreational spaces (e.g. sports facilities). Within these spaces, studies tended to refer to the importance of key spatial attributes, including greenness, comfort, connectivity, flexibility, proximity, functionality, ambience and configuration (see Figure 3).

In summary, based on the evidence reviewed, there is limited empirical understanding of how the design and use of campus spaces and places affect student outcomes. Specifically, it is difficult to qualify the likely impact, mainly because of substantial variations in the terminology used to define student outcomes, and variability in methodological approaches and sample diversity, along with a range of mediating factors that may or may not have been accounted for in the studies.

Based on the themes outlined in Part 1 and the outcome of two Project Advisory Board workshops, Part 2 identifies key areas for future research pertinent to higher education in the UK.

**Figure 3:** Key spaces and spatial attributes identified in relation to the effect of campus spaces and places on student outcomes
1. Introduction
1.1 Background and problem definition

The higher education sector in the UK and internationally is experiencing unprecedented change. A continually evolving regulatory landscape, growing student metrics and global changes in societal and environmental needs are starting to underpin the design and management of campus spaces and places. Although it is well-established that good quality higher education cannot be enabled and supported without ‘good quality environments’ (Edwards 2000), it is less well-known how learning and other university environments shape or support student outcomes.

Historically, efforts to improve quality of life have targeted the social and curricular aspects of higher education programmes. The physical setting of higher education has received less attention, despite the vast body of research over several decades that has revealed the numerous ways in which the built environment shapes educational experiences, especially in the primary and secondary school education context (Jamieson 2003).

The impact of campus spaces and places, and especially facilities design and operation, on students’ learning experience has long been observed (Moos and Lee 1979). However, only a few Post-Occupancy Evaluation (POE) studies have focused on evaluating the performance of higher education built environments to support student outcomes (Riley et al. 2010).

While there has been a long-standing interest in POE in higher education settings (Tookalo and Smith 2015), as well as an established understanding that space and spatial quality shapes learning (Nordquist and Laing 2010), there is still inadequate attention given to understanding the effects of campus built environments on student outcomes (Leaman and Bordass 2007). Campuses are increasingly seen as ‘places where a continuous flow of formal and informal learning can take place’ (UCISA 2016, p.9). Discussions of educational quality are incomplete without addressing the built and increasingly virtual aspects of learning and teaching spaces. Higher education has a major impact on the UK’s economy. In 2014 universities accounted for 940,000 jobs (800,000 full-time equivalent jobs) and generated £95bn of gross output for the UK economy, 2.9% of the nation’s entire economic activity (Oxford Economic 2017). In 2019/20 capital expenditure for the universities’ academic and residential estate was estimated to be £3.963bn (AUDE 2020). Despite its importance, there continues to be little published empirical evidence on different aspects of student outcomes and how they may be shaped by the campus built environment.

1.2 Aims and structure of the report

The aim of the report is two-fold. Firstly, Part 1 collects, analyses, syntheses and assesses international evidence on the effects that the design and use of campus spaces and places have on student outcomes, drawing on a systematic literature review. Part 2 involves scoping potential areas for future research and direction, drawing on workshops and focus groups.

For the purposes of the report, a campus is defined as ‘land and buildings used for university or university-related functions and having a role in achieving institutional goals’ (Den Heijer 2011). Places are referred to in the report as ‘spaces which have meaning for its users’ (Temple 2018). Student outcomes are seen as an overarching term for a range of measures assessing education-related consequences of students’ higher education experience – namely engagement, satisfaction, quality of life, retention and attainment.

Part 1 of the report has the following objectives:

- Use systematic evidence review techniques to collect all prior international studies on the effects of the design and use of campus spaces and places on student outcomes.
- Evaluate and assess the quality of previous studies, discussing the strengths and weaknesses of both those that fail and those that pass the quality assessment.
- Synthesise studies and discuss their findings for informing the current state of knowledge on the effects of the design of university campuses on student outcomes.

Part 2 discusses areas for future research determined by gaps identified in Part 1 and feedback obtained through two workshops with the Project Advisory Board.
2. Methodology
2.1 Overview

The review of existing international evidence was conducted as a rapid evidence assessment (Civil Service 2014; DfID 2017; Collins et al. 2015) using systematic evidence review techniques (search strategy, inclusion criteria, quality assessment, data extraction and synthesis). To ensure transparency and consistency, the methods deployed were based on the PRISMA approach (Preferred Reporting Items for Systematic Reviews and Meta-Analyses, Page et al. 2021). The review included evidence published between 2000 and 2021, and used a transparent and reproducible search to identify studies, along with explicit and objective methods to select, extract, quality appraise and synthesise the evidence. Searching for Part 1 was carried out using clearly defined searches across four databases, identifying 2,615 academic publications after deduplication. The identified articles were initially screened for relevance on the basis of abstracts, and then classified. The resulting 205 abstracts were screened again on the basis of the full paper, and those that passed were scored for quality purposes, resulting in a total number of 57 papers selected. All articles that did not pass quality appraisal were recorded and stored.

The review was undertaken in several stages as shown in Figure 4. To ensure the robustness of the review protocol, a pilot test was undertaken to check that the document filtering process was correctly applied and repeatable. Testing of search strings was carried out on a sample of databases by two researchers to ensure the same number of initial search results (and the same results) were obtained. Researchers agreed inclusion criteria across databases with the Project Steering Group and the search strings were adapted as necessary. Further quality assurance checks were carried out following screening Stage 1 and screening Stage 2, with two researchers cross-checking passed documents. The scoring of the documents that had passed both screening Stages 1 and 2 against the quality assessment scale was cross-checked by three researchers. Finally, the draft and final report were quality assessed and signed off by a senior analyst (outside the team).

Across the stages, the sample changed according to the following percentages. Table 1 presents an overview of the number of papers remaining at each stage, along with the percentage changes and the percentage of the total at each stage.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Initial Sample size and percentage changes per stage (%)</th>
<th>Initial Sample size and percentage of total number of papers (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial hits to applying inclusion criteria</td>
<td>3043</td>
<td>3043</td>
</tr>
<tr>
<td>De-duplication</td>
<td>85.9% (2615)</td>
<td>85.9% (2615)</td>
</tr>
<tr>
<td>Abstract screening</td>
<td>7.8% (205)</td>
<td>6.7% (205)</td>
</tr>
<tr>
<td>Applying inclusion criteria to quality assessment</td>
<td>84.4% (173)</td>
<td>5.7% (173)</td>
</tr>
<tr>
<td>Quality assessment to final sample</td>
<td>32.9% (57)</td>
<td>1.9% (57)</td>
</tr>
<tr>
<td>Initial hits to final sample</td>
<td>1.9%</td>
<td></td>
</tr>
</tbody>
</table>
2.2 Databases and sources

The search was conducted using the following academic databases. These were chosen because they include the most relevant and appropriate sources of literature of interest for the project.

Scopus is the largest abstract and citation database of peer-reviewed literature from various fields such as science, technology and the social sciences. It contains over 60 million records, including more than 21,500 journals (4,200 full open access), 7 million conference papers and 116,000 books. The database is updated daily and covers Articles in Press from over 5,000 journals.

Google Scholar is an online, freely accessible search engine that searches a variety of sources including academic publishers, professional societies and university repositories. It includes journal and conference papers, theses and dissertations, academic books and pre-prints.

Education Resources Information Center (ERIC) is a database of indexed and full-text education literature and resources containing more than 1.6 million records of a variety of source types, including journal articles, books, conference papers, curriculum guides, dissertations and policy papers.

Education Research Abstracts Online (ERA) is a database with access to over 25 specialist datasets covering all key areas of education research, with more than 150,000 records and over 1,000 abstracts uploaded monthly.

2.3 Search strategy and criteria

The search criteria were designed to be internationally inclusive with results filtered to prioritise the most relevant evidence. After conducting preliminary searches to assess the effectiveness of different search terms, the research team and Project Steering Group agreed the terms in Table 2 for each database.

### Table 2: List of academic database search terms

<table>
<thead>
<tr>
<th>Academic Database Search terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus and “Student Engagement”; University and space and “Student Engagement”; Learning and space and “Student Engagement”</td>
</tr>
<tr>
<td>Campus and “Student Retention”; University and space and “Student Retention”; Learning and space and “Student Retention”</td>
</tr>
<tr>
<td>Campus and “Student Satisfaction”, Learning and space and “Student Satisfaction”</td>
</tr>
<tr>
<td>Campus and “Quality of Life” ; “Campus Life”; “Campus Life” and well-being; Learning and space and well-being; Learning and space and “Quality of Life” (well-being and wellbeing both searched)</td>
</tr>
<tr>
<td>Campus and Attainment; Learning and space and attainment</td>
</tr>
<tr>
<td>Campus and “Student Outcome”</td>
</tr>
<tr>
<td>Campus and “Literature Review”</td>
</tr>
<tr>
<td>“Campus Architecture”; “Campus Design”; “University Building Design”; “Higher Education Buildings”; University Built Environment; Higher Education Space; University Facilities Management; Higher Education Facilities Management</td>
</tr>
</tbody>
</table>

2.4 Inclusion criteria

Criteria to select documents were applied in two screening stages. Stage 1 involved screening based on abstracts, while Stage 2 involved screening full documents. Inclusion criteria were developed based on the aim and scope of the project, as shown in Table 3.

### Table 3: Inclusion criteria used for Part 1 Sample

#### Screening criteria

**Documents were required to:**

- Be published in English
- Be published by research organisations
- Be available and accessible online within the project’s timeframe
- Indicate a credible evidence-base

**Documents were considered acceptable if:**

- Their title or abstract related to overarching issues of campus design strategies and university buildings

2.5 Quality Assessment

The reporting and research quality of the included documents was assessed using a Weight of Evidence framework developed by Gough (2007), combined with the TAPUPAS method, which is also explained in the paper covering issues pertaining to transparency, accuracy, accessibility, specificity, purposivity, utility, propriety, accessibility and specificity (see Table 4). Weight of Evidence is an approach employed in a number of professional fields for bringing together and assessing diverse fields of knowledge, understanding and evidence to help inform decision-making. Each document was scored out of a total of six criteria – transparency, accuracy, accessibility, specificity, purposivity, utility and propriety – and only those achieving the full score were used for the synthesis. Propriety was not considered as a scoring factor, given that all papers had passed academic peer review and been published in peer-reviewed journals. A sample of documents was assessed for quality by two researchers to check for consistency of scoring. Table 4 shows the distribution of the scores that the documents received during the quality assessment.
2.6 Synthesis

Documents that passed the quality assessment were then analysed thematically and reviewed by the team. Themes were observed and noted, and observations between different studies were compared and contrasted alongside assessments of the significance of the papers’ findings. Each reviewer then looked at the emergent themes, observing any overlaps before conducting a cross-comparison of reviewer findings and then drawing these together and fitting them into a logical narrative flow. Results of the synthesis are discussed in detail in the next section.

Table 4: Weight of Evidence Framework

<table>
<thead>
<tr>
<th>Weight of Evidence Framework (+TAPUPAS), based on Gough (2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Score</strong></td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td><strong>Weight of Evidence A: Generic review of quality of execution of study</strong></td>
</tr>
<tr>
<td>1PT</td>
</tr>
<tr>
<td>1PT</td>
</tr>
<tr>
<td>1PT</td>
</tr>
<tr>
<td>1PT</td>
</tr>
<tr>
<td><strong>Weight of Evidence B: Specific review of appropriateness of method</strong></td>
</tr>
<tr>
<td>1PT</td>
</tr>
<tr>
<td><strong>Weight of Evidence C: Specific review of focus/approach of study to review question(s)</strong></td>
</tr>
<tr>
<td>1PT</td>
</tr>
<tr>
<td>N/A</td>
</tr>
<tr>
<td><strong>Weight of Evidence D: Overall assessment combining Weight of Evidence A, B &amp; C</strong></td>
</tr>
</tbody>
</table>
3. Main findings
The most comprehensive definition of engagement is reflected in a student engagement review for the UK Higher Education Academy (HEA) as ‘the interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimize the student experience and enhance the learning outcome and development of students, and the performance and reputation of the institution’ (Trowler 2010, p.2).

