Background

A recent trend in tertiary education and in particular engineering is the construction or refurbishment of dedicated “learning spaces” (Radcliffe, Wilson, Powell, & Tibbetts, 2009). These are spaces that tend to be quite different from a traditional lecture theatre, in that they are often flat spaces without the obvious placement of a lecturer and students are often able to reconfigure furniture to suit their purposes. A number of other facilities are often part of these spaces, including various media devices such as screens and projectors, free Wi-Fi and tables suitable for group work. A number of practical concerns have driven uptake of learning spaces including the increase in student numbers (Graham, 2012), the need to upgrade facilities and the advent of new technologies (Joint Information Systems Committee, 2006; Temple, 2008).

In addition to the practical concerns, recent education literature has critiqued traditional university teaching especially lectures. Using lectures to teach is considered to be passive learning, whereby students passively receive information and learn from that. Current learning theory argues that students construct knowledge in social environments (constructivism) rather than absorbing knowledge passively (Killen, 2013). This means that learning occurs due to actions by the student such as interaction with the environment, with other students. This learning is built upon whatever prior knowledge and experience each student has, no student is an empty vessel.

A number of principles have been proposed for learning spaces (Long & Holeton, 2009). All principles demand “flexibility” or “versatility” of the space, allowing different methods of teaching and different activities. These principles assume that by creating an alternative space which is very different to a traditional lecture theatre active learning occurs automatically. While these principles may be of use they fail to consider what students, the main users of the space desire or need within a learning space.

The Pavilion space at Curtin University is a dedicated learning space for exclusive use by engineering students. The space was constructed according to learning space principles including flexibility, versatility and engaging students in active learning. Previous research in the space uncovered aspects of behaviour which can be inculcated by the unique learning and social experiences that students have within the space (Tibbits, Jolly, Szymakowski, Maynard, & Tade, 2014). It is primarily a work space for students, they go there to complete their studies. However, it is not solely a work space, social interactions related to study, such a group work or giving presentations are common but purely social interactions are somewhat frowned upon. Follow up examination of collaborative learning revealed some insights into what students liked and disliked in the space.

Using the insights allowed a list of features of the space that students have some feeling about (positive or negative). This list is then ranked by the students to determine how students value each feature relative to each other

The examination of value in this study is a simplification of previous work of a more theoretical nature by one of the authors (Tibbits, 2013). The relative value of features in the space will be determined in this study, but not the rationale behind the value, in other words what value systems or judgments are used to determine value. However, knowing what is valued highly or lowly, generates insight into what the value systems could be. Understanding the value systems is the next stage in this research project.

Understanding what these students value in this learning space contribute to our understanding of what may make a learning space frequented by students. Principles regarding the construction of learning spaces so as to enhance learning are not sufficient on their own to ensure students actually use the space, or use it as intended. This study aids to the literature as to what students value in a space which can then be included into learning space design. Not reported in this study are the results from another survey conducted simultaneously into the value of different interactions, such as group work, individual work and gaming within the Pavilion space.

Purpose or Goal

For this paper we sought to gauge how different features and interactions are valued by students within the space to enhance our understanding of why engineering students are frequenting the Pavilion.

Approach

A list of features of the Pavilion space that students used were identified in previous observations and focus group interviews (Tibbits et al., 2014). The finalised list of features is as follows.

Table 1 - List of features surveyed

Whiteboards
Toilets
Wi-Fi
Projectors
Location
Lunch space
Group work areas
Moveable furniture
Exclusive access
Clubs and societies spaces
Storage space (e.g. bags)
Individual work areas

Students were asked to rank the list according to value, that is, the most valuable feature was ranked 1 and the least valuable 12.

Surveys were collected from within the Pavilion between Friday 1st of May and Friday 5th of June and 100 subjects completed the survey. Of these some did not complete the surveys accurately; ranks were left off certain categories etc. These have been included in the results and account for the difference in the total number of ranks for each category. The effect of including these results is considered to be negligible for the purposes of generating a measure of relative value.