This section of the report presents an analysis of thematic issues pertinent to campus spaces and places and student outcomes, starting with student engagement and proceeding to quality of life, satisfaction, attainment and retention.

How campus spaces are used in relation to student engagement is also mediated by a range of non-spatial factors, which sheds light on the complexity of the matter. For example, it is difficult to compare studies conducted in different geographical locations as the cultural context of each may itself factor into how students engage with various provisions across the campus. In addition, depending on how an institution provides support for student engagement (e.g. for students that do not live on-campus) and also how it manages the spaces (e.g. student-led or institution-led) can change the way students engage with spaces.

Respective to student engagement outside the classroom, the demographic characteristics of students (e.g. gender and race) and their workload have also been reflected to mediate the quality and frequency of use of campus spaces.

Overall, as will be further described in this section, it is the spaces beyond the classroom that have been the focus of literature on student engagement, underlining the importance of the social aspect of engagement in discussions today.

3.1 Effects of campus spaces and places on student engagement

Literature suggests that how students use the spaces and facilities of a campus, both in terms of the quality of use and frequency of use, can impact their social and academic engagement. From the 12 studies examined in this evidence review, the use of spaces in relation to student engagement is reported to be affected by a range of spatial qualities, such as the function and flexible spatial configuration of each space, the ambience experienced as a result of temperature, acoustics, etc., the affordance for enabling students to establish personal territory and develop a sense of belonging to the space, as well as how close and connected a space is to other campus facilities. The spatial factors in Figure 5 highlight the importance of the capacity of the learning spaces of a campus to change and adapt to the needs of students and teaching and learning activities, while being mindful of the conditions that impact the quality of the experience. For example, in a classroom, students need to feel comfortable and have good visibility and hearing to be able to engage well. In relation to living and recreational spaces, the literature focuses on whether the use of such spaces can influence student engagement, presenting a gap in the understanding of how the design of living and recreational facilities may affect how students use these facilities for better engagement.

3.1.1 Informal learning spaces and student engagement

The evidence reviewed suggests that the design and use of informal learning spaces can support student engagement positively. Informal learning spaces are spaces where learning occurs outside the designated classroom time. Given that students spend most of their time in such spaces, their role in student outcomes has been emphasised in the literature (Peker and Ataöv 2020; Matthews et al. 2011). Deshmukh (2021) suggests that spaces that can facilitate ‘unscripted possibilities’ within and outside the classroom can change the way students engage with spaces. Respective to student engagement outside the classroom, the demographic characteristics of students (e.g. gender and race) and their workload have also been reflected to mediate the quality and frequency of use of campus spaces.

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Two types of informal learning spaces are discussed: purpose-built spaces, such as student lounges (Lary et al. 2019; Matthews et al. 2011) and spaces conventionally considered to be ancillary, such as open spaces (Peker and Ataöv 2020). A number of key design and use factors were found to have an effect on engagement, including multifunctionality and flexible possibilities of space use, composition (scale, furniture, etc.), proximity (cognitive and geographical) and ambience and comfort (physical, environmental and social).
Student engagement

- Spatial factors
- Non-spatial factors

Informal learning spaces
- ambiance (temperature, noise, etc.)
- comfort (furnishings)
- connectivity
- physicality
- territory
- student workload (class-size, study intensity)
- management of space
- academic background
- demographic characteristics
- cultural context

Recreational spaces
- academic background
- proximity (to other campus facilities)

Living spaces
- living arrangement (living-learning communities, etc.)
- institutional support
- demographic characteristics
- classroom type (traditional, studio, technologically enhanced, etc.)
- ambient (mobility, acoustics, etc.)
- comfort

Formal learning spaces
- quality of instruction/teaching
- proximity (geographical and cognitive)
- territoriality

Figure 5: Factors affecting use (quality and frequency) of campus spaces and places in relation to student engagement
Spatial attributes, social engagement and informal learning spaces
Matthews et al. (2011) suggest that informal learning spaces are of particular importance to undergraduates and first-year students in transitioning to university and establishing a sense of belonging. In their study at the social learning centre of an Australian university, interviews with 103 undergraduate students suggested that the design of such purpose-built spaces plays an important role in attracting students to the space in the first place. In particular, the composition of an informal learning space (e.g. open spaces or the placement of furniture), its multifunctionality (e.g. eating, working, etc.), and the environmental ambience (e.g. temperature, noise, etc.) are features that distinguished such spaces from other places on campus and were deemed a necessity by students. Similarly, Lavy et al. (2019) conducted a case study at a university in the USA to determine the critical spatial factors affecting the use of a study lounge by postgraduate students, combining a four-month observational study with surveys of 140 students (both frequent and non-frequent users). The findings showed that, regardless of students’ ownership of office spaces, study lounges were perceived as useful, suggesting that collectively they are more closely related to design issues, respectively. It was found that environmental and physical comfort (noise and temperature) serve a key role in attracting postgraduate students to such spaces, and that proximity made in-department lounges more preferable than out-of-department lounges. These collective factors are also seen in studies on campus open spaces (Peker and Atmaca 2014) extending the need for campus place-making beyond the physical boundaries of buildings.

Informal learning as a campus-wide strategy for social engagement
Proximity and connectivity of informal spaces is also found to be key to the overall dynamics of how students engage with the campus and interact with one another. In a UK-based study, Jones et al. (2016) surveyed and interviewed engineering staff and students across different years of study, reflecting on capital expenditure, students’ engagement with the university estate, and the capacity of buildings to support students’ approaches to learning. It was found that only 4.7% of students deemed the design of buildings to be important to their experience, a finding similar to that of the 2015 HEP@HEA Student Academic Experience Survey (Buckley et al. 2015).

However, the design of the campus estate as a whole was reported to play an important role in linking the academic environment to the academic culture. Minimising time of travel across campus and ensuring buildings are large enough to accommodate all the teaching and learning needs of discipline level cohorts was perceived positively in strengthening cohort identity and sense of belonging. Accessibility and the position of informal learning spaces was also noted as important by all interviewees, while the busyness and crowdedness of social spaces were reported as reasons why some students and staff would not engage with them. This stands in contrast to Matthews et al.’s (2016) findings where the noisiness of the social learning centre was seen as a positive feature. Such outcomes highlight the complexities that affect how students contextualise their experience within university spaces. Respectively, Ahn and Davis (2020) count geographical and cultural location as key in the contextualisation process and overall sense of belonging.

The four studies that examine campus spaces and places in relation to student engagement provide cross-sectional cases in the UK, America, Australia and Turkey. Across these four contexts it was found that the design of informal spaces impacts the type of learning an institution offers, and that investment in foregrounding informal learning through design can play an infrastructural role in social engagement across campus. The diversity and complexity of the types of activities spaces can accommodate are suggested to enhance the potential for interaction and informal learning. Depending on the composition of spaces provided both at an individual level and across campus, the balance between cognitive and geographical proximity can change. While close proximity can facilitate communication and knowledge sharing with like-minded individuals, as well as face-to-face interaction, too much of either type of proximity can result in social withdrawal (Lavy et al. 2020). However, students’ perceptions have been found to vary across the studies with regard to the ambient qualities of space (temperature, lighting, noise) in relation to the cultural expectation of what an informal learning space should offer, which can ultimately affect the frequency of use and the type of use.

Informal learning spaces and social engagement – mediating factors
In addition to the design of informal learning spaces, a number of other mediating factors were found to play a role, including the management and use of space by different users. Matthews et al.’s (2016) study suggested that not all informal learning spaces needed management and interaction by all user groups. Their study reported on students’ sole use and management of informal learning spaces, which was regarded as helpful to the informal feeling of the space, as well as providing an opportunity to enhance peer engagement and the skills acquired by working, socialising and learning in such a space. Although both peer interactions and faculty interactions are regarded as influential in how students socially integrate into university (Tinto 1975), not all spaces need to accommodate both types of interaction (Matthews et al. 2016).

While spatial attributes can contribute to the likelihood of specific behaviours, student engagement in informal learning spaces is also mediated by a number of other factors. Three key spatial attributes are found to relate to variances in how different student groups engage with informal learning spaces: physicality, convenience and comfort, and territoriality.

Bennett (2007) suggests that engaging with physical informal space compared to virtual space can enable a richer learning experience that is accompanied by racial, ethnic, religious and economic diversity. Informal interactions with diverse peers can have a positive effect on the perception of the campus environment. Moreover, through a study looking at the mediating effect of race and gender on campus interactions and perception, Laird and Niskinda (2010) note that diverse interactions will not benefit all groups similarly or bring groups closer together in how they perceive the social supportiveness. Reflections on the experience of teaching and learning during the COVID-19 pandemic also offer support for the physical campus environment. As Deshmukh (2021) suggests, virtual learning may recreate the classroom, but not the campus. So, while physical space can be regarded as a necessity for enriched academic and social engagement, it is not enough, and it requires effective institutional support (Tinto 1975) to unleash the potential of campus spaces.

Comfort and convenience are also found to be perceived differently by different users, with Bennett (2007) suggesting that the design and use of an informal learning space will require a carefully balanced accommodation of the different needs (e.g. listening to music versus silence). An informal learning space is said to require a spectrum of public and private spaces where students working alone or in groups can feel a sense of belonging (Bennett 2007). Similar to comfort, territoriality is another factor that can vary from individual to individual and culture to culture. This notion of territoriality resonates with Lavy et al.’s (2019) study, which found that postgraduate students at a university in the USA preferred exclusive access to study lounges. Compared to formal learning spaces, informal learning spaces can be regarded as assets to institutions through which they can shape learning culture(s). The design of these spaces needs to simultaneously account for a wide range of plausible interactions and engagements, along with a variety of uses and perceptions across different individuals and groups. It must also be infrastructurally flexible to continue to grow as the learning culture evolves. Therefore, informal learning spaces are complex entities, in that they deal more directly with the social dimensions of student engagement. However, it is important to note that the use and time spent by students in such spaces is not limited to the physical affordances the space creates for different user needs, and may be impacted by the academic context. For example, Gulwadi et al. (2019) argue that spatial affordances and the associated workload will have a significant effect on the types of spaces used and the time spent in them across different individuals and groups. Lavy et al.’s (2019) study on postgraduate use of a study lounge suggested no discernible correlation between occupancy rate and exam times.
3.1.2 Formal learning spaces and student engagement

There is limited evidence regarding the impact that the use and spatial attributes of formal learning spaces, such as classrooms, have on student engagement, in particular in relation to academic engagement. Nonetheless, as is discussed below, while the effect of the type of classroom (e.g. traditional versus an active learning studio) may not directly be seen in quantitative measures of academic engagement, the environment created in different types of classroom may have a qualitative impact on student engagement. Notably, how the room is configured, students’ comfort, and the quality of instruction are among the key factors in how student engagement with a formal learning space is considered.

Classroom type and environment – impact on student engagement

In the evidence reviewed, an emphasis is placed on the study of the impact that the design and use of classrooms and formal learning spaces for active learning have on student engagement. Stoltzfus and Libarkin (2016) compared students’ perception and performance in a Biology module, taught by the same instructor using the same active learning approach (flipped classroom) in a traditional lecture hall and a classroom designed specifically for active learning of large enrolled undergraduate programmes. To assess student performance, the authors measured individual and group effort. Individual effort was calculated by multiplying the number of days students engaged with a piece of software (through which they would send assignment responses) by the total grades on their assignments. Group effort was calculated by combining group grades on all group assignments. Pre- and post-content knowledge of students was also assessed through a survey, based on a number of biological concept inventories, and student perception was measured through a questionnaire including both multiple choice and open-ended questions. While students reportedly perceived the space designed specifically for active learning to enhance their performance, their actual performance (pre- and post-content knowledge, individual and group effort) showed no significant difference between classroom type.

Based on the findings, the authors suggest that enhancing student engagement does not necessarily require expensive changes and technology. Although this study included a relatively small number of participants (33-61, in different teaching sessions), it confirmed the findings of previous studies on classroom type and student outcomes (Jensen et al. 2015; Andrews et al. 2011), further supporting the idea that the instruction design plays a more foundational role than classroom type in affecting students’ academic engagement. Young et al. (2017) focus on the attendance and participation aspects of engagement in classrooms, also suggesting that a change in the physical classroom alone has less impact than when that change is combined with new teaching methods (p.86). In Young et al.’s (2017) study, students reported that they were able to see content on screens and hear instructions in both classroom types. With regard to engagement, in answering and asking questions, some students favoured the auditorium setting to the traditional classroom as they could hear the questions better, while others noted that they had difficulty hearing in the auditorium context. So, it would seem that while audio-visual quality can affect instructor-student interactions, the interaction is not pertinent to the room type itself, but to the effectiveness of the ambient environmental qualities within the space.

Similarly, in a qualitative survey of 36 undergraduate students at a university in the USA, Cooper and Frantz Fry (2020) compared perceptions of engagement in a learning studio classroom and a traditional classroom. Although the sample size of participants in this study is too small to derive conclusive outcomes, the authors draw attention to a range of insights into the effects that a classroom environment may have on student engagement, including quality of instruction, sense of belonging and comfort, and spatial configuration. Cooper and Frantz Fry (2020) suggest there may be some differences in how the quality of instruction is perceived in different classroom types. However, the study does not provide an analysis of the variables that may affect this perception. Nonetheless, in a similar study by Young et al. (2017) surveying 198 undergraduate science students in a traditional classroom versus an auditorium setting, the authors suggest that when a classroom is well-equipped with interactive technology the quality of instruction may be perceived similarly, regardless of the classroom type.
Main findings

Cooper and Frantz Fry (2020) suggest that where students felt they could have more face-to-face interactions with their peers, whether that be in a traditional classroom or a learning studio, it was deemed to be supportive of facilitating discussions. However, they also report on an account that considers the instruction design to be of more significance than the room configuration. Similarly, Young et al. (2017) report that students perceived an auditorium with fixed seating to not be supportive of small group work, while all students in this study considered the traditional classroom to enable easy interactions in group activities. Although it is not possible to discern exactly in what way the environmental qualities of formal learning spaces may impact various forms of student engagement, the studies in the review suggest that what goes on within the learning space, in terms of environmental ambience and sense of comfort, and delivery of teaching (activities and use of supporting technology), may have a more driving role in student engagement than the type of classroom (e.g. traditional, active learning studio, auditoria) alone.

3.1.3 Recreational spaces and student engagement

Participating in sports and recreational activities and engaging with such on-campus facilities has generally been shown to be conducive to positive student outcomes (Zegre et al. 2020; Mayers et al. 2017; Danbert et al. 2014; Miller 2011; Ellis et al. 2002). The provision of recreational facilities and activities allows institutions to support student interactions better and increase their sense of belonging. Therefore, like the learning culture that informal learning spaces across campus help establish, recreational spaces can introduce other subcultures that enhance opportunities for social engagement (Miller 2011).

Mayers et al.’s (2017) study, carried out through a survey of 171 students at a Canadian university, assessed five aspects of engagement specific to first-year students: academic, peer, intellectual, beyond-class and transition engagement. The results of this study showed that participation in recreational activities had a moderate positive effect on transition engagement, peer engagement, intellectual engagement and beyond-class engagement, particularly for students in their first year with lower academic grades (GPAs). Therefore, the study suggests that participation can moderate the relationship between grades and different aspects of engagement (except for academic engagement). Additionally, students with higher grades who participated in recreational activities showed higher engagement overall, especially in relation to beyond-class engagement. Overall, the authors conclude that students who engage in campus recreation find the engagement beyond the classroom.

Although it is not possible to generalise how participating in recreational activities affects academic and social engagement based on a singular cross-sectional study, the results (similar to findings on informal learning spaces) draw attention to how different groups, in this case students of a lower grade standing, may benefit from subcultural activities that have an impact on participation and sense of belonging. The study also suggests that students of a higher grade standing are generally well-engaged. There is, however, limited evidence that suggests how the design of recreational spaces, or their location and relationship with other on-campus facilities, could impact student engagement. Although recreational activities can happen across the campus, the extant literature predominantly focuses on the use of purpose-built sports halls where student engagement is of concern.

3.1.4 Living spaces and student engagement

On-campus living (in halls of residence) has generally been discussed to be beneficial to different aspects of student outcomes (Zegre et al. 2020; Graham et al. 2018; Hajrasouliha and Ewing 2018; Astin 1984). However, empirical research that looks at specific characteristics of halls of residence on student outcomes is scarce (Brorokema and Bowman 2017). The impact of living arrangements in relation to student engagement focuses on residence location (on campus, off campus), the provision of on-campus residency, and types of on-campus living spaces (living-learning communities versus traditional halls of residence).

There is limited consistent evidence to ascertain if living on campus or expanding on-campus living accommodation alone can benefit student engagement. Graham et al. (2018) note that as new technology is changing the way people interact and communicate, the previous benefits of living on campus in supporting social interactions may be of less significance. Nonetheless, the authors discuss that the provision of living spaces on campus can support institutions in the planning of formal and informal learning opportunities. With respect to the latter, LaNasa et al. (2017) examined whether extending the provision of on-campus living facilities could positively impact student engagement. Their study compared NSSE (National Survey of Student Engagement) results for 731 first-year students before and after the expansion of campus residential facilities at an American university. The expanded facilities offered a range of functions for social and academic activities, such as classrooms, presentation spaces, community areas, a music room and outdoor courtyards for socialising, in addition to the provision of living-learning communities to enhance connections between residential life and academic and social integration. The authors speculated that expanding on-campus living will not only be beneficial to students residing in such facilities, but could also encourage students living off campus to engage more, as the expansion would enhance the culture of participation. However, no significant impact was seen in the engagement of students living off campus.

For students living on campus, participation in co-curricular activities increased, while the overall quality of relationships decreased. However, given that these findings are based on ‘the unique population of a single metropolitan university’ (LaNasa et al. 2017, p.963), and that no other studies in this review made similar comparisons, it is difficult to conclude how the provision of on-campus residency will impact engagement. Therefore, as articulated by LaNasa et al. (2017), increasing physical facilities alone cannot be seen as a ‘treatment’ for student engagement. Notably, all of the studies in this review that explored the relationship between living arrangements and student engagement focused on first-year students. This may be due to the importance of social and academic integration as students transition to university, combined with the fact that on-campus living is usually only offered to first-year students and that in some institutions living on campus during the first year is a requisite. Nonetheless, if further research can provide evidence that on-campus living has the potential to enhance student engagement, it would also be relevant to understand whether an opportunity to continue living on campus might be conducive to continuing engagement as students progress through to graduation.

The evidence reviewed suggests that a number of mediating factors contribute to positive engagement, such as the proximity of living spaces to different types of formal and informal learning activities, as well as demographic characteristics and how institutions design and support activities within living spaces and for students residing off campus. Findings relating student engagement to on-campus living facilities, the location of living spaces, and residing in living-learning communities are discussed in the following subsections.
Main findings

Location of living spaces, commuting and social and academic engagement

Simpson and Burnett (2019) argue that while earlier studies suggested that commuter students are less engaged in academic activities and are more likely to fail their course (Chickering 1974), much has changed in campus environments and support for students that may not make earlier studies applicable to contemporary higher education provision. This argument is substantiated in a large-scale study by Graham et al. (2018), which looks at three categories of living: on campus (in halls of residence), within walking distance of campus and further than walking distance. The study looks at the relationship between on-campus living for first-year undergraduate students and seven dependent variables, namely collaborative learning, discussions with diverse others, student-faculty interactions, quality of interactions, supportive environments, time spent preparing for class, and perceived co-curricular gains. It draws on NSSE (National Survey of Student Engagement) data for a three-year period, comprising responses from 94,577 first-year students across 576 American institutions (excluding institutions that were mainly residential or mainly commuter).

The findings indicate a significant positive effect for the first three variables (collaborative learning, discussion with diverse others, and student-faculty interactions), especially when compared to living further than walking distance from campus. However, when compared to those living within walking distance, the advantages of on-campus living were less evident. Simpson and Burnett (2019) and Graham et al. (2018) conclude that institutional support, more than students’ living arrangements, plays a key role in the integration of students into academic and social communities, and if institutions make headway on this, then the ill effects associated with living off campus can be addressed.

Graham et al.’s (2018) study also highlights the importance of the more fine-grained categorisation of types of living spaces, based on proximity to campus facilities, compared to the binary categorisation of on-campus versus commuter. Notably, these authors revisited the impact and effectiveness of on-campus living in light of the changing landscape of options given to first-year students for their living arrangements.

Bearing in mind that the social dynamics and academic requirements of universities will continue to evolve, the relationship arrangements with the network of other factors affecting student engagement calls for a much closer study than is currently available in literature. In light of the collective review of student engagement so far in this report, it could also be questioned whether the proximity of living spaces to social/academic events plays a more significant role in student engagement than the location of the living space (on campus, close to campus, far away from campus). This becomes of particular importance when the literature goes on to discuss notions of the decentralised campus that benefits from facilities within the wider context of communities and cities (Deshmukh 2021; McDonald-Yale and Birchall 2021).

Living-learning communities and student engagement

Living-learning communities are a model principally common in the USA, introduced as a way to produce more integrated initiatives focused on student learning, targeted at undergraduate students. This living arrangement provides integrated opportunities for both academic and social engagements. Inkelas and Weisman (2003) examined the effectiveness of a variety of different living-learning communities on student engagement at one American institution, through a survey with 2833 participants comprising students living in traditional halls of residence and those participating in a living-learning programme.

The institution offers seven types of living-learning programmes that can broadly be categorised into three groups: transition, addressed at first-year students to facilitate transition to university; academic honours, providing a rigorous academic experience for preselected high-achieving students; and curriculum-based, focusing on particular topics of study.

Results of the study indicate that, compared to students living in traditional halls of residence, students in living-learning communities were more engaged in activities (such as faculty interactions and discussing socio-cultural issues outside the class) and perceived their environment more positively, with the most notable benefits observed in the transition and academic honours programmes. Additionally, students in living-learning communities found their residence environment more supportive compared to those living in halls of residence. The study also highlighted how social interaction among peers can take different forms in each living-learning environment.

For example, students in the academic honours programme would discuss academic issues with peers more, but not in forms of group-study sessions, whereas students in curriculum-based programmes would study more in groups. In collectively reflecting on the results, the authors also discuss that enhancing, developing and diversifying socio-cultural perspectives is best achieved through socially-oriented activities rather than academic activities.
3.2 Effects of campus spaces and places on quality of life

The evidence reviewed suggests that the design and use of campus spaces and places may have significant effects on the experienced quality of life. Out of nine studies whose primary focus was on quality of life, seven examined quality of life at a campus-wide level, with a focus on provision and use of green spaces and the spatial configuration and connectivity of green spaces with other spaces across the campus. However, as Figure 6 shows, the impact and usefulness of provisions of green spaces and the spatial design of a campus can be mediated by a range of psychological, environmental and personal factors that are non-spatial and play a role in how such spaces are used. The evidence draws attention to the importance of perceptive qualities of spaces in establishing a sense of belonging and positively affecting students' quality of life by encouraging active use of spaces and leveraging their restorative and affective capacity, which can differ from one student to the next. It also has to be noted that all the studies examining campus design in relation to quality of life have been conducted in geographical contexts with access to greenery. Therefore, there is a gap in the literature relating to how campuses in harsh climates and/or campuses with limited access to greenery can be designed to support students' quality of life.

In relation to living and recreational spaces, current literature is limited to examining whether the provision and use of such facilities can have an impact on students' quality of life. The findings are not fully conclusive and are reported to be mediated by students' personal attitudes, demographic characteristics, time, commuting status and facility management. Therefore, as reflected in Figure 6, there is little knowledge on how the spatial design of living and recreational spaces affects how students use these spaces to support their quality of life. Additionally, no studies in the evidence review examined quality of life associated with the use of learning spaces (formal or informal).