Tables 2, 3 and 4 detail attribute data of the respondents. Approximately 30% of subjects were female, which seems impressive but needs verification as to the entire female population in engineering.

Table 2 - Gender of respondents

Male	70
Female	29
Not specified	1

Students from all year levels are represented in the survey though predominately 2nd year (nearly 50%). First years were surveyed, even though all first years may not have access to the Pavilion space. Those surveyed must have had access due to classes in the Pavilion. It would be useful to know how many first years do have access.

Table 3 - Year level of respondents

1st	8
2nd	45
3rd	26
4th	17
5th	2
Diploma	2

A range of disciplines are represented in the survey population, the largest is chemical (26%). Other disciplines were roughly equivalent to each other (11-16), while a few disciplines, computer, mining petroleum and power, all had less than 10 respondents.

Table 4 - Discipline of respondents

Diploma	2
Chemical	26
Civil	14
Computer	4
EFY	8
Electrical	11
Mechanical	11
Mechatronics	16
Mining	1
Petroleum	6
Power	1

Table 5 shows the rank scores, count of 1s and standard deviation of the feature survey. The categories are listed as they were on the survey instrument. Recall that a lower average score reflects more people ranking the category as valuable.

Table 5 - Scores and details

Features	Whiteboards	Toilets	Wi-Fi	Projectors	Location	Lunch space	Group work areas	Moveable furniture	Exclusive access	Clubs and societies spaces	Storage space (e.g. bags)	Individual work areas
Average	8.35	5.49	3.59	9.00	5.11	6.46	3.93	6.93	5.65	8.22	9.50	5.55
Count of 1s	1	9	27	0	7	4	15	2	12	7	0	16
SD	2.58	3.04	2.71	2.51	2.86	3.21	2.57	2.70	3.41	3.45	2.19	3.34
Count N	100	100	100	100	100	100	100	100	99	99	100	100

Closer examination of the count of 1s (Figure 1), that is the total number of survey respondents ranking a category as most valuable gives a feel for what the sample population considers the most valuable. Wi-Fi was ranked most valuable by more respondents, followed by individual work areas and then group work areas.

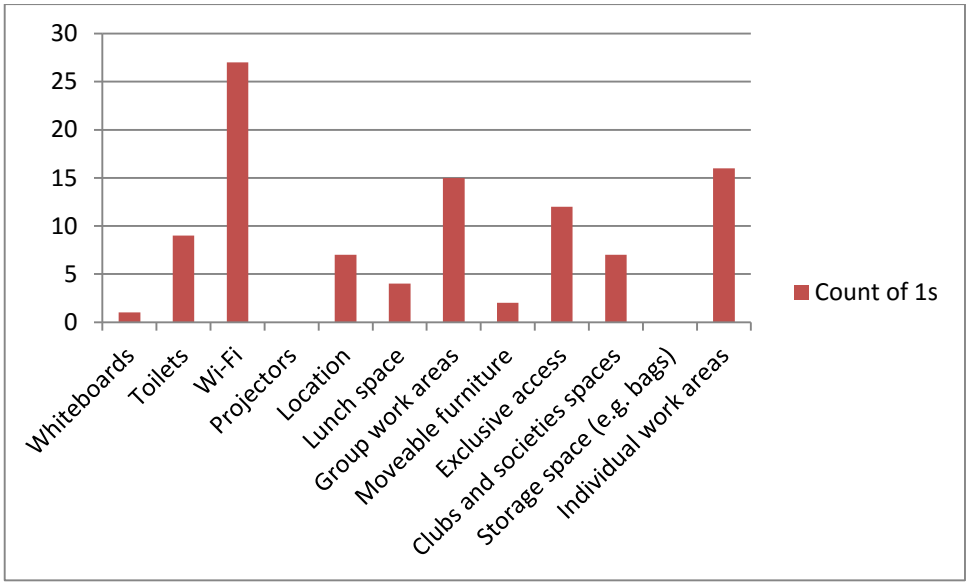

Figure 1- Count of 1s

The count of 1s is a guide to the overall evaluation of the most valuable rank. The average score is used to generate the position in social space of these categories. Figure 2 presents these scores in a “ladder”. It is cluttered and difficult to examine due to the one dimensional nature of the data and to assist the relevant numbers are included in Table 5.

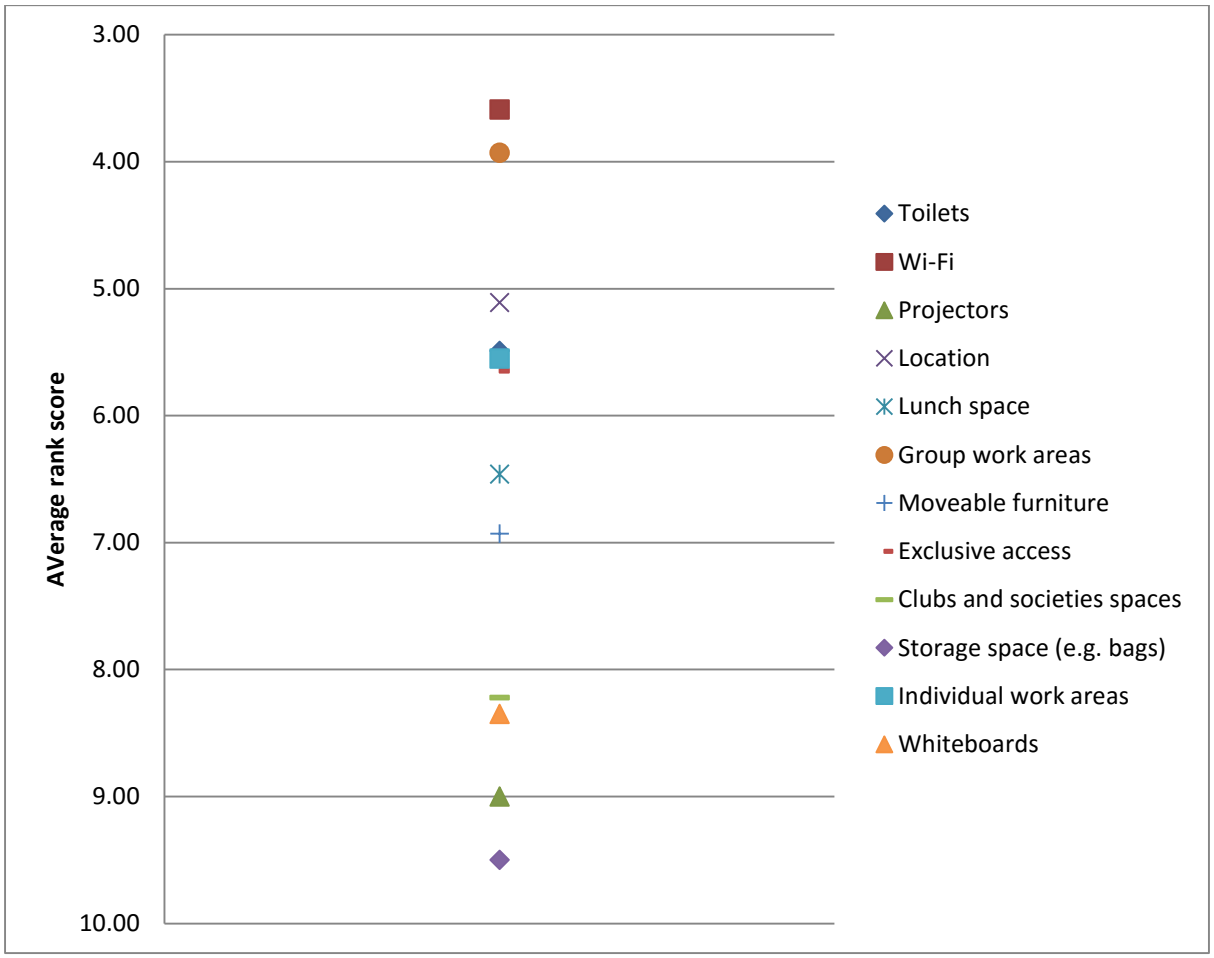

Figure 2 - Feature ladder

Discussion

Having a space where students can be social and work together, in a work orientated environment is valuable for these students. Achieving the balance between work and socialising may be quite unique to the Pavilion, for example spaces in the library may be considered not social enough, while a coffee shop, park or pub may be too social. The Pavilion may occupy a Goldilocks point on the social – work scale. In interviews, students have suggested the space is primarily a work space and they frown upon obviously social behaviours such as gaming, however these behaviours are tolerated. The ranking of interactions within the Pavilion confirms this desire for a working space.

According to students who completed this survey on the Pavilion space, Wi-Fi is, clearly, the most valuable feature in the space. That Wi-Fi is ranked most valuable is puzzling for a number of reasons. Firstly free Wi-Fi is available all over the campus, so the most valuable feature of a learning space is ubiquitous and not unique to the space. Secondly, Wi-Fi can be used for scholarly purposes for research, to access lectures, complete assignments etc. and it can be used for social/ personal reasons such as to check email, social media and to watch cat videos. Which purpose has more value to these respondents, is it the scholarly use or the social use? Another element to consider about Wi-Fi value is the fact that such use is free on campus, whereas students may be paying significant out of pocket expense for their data usage for their phones or laptops off campus. Finally it is unlikely that any new learning spaces or any building or room on a university campus would not have Wi-Fi, such is the technology's pervasiveness.

The second most valuable feature in the space is group work areas. While these are designated as work areas, significant social interaction occurs within them also. Students have been observed working and interacting socially in these spaces at the same time.

A group of features; location, toilets, individual work areas and exclusive access can be considered the third most valuable features of the space. Going into this study we were of the opinion that the exclusive access may be very valuable for engineering students. This ranking suggests that it is valuable but not as valuable as we thought it would be. The location of the building is central for engineering students and students have often reported using the Pavilion as a base or a greeting / meeting place between lectures and tutorials. The inclusion of toilets as valuable may reflect the lack of such facilities in some other engineering buildings, particularly the lack of these facilities for women.