Quality of life measures, as reflected in the literature, comprise a series of self-assessments regarding status and attitude towards health, happiness and satisfaction, with aspects of personal and social life (Gulwadi et al. 2019; Hipp et al. 2016; Holt et al. 2019; McFarland et al. 2008). In this light, quality of life is about someone’s general contentedness with life, which could be impacted by the quality of their relationships and the environments they experience.

Figure 6: Factors affecting the use (quality and frequency) of campus spaces and places in relation to quality of life
Main findings

Affect students’ quality of life. The frequency and type of use of green spaces and restorativeness

3.2.1 Campus masterplan, spatial attributes and quality of life

At a campus-wide level, a network of spatial attributes such as greenness, scale, connectivity, proximity, transparency and configuration have been key to discussions about how the built environment of campuses can impact quality of life. Perceptions of the campus environment were entangled and, to a significant extent, dependent on time and the busyness of students, demographic characteristics, prior experiences of green spaces, and mental health, as well as perceptions of the restorativeness of green spaces. The next section discusses issues affecting how students emotionally engage with the campus and how their use of campus impacting their quality of life. This is followed by a specific discussion on the frequency and type of use of green spaces, and perceptions of greenness and restorativeness.

Campus, emotional engagement and quality of life

Ahn and Davis’s (2020) study of students at a UK-based university suggests that, in addition to academic and social engagement, surrounding living space and geographical and cultural location, both within and beyond the university and personal space (life satisfaction, life attitudes, identity and personal interests) are other domains that contribute to sense of belonging. In this sense, how students feel and relate to spaces, peers and activities is regarded as an important outcome of their university experience. The emotional engagement that is required for students to feel they belong is reciprocated in a study by Boyd et al. (2020) who foreground the notion of sense of community (that encapsulates sense of belonging) as a way of better understanding student satisfaction and perceptions than behavioural engagement alone. A sense of community includes the sense of inclusion, similarity to others and membership in the same way as a sense of belonging does, but it also includes a feeling by members that they matter, can be influential, and that their needs can be fulfilled, as well as creating a sense of commitment and belief of shared responsibilities. It is therefore seen to link closely with the psycho-social benefits that members feel they are receiving from their community and its social resources (Boyd et al. 2020). This psycho-social aspect of the student experience and mental wellbeing has been a focus in literature that addresses how the use of spaces and spatial features of a campus can affect students’ quality of life.

Frequency and type of use of green spaces and restorativeness

One of the most salient spatial features discussed in the literature in relation to quality of life is greenness. However, interpretations of what constitutes greenness can vary from one student to the next (Holt et al. 2018). By compiling a list of definitions and asking a sample of 15 students to rank their relevance to a university campus, Holt et al. (2019) presented the following definition as most relevant: ‘Area(s) containing elements of living systems that include plants and animals across a range of scales and degrees of human management, from a small urban park through a relatively “pristine wilderness”’ (Bratman et al. 2012). The importance of greenness as a spatial factor for students’ quality of life is discussed in its capacity to create affordances for environmental restorativeness, supporting the mental wellbeing of students (Gulwadi et al. 2019; Holt et al. 2019; Hipp et al. 2016).

Active interaction with nature can positively affect quality of life, as suggested by McFarland et al.’s (2008) study of undergraduate students at an American university. Their study suggests a significant positive correlation between students’ self-reported use of green spaces and their perception of overall quality of life. The study also investigated two subdomains of quality of life: affective, assessing how students feel about their experience; and cognitive, assessing the degree to which students feel they experience demanding cognitive challenges. A significant correlation was also seen between the use of campus green spaces and the affective dimension of quality of life. Holt et al. (2019) extend the discussion beyond frequency of use, suggesting that to unleash the restorative capacity of green spaces, performing physical activity immersed in such an environment can be key. This study compares active (physical activity in green spaces for more than 15 minutes a day over a month) and passive (non-physical activity in green spaces for more than 15 minutes a day over a month) use of green spaces on quality of life through a survey of 207 undergraduate students across 11 courses at a suburban American institution. Factors influencing the frequent use of green spaces, such as busyness with academic and extracurricular work, the frequency of use of green spaces during childhood, and barriers to using green spaces were also included in the survey.
The study reports a positive association between highly active (physical activity) use of green spaces, low perceived stress and high quality of life, whereas high passive (non-physical activity: sitting, studying, eating, socialising) use of green spaces presented no association with any measures of wellbeing. Moreover, the study suggests that active use of green spaces is positively correlated with unstructured and structured daily activities in green space as a child, good health and prioritisation of health; whereas passive use and overall use of green space was only significantly correlated with having had structured interactions with green space as a child. Additionally, the authors suggest that students have an affinity with water features and gardens, proposing that providing activities near these types of spaces, as well as administering programmes that can benefit from green spaces, can overcome some of the barriers to using such spaces.

Both studies also draw attention to the mediatory role of gender and race in the use of green spaces. While McFarland et al. (2008) suggested that the use of campus green spaces are not more beneficial to any particular gender or ethnic group, Holt et al. (2019) showed that the use of green spaces between high active use of green spaces, gender (male) and race (white). However, the reasons why the spatial features of campus green spaces may have contributed to students’ self-assessment of their use of such spaces is not clear in either study.

Nonetheless, as implied by Holt et al.’s (2019) study, students’ prior experiences of engaging with green spaces can impact and shape their interaction with such spaces as they enter university, framing spatial interactions as a complex issue. Although a lack of awareness or lack of time were regarded as barriers to using campus green spaces, what impacted the type of use (active versus passive) was related to students’ prior experiences. Therefore, while it can be concluded that frequent and active engagement with campus green spaces can be beneficial to quality of life, how this is mediated by other factors and the design and type of the green spaces remains under studied.

The spatial quality of greenness can be subdivided into objective greenness and subjective greenness. Objective greenness has indicators as density, proximity, type, size and quality, whereas subjective greenness is considered to be the level of greenness students associate with the campus. In assessing how objective greenness is associated with perceived greenness, perceived restorativeness and quality of life, Gulwadi et al.’s (2019) study draws attention to the location, proximity and connectivity of green spaces. This large-scale study carried out with undergraduate students across four campuses, two in America and two in Turkey, explores greenness at three levels: overall, measuring greenness across the entire campus; central, measuring greenness in the main areas of the campus; and building, measuring average greenness around the academic buildings.

Although all the universities presented substantial greenness at the three levels (overall, central, and building), there was a difference in the correlation between objective greenness and perceived greenness in Turkey and America. In the Turkish universities, all three levels of objective greenness correlated with perceived greenness. However, in the American universities, building level objective greenness did not correlate with perceived greenness, and overall campus greenness had a negative correlation with perceived greenness. The authors confirm previous findings that objective and perceived measures can frame greenness in different ways, where perceived measures provide a user perspective and objective measures provide an aerial perspective. Especially in relation to the negative correlation observed at the overall campus level in American universities, the authors speculate that the daily engagement of students with peripheral parts of the campus (beyond the buildings where teaching takes place), along with the visibility of green spaces, affects their perception of greenness. The study also shows that while building-level objective greenness of a university may not necessarily result in it being perceived as more green or restorative, it does have a positive correlation with the social and environmental measures of quality of life. The authors suggest that the ‘presence of nearby green features may provide opportunities and environmental affordances for social support’ (Gulwadi et al. 2019, p.44) and that green planting at the building level could be rethought in ways to help with restorativeness.

Perceived restorativeness is thought to be comprised of four facets: sense of being away (escapism), fascination, coherence and compatibility (Hartig et al. 1997). In the context of this Turkish study, building-level greenness was negatively correlated with fascination, and no correlation was observed between perceived greenness and coherence (a measure of connectedness to the whole). The authors speculate that this is due to the configuration and clustering of buildings, which, despite connected pathways and rich landscaping, affected the perception of coherence. However, in relation to the compatibility facet of perceived restorativeness, it is suggested that the more students feel compatible with their environment, the higher their overall quality of life, leading the authors to propose that the provision of greenness in different locations can provide options for students to assess their sense of compatibility. The importance of the location and design of campus green spaces is also emphasised by Hupp et al.’s (2016) study conducted across two American universities and one Scottish university. The study not only shows a significant relationship between perceived greenness and quality of life, but also that this relationship is mediated by perceived restorativeness. Perceived restorativeness was reported to be positively associated with the social, psychological and environmental aspects of quality of life, leading the authors to propose that the campus as restorative can be an important step in perceiving the campus as green and increasing a higher quality of life.

Despite the complexity shown to exist between objective greenness, use of space, perceived greenness and perceived restorativeness, which may potentially be mediated by other socio-cultural and geographical factors, light is thrown on the importance of a campus-wide level of design of physical features in how different spatial qualities are not only perceived but also make an actual positive impact. Evidence on the relationship between recreational spaces and quality of life in this review is limited to one study, which focuses on the use and management of recreational services. Ellis et al. (2002) carried out a study involving 342 students (undergraduate majority) at an American university, investigating the relationship between self-assessment of frequency of participation in recreational services and quality of life. Four indicators of quality of life were used in the study: satisfaction with life as a whole, satisfaction with the university experience, extents of the interference of emotional health with social functioning, and frequency of feeling energetic. In relation to these indicators, the authors reported a significant positive relationship with frequency of participation in recreational services. However, they saw no significant relationship with students’ satisfaction with how their life was being spent, or their assessment of how their physical health interfered with their social functioning. Although this study is reported to be consistent with findings in recreational services literature about positive effects on student experience, the small effect size of the findings requires further studies to better support the proposed positive association. The authors suggest that the small effect size they observed could be impacted by the management of the recreational services, highlighting the idea that better benefits-based management and programming may be helpful in enhancing quality of life more explicitly.

This study, alongside the general perspective portrayed in the literature, reinforces the idea that, while the provision of services can provide a good physical infrastructure to support different aspects of student outcomes, effective management and institutional design is required to curate activities and programmes that can deliver these outcomes.
Main findings

3.2 Living spaces and quality of life

Evidence on the relationship between living spaces and quality of life is limited to one study. Kirk and Lewis (2015) discuss that commuter students are more likely to have full-time jobs, which complicates their responsibilities and identity while they are studying. Accordingly, based on the 2011 NSSE (National Survey of Student Engagement), it is reported that while 75% of students living on campus participated in co-curricular activities, commuting students’ participation dropped to 59%. The authors highlight the importance of sense of community and social capital for enhancing the integration of commuting students (as well as traditionally under-represented groups), facilitating ways to establish and draw on social networks to support the achievement of goals and what is regarded as success in the university experience. Through a mixed methods approach, a large-scale survey of students at an American institution was carried out, followed by focus groups to explore how different student groups develop a collegiate sense of community. The statistical analysis of the survey assessed the predictability of a collegiate sense of community based on demographic factors (gender, age, race/ethnicity, sexual orientation, marital status), commuting status and cumulative credit hours. The results of this study suggest that sexual orientation, commuting status and cumulative credit hours are significant predictors of collegiate sense of community, with students who lived on campus reporting a higher collegiate sense of community and those who spent more time in university (based on credit hours) having a lower collegiate sense of community. Additionally, the collegiate sense of community was shown to be significantly correlated with positive affect, life satisfaction, self-efficacy and educational expectations.

The qualitative analysis was based on focus groups involving 24 students with different demographics (four racial/ethnic groups: White, Black/African American, Hispanic/Latino, American Indian; first-generation students; and LGBT students). The analysis discusses that participants considered their identity to be an asset that opened up opportunities, and that their minority status was not thought to disadvantage how they connected to the campus. In the discrepancy seen between the quantitative data and the findings of the focus groups, the authors account for both self-report bias and the possibility that a specific focus group may have included highly involved students. The authors also explain that first-generation students regarded university as a place for attending and leaving classes rather than a place to connect and participate, while other sub-groups of the study reported high participation in campus activities. Notably, the attitude towards sense of community on campus was regarded as independent of residence status. As the authors explain, while for some commuting students the campus was a place to connect to (despite some difficulties), not all students were interested in developing a collegiate sense of community. Nonetheless, some of the difficulties and barriers in connecting to campus for commuting students were issues of time (balancing studies, employment and activities), transportation, and scheduling of non-curricular events on campus (evening events noted as difficult to attend).