It is interesting to note that clearly the least valuable features were storage spaces, projectors, whiteboards and clubs and societies' spaces. The addition of whiteboards and projectors in the space was thought to enhance group learning, however in interviews many students have stated they have never used them and those that have only rarely. For projectors this can be an issue of how to use them and for whiteboards a problem mentioned was the lack of writing equipment.

Conclusion

What students' value in a learning space was uncertain before this work. What students' value in a space is important as providing valued facilities could encourage use of the space. This research provides clear evidence that students value Wi-Fi the most within a learning space, yet it does not detail why such a feature is highly valued relative to other features. In particular features specifically designed for use in a learning space such as group working areas, whiteboards and projectors, all of which are tools to encourage collaborative learning are valued less, and greatly so in the case of whiteboards and projectors, than Wi-Fi. Nor does this research provide an explanation for the value ascribed to any of the features in the Pavilion space. The peculiarity of ubiquitous Wi-Fi being the most valued feature of a learning space suggests that further examination of how and why students value things would be a great benefit for understanding student behavior in more detail.

Regardless of reasons why, this information is of use to designers of learning spaces, in that the most valuable feature according to students will be something that was likely to be included anyway; Wi-Fi. Of least value are features such as projectors, whiteboards and storage spaces, such items could and should be replaced by more valuable features such as group work areas. Also important to students are basic facilities such as toilets and individual work spaces. The value ascribed to these features may reflect the changing nature of student behavior and demographics, with more time spent on campus and more women engineers. Making a space exclusive use is another valuable feature of a learning space and could be easily implemented. Not so easily implemented would be the location of the space.

This research raises a number of questions including; how are the features of other spaces on campus valued differently? Do engineering students value features differently? It is assume that facilities with valuable features are frequently used but is that the case?

The next step in this research project is to investigate the question arising from the fact that Wi-Fi is the most valuable feature in this space, which is what are the value systems or judgments that students are using when assessing these features?

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