In light of these findings, the authors conclude that collegiate sense of community can be predicated by how long a student has been at university and where they live, and that a student’s attitude towards university can be a key factor in the development of a collegiate sense of community, regardless of demographic characteristics or residential status.

3.3 Effects of campus spaces and places on student satisfaction

In this evidence review, 20 papers examined the effects of campus spaces and places on student satisfaction. As Figure 7 shows, spatial qualities such as ambience (e.g. air quality, temperature, noise, lighting), comfort, flexibility and proximity are recurrent qualities that have been found to be important when considering how students use campus facilities in relation to their level of satisfaction. These four spatial qualities foreground the importance of the closeness of different facilities and the internal conditions of each facility when designing campus spaces and places with student satisfaction in mind. As the literature implies, the quality of campus facilities, such as architectural style, can be seen to have much less effect on student satisfaction as they settle into university. Moreover, evidence suggests that non-spatial factors, most notably those related to the academic situation of students (such as their year of study), play a mediating role in how students use spaces and their associated level of satisfaction with each space. It is also worth noting that how facilities and spaces are maintained has only been discussed in relation to student satisfaction – and no other aspect of student outcomes – in this evidence review. While no studies in this review examined the relationship between recreational spaces and student satisfaction, the literature on how living spaces affect satisfaction is also limited, eliciting potential areas in need of further research for a more holistic understanding of how campus spaces and places can impact student satisfaction.

3.3.1 Campus masterplan, spatial attributes and student satisfaction

Ease of accessibility (between academic buildings, facilities and recreational spaces) was rated as an important factor in Abdi-Razak et al.’s (2011) mixed methods study of 400 students across four universities in Malaysia. Circulation design and lighting quality (for security purposes) were also emphasised in this study, mapping back to Kärnälä et al.’s (2013) findings around safety and comfort. Abdi-Razak et al. (2011) conclude that the most compact campuses are the most popular, potentially standing in contrast to the desire for open green spaces in other studies and countries. Campus accessibility and convenience, in terms of the location of key transport routes and maintenance of walking routes, was found by Kärnälä and Julin (2015) to have an important impact on staff and student satisfaction in two different campus locations at a university in Finland.

With regard to student satisfaction with their campus environment, Costa and Steffgen (2020) (pp.2-3) build on work from other literature (Clemes et al. 2008) to propose a simple typology of university campus facilities as consisting of two types: physical environment (library, computer rooms, lecture rooms, and workplaces, university layouts and social factors) and learning environment (course climate, course requirements, learning promotion, lecturers and teaching, and skill acquisition). The physical environment will, of course, include the architectural style, presentation and internal layout of buildings, the spaces between buildings and the facilities provided within them, and green spaces and other infrastructural offerings, as documented in this report. In their case study of undergraduate Psychology students in Luxembourg moving from an old campus to a new one with upgraded facilities, Costa and Steffgen (2020) showed that while there was an overall higher level of satisfaction with the physical environment, provided by new facilities (in particular classrooms, library, workplaces), student satisfaction with their learning environment did not significantly change.
Student satisfaction

- **Spatial factors**
- **Non-spatial factors**

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**Formal learning spaces**
- Configuration (seating arrangements and layout)
- Ambience (lighting, noise, architectural style)
- Comfort
- Flexibility

**Living spaces**
- Proximity
- Ambience (noise, etc.)
- Year of study
- Academic background
- Demographic characteristics

**Informal learning spaces**
- Proximity
- Ambience (furniture)
- Configuration (density, etc.)
- Flexibility
- Ambience (lighting, etc.)

**Campus**
- Comfort
- Flexibility
- Proximity
- Functionality

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Figure 7: Factors affecting the use (quality and frequency) of campus spaces and places in relation to student satisfaction.
The study also showed that student satisfaction varied depending on year group, with the greatest difference observed among final-year students. This group was notably more concerned with skills acquisition and learning promotion than with the physical environment itself, compared to the overall study group. Temple (2018) also points to this idea that final-year undergraduate students are less concerned with physical facilities compared to course content, interactions with academic staff, assessment methods, etc. (based on the UK National Student Survey). In addition to the year of study, Costa and Steffgen's (2020) work also highlighted the influence of gender on some of the results. For example, female student satisfaction with certain aspects of the physical environment, such as classrooms and equipment, were positive predictors of course climate satisfaction.

In contrast, Bennett and Benton (2001) examined undergraduate students’ perceptions of campus architecture design features, drawing on promotional material and photographs taken from Peterson’s guide to four-year colleges (Peterson 1993) that depict various styles of architecture. Their findings suggest that students attributed ‘greater individual success and stimulation’ and a ‘superior education’ (Bennett and Benton 2001, p.172) to representations of modern architecture rather than to traditional or historical ones. Photographs of newly built campuses were also favoured. Importantly, though, the study was limited to a Midwestern USA single-state context and first-year undergraduate students only, most of whom lived on campus (enrolled in Educational Psychology). It is also unclear what the photographs conveyed, as no visual materials are presented in the paper. The findings of a number of other studies emphasise the importance of the learning environment over and above elements of the physical environment. Safety and comfort are rated as high-importance in three large-scale student surveys (Eckert 2012; Kärnä et al. 2013; Kärnä and Julin 2015), with Eckert’s (2012) survey of 7,978 students (21% response rate) at eight large regional universities in the state of Ohio, USA (covering all year groups, full-time and part-time) finding that university’s service offerings were considered to be much more important. Similarly, Jones et al. (2016) studied an engineering-based department at a Russell Group university (60 electronic surveys, 200 second-year students in focus groups), finding that ‘better designed buildings’ were a low priority for respondents, coming beneath more informal and formal contact time, different teaching styles and more online activity. Importantly, however, Jones et al. (2016 p.486) also note that the students ‘expect the buildings to maximise their learning opportunities and create the ideal environment for their safety, interaction and personal development’ (p.486). Estates development, it is argued, can provide the opportunity to revisit and, where appropriate, disrupt established pedagogical practices. Both Costa and Steffgen (2020) and Douglas et al. (2006) note in their findings that the university’s physical environment and facilities appear to influence choice of where to study and, in the earlier years, satisfaction with the learning environment, possibly echoing Bennett and Benton 2001. However, they also argue that, once there, students are primarily concerned with the quality of teaching and learning.

3.3.2 Formal learning spaces and student satisfaction

The impact of learning in different classroom environments was considered by Hill and Epps (2010) in a study of 237 undergraduate Business students’ satisfaction and evaluation of teaching. The classroom environment was examined based on comparing teaching sessions across a standard and upgraded classroom setting. The classrooms varied in terms of capacity, seating layout, entrance location, and the number of computer workstations, as well as lighting and noise control. The study found that students in the upgraded classrooms did display higher levels of satisfaction with teaching sessions and with the lecturers. Preferences for specific classroom design features such as tiered seating, lighting and classroom noise control featured highly, and had an impact on satisfaction levels, despite the teaching sessions being the same.

A relatively small number of studies have investigated relationships between indoor environmental quality and student satisfaction. Choi et al. (2014) examined this through 631 student satisfaction surveys at an American university. Thermal conditions, indoor air quality, acoustics, aesthetics, technology and access to views all had a positive impact on student satisfaction. Lighting and furnishings were not found to have an impact, although prior studies have shown that lighting quality can have an impact on student performance. Relatedly, Yang et al. (2013) conducted a study into student perceptions of six classrooms’ physical attributes – specifically, ambient, spatial and technological aspects – in a university setting. The six classrooms were selected to reflect an accurate sampling of existing and renovated classrooms, as well as a range of higher education classroom types with various levels of technological capabilities. 627 valid responses were used to analyse ten classroom attributes: temperature, air quality, artificial lighting, daylight, acoustics, visibility, room layout, furniture, hardware, and software. The paper argues that it provides methodological insight into ways of evaluating university learning environments more holistically by linking two Likert scales: one rating students’ environmental satisfaction and the other measuring the impact they felt this would have on their performance.

The students expressed low satisfaction with artificial lighting, but also gave it a low-impact score. Acoustics, however, received low satisfaction and a high-impact score, from which the authors conclude that improving acoustics might be given the highest priority in order to improve student perceptions (Yang et al. 2013). Seating location was also found to have a marginally significant impact on the perception of acoustics, furniture and visibility, most likely due to an uneven distribution of sound, furniture arrangement, and sightline barriers. In particular, temperature was found to be the most influential attribute, consistent with previous research findings.

Overall, the results reveal that student perceptions rely heavily on spatial attributes, specifically visibility and furniture, and ambient attributes, specifically air quality and temperature, which are highly impacted by the design, management and maintenance of classrooms. The paper also investigated the effects of non-classroom factors, including gender, seating location, cumulative GPA, college year and expected course grade, on student perceptions of learning environments. The results showed that perceptions of visibility, acoustics and furniture were more sensitive to non-classroom factors, followed by temperature, air quality, artificial lighting, room layout and software. The limitation of this study is that the causality between the perception scores of classroom attributes and the corresponding descriptive conditions were predefined as linear.
Main findings

3.3.3 Informal learning spaces and student satisfaction

In a study by Hanssen and Solvoll (2015), spatial quality and the operational management of university campus social areas, auditoria and libraries were found to be most strongly influence students' overall satisfaction, with social areas such as hallways and areas where students may choose to relax and interact socially between lectures and classes (p.754) having the greatest influence. Interestingly, access to computer facilities were not found to strongly influence overall satisfaction. However, the study only involved a sample of Norwegian students from one ‘relatively small Norwegian university’ (6,000 students) (Hanssen and Solvoll 2015, p.755). Although the sample of returned responses was relatively large (1,457), it did not include any international students, and the authors acknowledged that it is unclear if these preferences could vary between different types of campuses or across a larger and more diverse sample. According to Li et al. (2018), university libraries are important facilities for students, playing a couple of key roles: a central distribution and circulation space for book-sharing activities, and a comfortable, quiet and safe environment for self-regulated learning. In relation to the second point, and drawing on Lavy et al.'s (2019) review of literature, a library can be seen as an informal learning space where some features such as quietness are actively enforced compared to social learning lounges. Li et al. (2018), therefore, discuss the importance of obtaining the learning satisfaction of users through design. They studied users (462, second-year undergraduate to doctorate level, majority undergraduate, including a number of staff) learning satisfaction with a newly designed and renovated university library at a Chinese university. As the authors explain, in mainland China all students are required to live on campus and therefore in this study 97.6% lived on campus in four different student quarters with varying proximity (on foot) to the library.

The authors assessed learning satisfaction in relation to six size-dependent variables (derived from a synthesis of literature): acoustic quality, light environment, air quality, learning space, learning facility, and accessibility. Within these dependent variables, 19 factors were shown to have significant effects on learning satisfaction: natural lighting, electric lighting, electronic screen glare, collection management, bookshelf design, supporting facility convenience, temperature, humidity, air freshness, typing noise, user movement noise, equipment and facilities noise, private traffic convenience, public traffic convenience, adequacy of self-learning spaces, learning space configuration, discussion room design, chair design and desk design. The findings suggest that there is an ongoing reliance on the physical space of libraries for self-learning, and therefore lighting plays an important role (no gender difference in terms of lighting environment and satisfaction); that satisfaction with the acoustic environment can significantly impact visit duration (male students were found to be more tolerant of typing noise than female students); and that accessibility satisfaction (proximity) has a significant impact on learning satisfaction (no difference between genders).

A number of studies emphasise the importance of designing more flexible learning spaces that can allow for both formal and informal learning, mirroring Kärnä et al.’s (2013) findings mentioned in section 3.3.1. Perks et al.’s (2016) study highlights the importance of flexibility of space, in terms of furnishing arrangements, to satisfaction of students with the effectiveness of learning spaces. This issue was also highlighted in the findings of Lavy et al. (2019). Perks et al. (2016) provide a case-study of a classroom (with capacity for 60 students) that was modified based on student and instructor feedback, as well as four features of importance for improving classrooms for learning that were drawn from a literature review: flexibility, sensory stimulation, technology support and decentredness. With their modifications, they revised the room orientation, reduced capacity, reconfigured the arrangements of the trapezoidal table, adjusted the size and placement of the white board, upgraded the technology, adjusted the size and placement of the instructor workstation and repainted the side walls to feel warmer.

Interestingly, this study shows that the outcome of in-class surveys and a focus group in one semester was favourable towards the relationship between flexible space design and satisfaction (in particular, the reduced number of chairs and tables was reported to improve students’ sense of engagement), whereas no discernible relationship was observed in the following semester. The authors go on to wonder whether this relationship was also affected by other environmental factors, or the fact that the modified classroom was more suitable for more active learning, concluding a need for repeated tests. As previously mentioned in the section about student engagement, Lavy et al. (2019) reviewed the literature for quality design of purpose-built informal learning spaces. From this, a number of considerations were put forward: functionality is more of a priority than aesthetics in a learning space; noise and busyness can affect students' cognitive abilities, placing silence as a key requirement for students in learning spaces; the capacity of a space for collaboration, cooperative learning and emotional support is noted favourably; the significance of flexibility and comfort in layout and furniture to support work efficiency and learning outcomes; and the ability to establish a sense of belonging and use time efficiently in such spaces by having a territorial working environment. This last consideration is reciprocated by Temple (2018) who discussed the role of sense of ownership in making a space one’s own. Beckers et al.’s (2016) study with 52 undergraduate Business students at a Dutch institution also discussed the importance of diverse choices and the provision of informal spaces for learning in a time when learning is more student-led than teacher-led.
3.3.4 Living spaces and student satisfaction

A number of studies have been published assessing different types of student accommodation. While the results seem to be very diverse, making generalisable conclusions quite difficult, the models proposed for the studies could be quite useful in any future residential work.

Only one study based in the UK made it through to the final analysis, and the methods it used were not particularly strong (a quantitative survey of 39 respondents). McGrath and Horton (2011) looked at the construction methods used for student residences, with an eye to evaluating the use of Modern Methods of Construction (MMC). A Post-Occupancy Evaluation (POE) survey of students in Nottingham found that construction methods are not a high priority for students. Proximity to the university was their main consideration, and intrusive noise was their primary concern.

Furthermore, Bronkema and Bowman (2017) report the effect of halls of residence design (apartment suites and more traditional halls) on student satisfaction to be insignificant. In their American study, the authors placed a hypothesised emphasis on social media presence and onboarding activities to build a sense of community as more important factors in student satisfaction (although no published work has examined this further). In addition, the findings of the study suggest that students with better high-school grades experience a greater sense of community and college satisfaction from living in traditional halls than students with lower grades, and that buildings with all first-year students were also associated with higher levels of satisfaction.

The two largest studies to make it into this section of the review each (coincidentally) considered 495 student responses (Gbadegesin et al. 2021; Najib et al. 2011). Gbadegesin et al. (2021) looked at private off-campus housing provision in Nigeria, while Najib et al. (2011) studied on-campus residences in Malaysia. From looking at three student hostels of one university and considering a mix of undergraduates and postgraduates, Gbadegesin et al. (2021) found low levels of satisfaction overall, with a principal finding being that landlords need to be regulated to respond more quickly to issues, and that the university jurisdiction should extend to show concern for off-campus students.

Meanwhile, Najib et al. (2011) proposed a Student Residential Satisfaction framework (SRS) to analyse satisfaction across 29 clusters of residential blocks at three universities, gathering the 495 responses (the great majority being undergraduates). In contrast with Gbadegesin et al. (2021), this study found high satisfaction across the sample, along with high loyalty behaviour (students remaining in the same place in subsequent years and recommending their residences to friends). The authors argue that their SRS index can serve as a benchmark for Malaysian Higher Education, helping to improve provision and encourage more students to stay on campus.

Finally, Simpeh and Shakantu (2020) conducted phenomenological and focus group discussion research with 82 students from five universities across a selected area of Ghana to isolate more and less important facilities and services provided within student housing. From this, they produced a four-level Student Accommodation Model comprised of 45 prioritised spaces and services, arguing that the model could be applied more widely because ‘a conducive on-campus student accommodation must be resourced with spaces and services that are required to promote the living and learning experience of students as well as those required to promote their leisure and well-being’ (p.227). The transferability and replicability of Najib et al.’s Student Residential Satisfaction framework and Simpeh and Shakantu’s Student Accommodation Model is not known at present, but they could provide useful resources for future study around student living spaces and satisfaction.
3.4 Effects of campus spaces and places on student attainment

Eight studies in the evidence review primarily focused on the effects of campus design and use on student attainment, placing an emphasis on informal and formal types of spaces and living spaces. As Figure 8 shows, when considering how learning spaces are used in relation to student attainment, the important spatial factors are the internal qualities of the space that affect comfort, air quality, noise, temperature, etc. However, this range of factors is not exclusive to student attainment, as the same three factors are also relevant to the impact of the design of formal learning spaces on student engagement, suggesting that the same spatial factors can simultaneously affect different aspects of student outcomes. Similarly, the proximity factor that is discussed in relation to living spaces is also seen when student engagement is studied. The implied interrelatedness between the student outcomes is seen in literature on student attainment, where attainment is rarely studied exclusively and is often interlaced and studied in conjunction with other student outcomes. This, in addition to the limited number of studies, challenges a conclusive reading of how campus spaces and places affect attainment.

3.4.1 Formal and informal learning spaces and student attainment

Use, operation and the environmental conditions of both formal and informal spaces were found to have an effect on student attainment. Soria et al. (2013) investigated the effect of library use on first-year undergraduate retention and attainment (from one semester to the next) and grades. The authors’ review of the literature broadly suggests that engagement with library services and activity play a beneficial role. Notably, some previous findings suggest: an association with library-related activities and other forms of engagement such as active and collaborative learning, student-faculty interactions and academic challenges; a possible association (due to some limitations such as sample size, or small-to-medium effect-size of the correlation) between library use and grades (in forms of looking for a correlation between the number of books checked out and grades, or citation behaviour and grades on assignments); and a possible association between library expenditure and student retention. In Soria et al.’s (2013) study at an American institution (in one semester), data on library use was gathered automatically by student logins to central databases and websites, as well as building a list of attendees to different library activities such as workshops, consultations, etc. From the 5,368 first-year students enrolled, 73.1% had used at least one library service, 28.7% had used no library service, and more than half of the students had used the databases during their first semester. Notably, 85.4% of the students also lived in halls of residence. The results of this study suggest that students who used the library at least once had significantly higher first-year grades compared to those who did not use the library, although the reported effect-size is medium. The authors also report that several demographic variables were associated with student grades, with female students having higher GPAs than male students and students of colour having lower GPAs than white students. Additionally, a significance association between library use and retention was observed.

Figure 8: Factors affecting the use (quality and frequency) of campus spaces and places in relation to student attainment
Main findings

Jamieson (2003) draws attention to the importance of understanding university campus spaces and places not just as physical environments experienced in purely functional terms but also in visceral terms. The paper argues that recent research in the field to take into greater consideration how teaching and learning ‘takes place’, moving away from what many writers have termed a ‘megastudent’ paradigm that sees students to be at the core of teaching and learning processes. Jamieson draws attention to research undertaken in the pre-school and primary school sector that has been examining the physical environment in which learning takes place for some time – studies that have highlighted the importance of how spaces for learning are personalised by users. In Europe and the USA, extensive efforts have been made to design primary and secondary schools in which ‘the physical environment is the active ingredient’ in the quality of student learning experiences. Jamieson (2003) offers an approach based around four principles of personalised comfort levels, aesthetic impact, fit-of-spaces and spatial layout. The paper is not based on any empirical study – instead, it is based largely on opinion and drawn out of a review of literature in the field – and it lacks a robust methodology that can sustaining the propositions made.

Cotner et al. (2013) show that technology-enhanced learning environments such as those in Active Learning Classrooms (ALC) have a positive effect on student learning, as shown in course grades. Their study compares the course grades of a Biology course delivered at an American institution in an ALC (161 students) and traditional classroom (102 students).

Mongkolsawat et al. (2014) investigated the perceived learning performance of students in relation to indoor air temperature at an institution in Thailand. Their study compared performance in air-conditioned (AC) and fan-ventilated (FANV) classrooms in the hot and humid climate of Thailand. In reviewing the literature, the authors explain that temperature and performance can be measured both objectively and subjectively, but ‘when both performance and thermal conditions are assessed by self-report, the correlations between these two variables are relatively strong’ (p.99). In relation to studies using objective measures, they explain that while studies measuring performance objectively in relation to the thermal condition are inconclusive, a number of empirical and chamber-based studies suggest a positive relationship between objective performance and IAQ indicators (CO2 concentrations, ventilation rate and odour). However, the studies the authors draw on are not exclusive to higher education buildings and often reflect on findings from pre-university education. In this study, Mongkolsawat et al. (2014) factor in four parameters for Perceived Learning Performance (PLP): attention, sleepiness (the term used in the questionnaire was ‘freshness’), alertness and environmental tolerance. Their PLP study was conducted through a questionnaire (rating) at the end of a session in an AC classroom and a FANV classroom. Additionally, students were asked to rate the environmental comfort of their classroom in relation to thermal comfort, visual comfort, hearing comfort, air freshness (including odour) and overall comfort. Along with demographic data, data was collected on the type of clothing worn (seemingly measured in terms of value) and the area of the classroom in which each student sat. Reportedly, four AC and three FANV classrooms were selected, but it is not clear what informed the choice of these rooms. The authors explain that variables such as class-size (number of students), participants’ gender, and the time of the class session (morning, afternoon) were kept balanced, and no student participated in the survey twice. A total of 673 students participated across the entire study, and in both classes approximately 64% of the participants were female. Although the average age of the students (20 years old) is reported, it is not clear what stage the students had reached in their studies and whether a difference in year of study was controlled for in any way.

Additionally, due to practical issues, the AC data was collected during a hot rainy season while the FANV data was collected in a mild season. The results suggest that environmental comfort was lower overall in FANV classrooms compared to AC classrooms, which the authors speculate could be due to the proximity of the FANV classrooms to sources of noise and air pollution. The most notable correlation between PLP and environmental comfort in AC classrooms was in the overall comfort measure, while in FANV classrooms it was in the thermal comfort measure. The authors also conducted an analysis using an ALC classroom type by grouping students based on comfort levels (uncomfortable, neutral, comfortable). Although there were no uncomfortable students in FANV classrooms, there was a significantly lower PLP than those who were uncomfortable in AC classrooms. It has to be noted that the number of students in each classroom based on comfort level categorisation was not strong enough to clear how the authors considered this difference in their calculations).

Nonetheless, the authors draw on previous literature to discuss the consistency of their results with previous findings in which students’ PLP is considered to be affected by perceived thermal and overall comfort. In this study’s cases, this was notable in FANV classrooms.

3.4.2 Living spaces and student attainment

In terms of student attainment, commuting to campus versus living on campus has been a notable issue. Simpson and Burnett (2019) draw on a range of studies, postulating that ‘academic performance does not result from living on campus in and of itself, but through the opportunities to engage with campus life and levels of support on-campus residential communities can provide’ (p.288). Simpson and Burnett’s study of 870 first-year undergraduate students at an American institution suggests that commuter students (those living within walking/driving distance of campus) received higher grades than residential students (during their first academic year). Their sample comprised 68% on-campus residents and 32% commuters. They conclude that although the ‘academic performance attributed to living arrangement was significant, it is not of practical significance’ (p.295), and that these results alone are not enough to reasonably conclude an advantage or disadvantage to commuting to campus. Their study postulates that the social and academic integration of students plays a more important role in their attainment than their living arrangements. However, this postulation is based on prior research rather than an assessment of the engagement behaviour of the study group. Additionally, all the studies included in this systematic literature review of on-campus living are focused on first-year undergraduate students. Therefore, it is not clear how the living arrangements for more senior years, where halls of residence may not be available, can affect student outcomes.

In terms of living typologies in relation to student outcomes, Hobbs et al. (2018) compared the effects of a particular living arrangement known as a Residence Learning Community (RLC) with traditional halls of residence and off-campus living (non-RLC) through an observational study of a cohort of 4,805 students at a Canadian institution. An RLC is a ‘group of students intentionally living together in a residence space’ (p.2). The RLC can take various forms, such as RLCs associated with a particular programme at the institution, or a socially focused RLC associated with students’ non-curricular activities. However, from the description provided in the paper, it is not clear where the RLCs are located: on-campus, off campus or both. The authors note that the literature in this area shows both a positive effect, as well as no significant impact, of an RLC on first-year grades, retention and 5-year graduation. They also highlight the differences between Canadian and American RLCs, in that Canadian RLCs are primarily exclusive to first-year students with limited faculty involvement. Although RLCs may not be common within a UK context, undergraduate students tend to house-share with peers on same course or non-academic programme (sports) after their first year at university. Thus, studies on RLCs may be pertinent to thinking about the future of UK residency facilities. In terms of student outcomes, the authors found no significant difference between traditional halls of residence and off-campus living. Additionally, RLC students achieved significantly higher first-year averages compared with non-RLC students when controlling for gender and discipline.
3.5 Effects of campus spaces and places on student retention

From the 11 papers with a primary focus on student retention, the emphasis was mainly on campus-wide design, living spaces and recreational spaces. As shown in Figure 9, greenness, urbanisation and functionality have been reported to be key spatial factors that affect how students use the campus in relation to retention. While literature suggests that the use of a range of facilities beyond the classroom, such as libraries, halls of residence and recreational facilities, can be positively associated with student retention, there is no significant evidence as to how the spatial qualities and design of these facilities can play a role in supporting retention. Respectively, studies in the evidence review that have looked at the types of spaces for both formal learning (e.g. traditional classroom versus learning studio) and living (e.g. traditional living space versus suite-style apartments) do not suggest there is any significant impact on student retention. Notably, these studies are predominantly led through mapping the frequency and perception of use of spaces against statistical data on enrolment and other variants related to academic and social integration, and therefore they do not offer fine-grained detail on how the design of spaces may contribute to student retention. Furthermore, non-spatial factors such as students’ academic background, parental income, etc. have been discussed to mediate in degree to which use of living and recreational spaces can be associated with retention rates.

3.5.1 Campus masterplan, spatial attributes and student retention

Irrespective of the size of a campus and the degree of urbanisation of the setting a campus is placed in, two spatial attributes of greenness and urbanism have been reported to have a positive impact on student retention.

Greenness, urbanism and student retention

Hajrasouliha and Ewing (2016) conducted the most comprehensive study on the relationship between campus masterplans and design and student retention within the first year of their studies and ultimately throughout their university experience to graduation. Drawing from research (Hajrasouliha 2015) that analyses the masterplans and design recommendations of fifty American universities, a well-designed campus is conceptualised as ‘a mixed, compact, well-connected, well-structured, inhabited, green campus in an urbanized setting’ (Hajrasouliha and Ewing 2016, p.31). By mapping retention and graduation data from 103 research intensive American universities against different dimensions of a well-designed campus, three results of significance were observed:

• A strong positive association between retention, graduation and campus living, greenness and urbanism (a composite variable from dimensions of compactness, connectivity and context)
• No significant relationship between retention, graduation and land-use organisation or spatial configuration
• No significant relationship between retention, graduation and age of institution, size of campus, affordability of education, economic status of the setting (city), climate index, safety of the setting, or degree of urbanisation of the setting

The urbanism dimension of campus design can be regarded as being of particular importance when considering campus master planning because it draws on a range of factors such as density of buildings, vegetation and activities, proximity, perviousness of open spaces, accessibility and connectivity within and surrounding the campus, which, as discussed in this review, have positive associations with student engagement, quality of life and satisfaction.
While dimensions of land-use organisation and spatial planning are not shown to be associated with retention and graduation in Hajrasouliha and Ewing’s (2016) study, they include a combination of spatial attributes related to the design of open spaces that have been deemed important by Peker and Ataöv (2020) in relation to the student learning experience and development. The relevance of open spaces to student retention can be considered in the affordance of such spaces for supporting a variety of learner needs. In particular, the changing landscape of teaching, learning and research towards a collaborative paradigm necessitates not only the provision and reorganisation of spaces for collaboration, but also an increase in the functionality of each space and enhancements to the possibilities for interactions across the whole spectrum of campus spaces, be they outdoors, indoors, primary or ancillary (Hebbert 2018; Peker and Ataöv 2020; Jansz et al. 2020; Winks et al. 2020). Hajrasouliha and Ewing’s (2016) study focuses on the provision and relational situationalness of spaces across campus, and therefore finer-grain aspects of space typology and actual use of space in relation to the well-designed campus dimensions and student retention are not considered.

Furthering the work of Hajrasouliha and Ewing (2016), Hajrasouliha (2017) proposed a campus scoring formula that is a composite of the three variables of greenness, urbanism and campus living (Campus Score = 0.177*Urban+0.215*Green+0.251*Living). Campus scores were calculated for the same 103 American institutions involved in Hajrasouliha and Ewing’s (2016) study. Interestingly, the 2017 study revealed a significant positive relationship between the campus score and the age of the institution, size of the city, and urbanisation of the setting – all of which were factors that were not significantly related to retention and graduation in Hajrasouliha and Ewing’s (2016) study. However, Hajrasouliha (2017) reported that older institutions in the sample had higher living scores (related to the degree of on-campus living). Additionally, institutions in larger cities or suburban campuses also had higher living and greenness scores. Derivable from this study is that older institutions and those with more estate availability, in that they may be able to afford (physically and financially) to accommodate green spaces and living spaces on campus, are better positioned to support students staying at university until graduation. On the other hand, there are studies that allude to the idea that the proximity of living spaces and greenness to a campus can be as effective as on-campus facilities (McDonald-Yale and Birchall 2021; Zegre et al. 2020). However, whether these provisions can be directly associated with student retention remains open to investigation.

3.5.2 Formal learning spaces and student retention

The evidence in this review examined the type of classroom as well as the use of libraries in affecting student retention. Cooper and Frantz Fry (2020) conducted a large-scale study at an American university to compare the impact of a traditional classroom and a learning studio (equipped for active learning) on course attrition. The results of this cross-sectional study showed no significant relationship between learning environment and course attrition, leading the authors to conclude that continuing or dropping out of a course cannot be related to the environment alone. Beyond the classroom, Soria et al. (2013) investigated whether the use of other learning spaces such as libraries can affect student retention. A study carried out at an American university suggests that first-year undergraduates who used the library were associated with higher retention from one semester to the next compared with non-users. This finding is consistent with previous research and general views within this area of focus (Bell 2008). However, as the authors note, there is little knowledge on how library activities contribute to retention, which could be very important in understanding how to design activities for students in their early days of engaging with a university in order to establish strong connections.
Main findings

3.5.3 Recreational spaces and student retention

There is a consensus, albeit limited to studies in this review, that frequent use of recreational spaces can positively affect retention. In a large-scale study on the relationship between the use of campus recreational facilities and retention for first-year undergraduate students, Zegre et al. (2020) observed a significant positive relationship. They accounted for honour programme participation, intercollegiate athletic participation and academic background (measured by high-school grades) as covariants. Notably, they showed that in students with a weaker academic background, the use of campus recreational facilities yielded higher first-year retention. In this study, students who lived on campus were also higher users of recreational facilities. Interestingly, students who preferred to live far from campus but were assigned accommodation closer to campus had better recreational facility use. The study also highlights the importance of confounding variables, which, if not accounted for, can bias the understanding of the impact of recreational facility use on retention. For example, Zegre et al. (2020) discuss a significant negative relationship between first-year retention and indecision among majors. This finding is consistent with Tinto’s (1975) model of student departure, which discusses the importance of institutional support in addition to academic and social integration and engagement.

Miller (2011) suggests that students who use recreational facilities more frequently are more likely to attend and engage, and therefore progress. In a questionnaire involving 453 students at an American university, most students agreed that the recreation centre provided strong emotional ties to the university, and was essential in creating a social bonding experience. The recreation centre was seen as a major attraction, not only drawing students to the university but also encouraging them not to leave it, by improving their sense of belonging and responsibility to the university. The study is limited by the representativeness of its sample, as the majority of the students who participated were frequent users of the recreation centre. Nonetheless, the study extends prior work in the field that suggests having a sense of community increases student retention.

Danbert et al. (2014) drew on literature to suggest that while most studies suggest a positive relationship between participation in campus recreational facilities and student retention, the effect-size has been small. In Danbert et al.’s (2014) large-scale American study, this idea was further supported as results indicated that, although not statistically significant, comparing students who purchased sports membership to non-members, more members were retained after both one year and two years at university.

Additionally, noting that students’ departure is not always voluntary, a result of poor social connection, and can be interlaced with a myriad of factors such as poor academic performance, the specific impact of recreational facilities on student retention is difficult to identify. As Danbert et al. (2014) explain, the socio-economic status of students, which was not accounted for in their study, may have impacted students’ ability to purchase sports membership in the first place, and therefore may be regarded as a possible factor affecting student retention. Nonetheless, some studies, such as those of Huesman et al. (2009), have attempted to delineate this relationship between recreational facility use and retention. In a cross-sectional study at an American university, Huesman et al.’s (2009) findings suggest that students who used the facilities 25 times in one semester increased their one-year retention by 1% and probability of five-year graduation by 2%.

3.5.4 Living spaces and student retention

While there appears to be a consensus that living on campus can be beneficial to student retention, mediating factors, such as how students’ academic backgrounds affect their choice of where to live, economic status (potential income) and the type of living arrangement (e.g. traditional halls of residence versus living-learning communities).

Schudde (2011) argues that while the benefits of living on campus are not negligible, understanding how living on campus supports student retention is not clearly established. One of the main issues raised in this study is that the quasi-experimental methods of previous research on the effects of on-campus living on student outcomes have not allowed for controlling the students’ choice of living arrangement. Students self-select whether to live on campus or not, and certain factors may contribute to this choice. For example, it is discussed that students that are most academically prepared have been shown to be more likely to live on-campus or that students who are interested in extracurricular and social participation may be more likely to live on-campus. Additionally, due to the variance in study groups and the magnitude of previous studies, the author argues that there is little consistency regarding the impact of residency on student outcomes.

Schudde (2011) therefore uses a combination of data gathered by the US Department of Education, namely data from the Educational Longitudinal Study (ELS) (providing pre-university details) and the Integrated Postsecondary Education Data System (IPEDS: 2003-2004 & 2004-2005). The ELS was carried out between 2002 and 2006 by the National Center for Education Statistics, following students in their transition from high school to university across America. The analysis is led by using Propensity Score Matching that enables students with similar propensity to live on campus, but who ultimately make a different housing choice to be matched, in modelling students’ housing decision prior to enrolment in university. This model consists of all the variables that can affect housing decision: race, sex, family composition, parent’s income and education, high-school grades, perception of living arrangement during university, time dedicated to extracurricular activities during school, perception of the importance of making friends.

The descriptive statistics resulting from the study show considerable differences between students choosing to live on campus and those living off campus. Students living off campus had lower parental income, worked more, spent less time doing community activities during school, and also participated less in extracurricular activities at university. The Propensity Score Models show a significant difference in the retention of students who choose to live on campus compared to off campus, suggesting on-campus living can increase retention by 3.3%. Schudde (2011) notes that while the use of large national datasets can suggest that the results are generalisable to a degree, campus-level factors such as climate or housing policy that can impact students’ decisions could not be accounted for. Nonetheless, despite this limitation, Schudde’s (2011) finding is in agreement with comparable large-scale studies such as that of Hajrasouliha and Ewing (2016), who also suggest there is a positive relationship between living on campus and student retention.

In 2016, Schudde published a follow-up paper, using the same dataset to investigate how choice of campus residency can affect student retention into the second year for those from lower-income families. After controlling for a number of demographic, academic and institutional measures, the results suggest that family income does not predict living on campus – instead, it is prior academic achievement and high-school grades. Additionally, it is concluded that for students from a lower-income quartile (below US$38,511) living on campus has no significant impact on retention, whereas a higher retention rate was observed for students from a higher-income background. The author suggests that this is a result of a cultural mismatch that ultimately affects how students from lower-income families interact with their peers, as well as their financial ability to take part in various university activities. Notably, Schudde’s (2016) study only included universities where living on campus was provided as a choice. Therefore, whether other forms of living can increase student retention remains open to question. Nonetheless, cross-sectional studies such as that of Zegre et al. (2020) suggest that for students from a weaker academic standing, living on or in close proximity to campus increases the likelihood of participating in extracurricular activities such as sports, and that this can have a positive impact on retention.
Bronkema and Bowman (2017) argue that the type of interactions that are facilitated by living on campus is indeed what affects student retention. Among the strategies used by universities, mainly in America and Canada, to leverage the academic and social integration opportunities that living in halls of residence offers, Residence Learning Community (RLC) programmes were introduced. As noted in 3.4.2, an RLC is a ‘group of students intentionally living together in a residence space’ (Hobbins et al., p.2), with various options such as RLCs associated with a particular programme or socially focused RLCs associated with non-curricular activities. To understand how student retention is affected by RLC living arrangements compared to living in traditional halls of residence, a study of a cohort of 4,805 students was carried out by Hobbins et al. (2018) at a Canadian university.

Specific to student retention, this study shows no significant difference between traditional halls of residence and off-campus living. However, a significant relationship between RLCs and student retention and RLCs and five-year graduation (before controlling for gender and discipline) was observed, and when considering gender, RLCs were slightly more beneficial to male students. Additionally, when considering discipline only, in the three disciplines with more students living in RLCs (Biological Science, Engineering and Physics, and Agriculture), RLCs were seen to have a significant impact on retention and five-year graduation, with RLC living being significantly more beneficial for those studying Biological Science and Agriculture.

3.6 Methodological considerations

Overview of methodological approaches

As shown in Figures 10 and 11, the studies on campus spaces and places and student outcomes are mostly conducted through student questionnaires (46%) and analysed quantitatively (75%). A key limitation of this largely quantitative approach is the often-speculative suggested correlation between the spatial qualities of campus spaces or the management of campus spaces and student outcomes. 16% of the studies in the evidence reviewed have used mixed methods approaches for data collection, with forms of quantitative data collection followed up by interviews and focus groups with participants. However, the challenge in this approach has been the studies’ limited samples, both in terms of size and representativeness.

Although 23% of the studies draw on data from more than one higher education institution, most of the studies are cross-sectional and illustrative of one institution across a limited period of time. Additionally, as highlighted in this evidence review, a number of factors such as culture (Gulwadi et al. 2019; Peker and Ataöv 2020), climate and context (Hajrasouliha 2017; McDonald-Yale and Birchall 2021) contribute to the lack of comparability of different university settings and the applicability of findings from singular studies to university design, planning and management in general. Noting the importance of the socio-academic backgrounds of students (Tinto 1975) and the cultural-geographical specificities of different regions, there is scope for regionally based studies of campus spaces and places in relation to student outcomes in order to obtain a more meaningful comparison of campus settings and better use of mixed methods (qualitative and quantitative) approaches for data collection and analysis.

In light of this overview, there are a number of considerations deemed significant for future studies, which will be explained further.
Study group and accounting for participation and representation of different demographics

As shown in Figure 12, out of the 86% of studies with human participants in this evidence review, there is a significant focus on the undergraduate student population and, in particular, their first year of education. Although faculty interactions have been regarded as part of successful student integration and retention (Tinto 1975), the inclusion of faculty members in studies in this area has been limited. This evidence review also highlights the importance of the background of students entering university, as well as their living arrangements during their time at university and their performance through to graduation. Nonetheless, although the demographic makeup of the study group is acknowledged, it is not always fully stated. In studies that relied on participant engagement (such as questionnaire-based studies), compared to those using national or institutional datasets, controlling for equal representation of different demographic groups was noted as a challenge, with female students and students from a white background more likely to participate in the study. While some studies discuss their methods of controlling for the effects of the demographic makeup on the correlation under examination, this has not been consistently reported in all studies.

Clear definitions and consensus in methods of assessment

Ill-defined terminology related to student outcomes presents methodological and empirical difficulties for the cross-comparison of studies. For example, the term ‘student success’, which is used in a number of studies, was either not defined (LaNasa et al. 2007) or regarded as an umbrella term for a range of other outcomes that differed from one study to the next: student success encompassing retention, graduation and academic performance (McDonald-Yale and Birchall 2021); student success encompassing retention, grades and credits completed (Danbert et al. 2014); and student success equated to grades achieved (Soria et al. 2013).

In some areas of focus, for example student engagement, a number of studies offered detailed classifications of finer-grained aspects of engagement. However, comparing study findings is difficult due to nuances in the definitions provided. For example, it is not clear how the engagement categories of Tinto (1975) (academic engagement, social engagement), Boyd et al. (2020) (class engagement, programme engagement and interaction engagement) and Mayers et al. (2017) (academic engagement, peer engagement, intellectual engagement, beyond class engagement, transition engagement) can map against one another.

Out of the five types of student outcomes reviewed, the definition of student retention was more consistent across the literature, referring to transition and continuity from the first year to the second year of university studies, with only a limited number of studies in the review looking at retention as transition from one semester to the next (Soria et al. 2013) or including transition to graduation (Hajrasouliha and Ewing 2018). Although in some systematic literature reviews the authors have provided definitions of a student outcome that can comprehensively accommodate all variations under one definition (e.g. student engagement as defined by Trowler 2010, p.2), there is scope and a requirement for delineating some common ground in definitions and the classification of terminologies in the design of future studies in this area.

Moreover, the evidence review highlights scope for methodologies that extend beyond objective measurements of the spatial qualities of campus spaces (e.g. provision, location, size) and performative aspects of student outcomes (e.g. enrolment, grades achievement, frequency of use, membership) to include participants’ perceptions. In particular, studies on quality of life and greenness showed that there can be a difference between objective and perceptive measures, and while objective greenness, for example, may be positively associated with retention (Hajrasouliha and Ewing 2018), if the campus environment is not perceived as green, this perception will affect how it is used (Gulwadi et al. 2019). Some studies, such as those of Mongkolsawat et al. (2014) and Bronkema and Bowman (2017), do apply subjective measures to aspects of student outcomes such as attainment and retention, which are most commonly measured objectively. However, studies of this nature are limited. Mixed methods methodologies therefore may be able to facilitate a deeper understanding of the complexities affecting correlations between campus use and student outcomes.

There is also potential for the development of frameworks of assessment specific to university campuses and student outcomes. Some studies in this review draw on elements of general urban studies or assessments developed by non-higher education institutions such as the World Health Organisation. While a university campus setting may share many traits with other environments, it has also been regarded as a unique environment (Hajrasouliha and Ewing 2018; McDonald-Yale and Birchall 2021). Some studies have also attempted to propose methodological frameworks specific to a campus setting (Kärnä and Julin 2015) and quantitative ways of scoring campuses (Hajrasouliha and Ewing 2016). However, more clarity is required on the applicability of methods and frameworks adopted from other fields to the types of behaviours, interactions and expectations of a university campus, as well as the generalisability of frameworks and measures developed specifically for campuses and student outcomes.
4. Areas for future research and next steps
4. Areas for future research and next steps

The previous sections discussed the findings of the systematic review of evidence on how campus spaces and places can affect student outcomes. This evidence presented three potential areas for future study, including:

- Effects of campus green spaces on student outcomes in the UK
- Effects of, and the use of, social/informal spaces to support learning cultures and student outcomes
- Effects of living arrangements on/off campus on student outcomes

Part 2 of the study aimed to discuss potential contributions for these three areas of study through consultations and workshop discussions with the Project Advisory Board. Workshops are an established way to determine research purposes: to produce reliable and valid data about the domain in question (Baran et al. 2014). The participant group (25 in total) provided a range of expertise from the higher education sector, including estates and management, operation and leadership, design and management, academic and professional, student and policy.

Two workshops were held. The first workshop, Scoping and Reflection, was designed to explore participants’ views on how the design and use of campus spaces and places shape learning cultures and social capital across two characteristics – physical qualities and social qualities – at three scales (macro, meso and micro). Participants formed two groups, with one group focusing on physical qualities and the second on social qualities. Using Jamboard, each group was asked to consider the relevance and importance of the design and use of spatial factors and (from the participants’ viewpoint) learning cultures/space provision for different activities. At the micro scale, the main factors discussed were diversity and functionality of space provision (see Figure 13). Regarding social qualities at the macro scale, key insights from the workshop emphasised the importance of accessibility and a sense of belonging. At the meso scale, discussions focused on the environmental and social diversity of spaces, accessibility and connectivity between spaces, and diversity and variety of space provision for different activities. At the micro scale, the main factors discussed were diversity and functionality of space provision (see Figure 14).

The workshop provided an opportunity to identify new factors at play and the relationships between them, which neither the participants nor the researchers might have been aware of before the workshop. Overall, it was found that there is justifiable scope to develop a future study that could explore the effects of campus spaces and places on learning cultures, with a potential focus on the diversity and functionality of key spaces such as informal/social spaces identified as critical to student outcomes.

In terms of physical qualities, participants focused their discussions at the macro scale (city-wide qualities of the campus and wider masterplan) in reference to accessibility and campus location/transport connectivity, as well as the perceived safety of routes to and on campus spaces. Regarding physical qualities at the meso scale (within the campus setting), the discussion highlighted a need for informal, drop-off and community spaces, and the value of sporting facilities and good environmental design, including safety. At the micro scale, key factors identified by the group were the variety and diversity of spatial types, accessibility and inclusivity, and the integration of virtual spaces (see Figure 13).

Regarding social qualities at the macro scale, key insights from the workshop emphasised the importance of accessibility and a sense of belonging. At the meso scale, discussions focused on the environmental and social diversity of spaces, accessibility and connectivity between spaces, and diversity and variety of space provision for different activities. At the micro scale, the main factors discussed were diversity and functionality of space provision (see Figure 14).

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The outcome of the discussion concluded that Part 2 of the project could either explore the character of informal spaces and their effects on student outcomes, or it could be a typological study into modes of design and use of informal learning spaces on learning cultures, and the effects of living arrangements on student outcomes. In the survey, participants were asked to rate areas of importance and give details on areas for further exploration in terms of their contribution to HE policy and campus design and management, as well as addressing the challenges and opportunities presented by each theme.

More research is needed, specifically qualitative studies with diverse empirical settings, on how the use of informal spaces in different university campus settings benefit student engagement and satisfaction across different times of the academic year, across different year groups and among a diverse range of users. These studies would provide important insights into how campus estates could be designed and among a diverse range of users. These studies would provide important insights into how campus estates could be designed and managed in a much more fine-grained way, especially in the context of the UK’s post-pandemic green recovery.

In both instances, the next part of the project would expand on the research reviewed in Part 1. The systematic literature review discussed in Part 1 presented evidence suggesting significant implications for how the design, management and use of campus spaces and places contribute to student outcomes. While limited in geographical reach, scope and the methods employed, the evidence nevertheless offers insights into important effects that the use of campus spaces such as libraries, informal and flexible spaces, and recreational and green spaces have on student engagement, retention, satisfaction, attainment and wellbeing. Specifically, the use of informal spaces played a big part in most student outcomes. How, and to what extent, this varied among different user groups remains underexamined and requires further study.

The challenges and opportunities presented by each theme.

Future research and next steps

Following a discussion with the Steering Group and further re-reading of the evidence collated in Part 1, the second workshop explored participants’ views on all three potential areas for future study. In advance of the workshop, 26 participants were sent a short survey that included questions on the potential value and significance of each area of study, and the associated challenges. Participants included representatives from higher education senior management, estates management, academic staff and students, as well as architects and contractors. The survey included questions on three key themes: the effects of greenness on student outcomes, the impact of informal learning spaces on learning cultures, and the effects of living arrangements on student outcomes. In the survey, participants were asked to rate areas of importance and give details on areas for further exploration in terms of their contribution to HE policy and campus design and management, as well as addressing the challenges and opportunities presented by each theme.

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