Designing Learning Spaces for Effective Learning

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ABSTRACT *The connections between the design and use of space in higher education, and the production of teaching and learning, and of research, are not well understood. This study reports the developmental steps prior building the learning spaces in Universiti Sains Islam Malaysia (USIM). Space issues in higher education have usually been considered either in the context of space planning (the aim of which is to provide appropriate amounts of space for defined uses, and to maximise its use once provided) or as part of campus planning and building design. The findings report the level of design effectiveness of the learning spaces in USIM. The recommendation from learning space users to be utilised on the design improvement for the next learning spaces in USIM will be reported in this study.*

Keywords: Development Processes, Learning Spaces, Universiti Sains Islam Malaysia, Ubiquitous Learning

Introduction

Higher education is in a constant change and in interaction with its surrounding environment as are the humans involved. A part of this is the digitalization and the opportunities and challenges it offers. The digitalization era is emerging and all educators in higher education today are more or less involved in activities where digitalization plays a passive or active role. Digitalization could be something just occurring at random or carefully tailored to a situation.

As educators, what various aspects are on our minds when planning a course, module, or a program? When planning for learning at program level in the health sciences, most teachers would probably agree on that the intention and main concern is to develop knowledge, skills, and abilities required within the profession. On a more concrete level, as teachers, we need to care about the intended learning outcomes, teaching and learning approaches, literature, and other resources needed.

The integration of knowledge, skills, and abilities required in the professions support the use of active learning approaches early on, where meaningful learning promoting a deeper understanding is a corner stone (Mayer, 2002). This maybe

reflected by the use of a socio-constructivist approach and learning activities such as problem-based learning or case methods. Both methods used long before the opportunities to add digital support to learning were thought of. These methods promote student interaction and prompt the integration of knowledge and theory by authentic scenarios to explain or manage situations (Knobloch, 2003). The main approach used (such as PBL) should also define or be supported by the approach used in other learning activities to assure alignment and rationale from the students' learning perspective.

In addition to the learning activity itself, we as teachers also need to take responsibility for the learning spaces, on campus, at hospitals, and the virtual space. Lately, increased attention has been brought to how we design not only our learning tasks but also learning spaces in higher education. The learning spaces can be defined as the spaces created to support, facilitate, stimulate, or enhance learning and teaching (Unge et al., 2018).

Review of Literature

Learning Space Design and Interactive Learning

The study of learning spaces in higher education has not historically attracted a great deal of attention from scholars or researchers; the work of higher education has, implicitly, generally been considered as taking place independently of the spaces in which it was located. In contrast with the schools' sector, where the design of learning spaces has been a continuing preoccupation (Clark 2002), several standard texts on teaching and learning in higher education for example Light and Cox (2001) do not mention the nature of learning spaces, even in passing.

In addition to the physical spaces, during the past 15 years, the use of e-learning has increased rapidly and could now be described as various digital learning spaces. E-learning offers opportunities to be utilized to facilitate class administration but also to promote learning and add new learning spaces. We would thereby argue that when we discuss e-learning, it is actually learning with the 'e' as a label of indication that the learning is intended to be supported by a digital learning space.

In work which specifically highlights 'space' or 'environment', the meaning is usually related to the ways in which, teaching and learning are conceptualised or organised, rather than to do with physical arrangements. Instead, consideration of space in higher education has commonly taken place either in the context of space planning, or as part of campus master-planning and architecture, rather than being seen as a resource to be managed as an integral part of teaching and learning, and research, activities. More recently, the idea of strategic planning of the university estate has emerged, linking decisions about the estate to wider issues of institutional strategy, but here the dominant concerns have been ones of space utilisation and financial effectiveness (Higher Education Funding Council for England 2000).

Active classroom designs that facilitate interaction between faculty and students have been successful in improving student learning outcomes (Cox, 2011). Experimental classroom designs that feature innovative use of furniture, such as swivel chairs and tables on gliders (Rands & Gansemer-Topf, 2017), tablet desks on gliders (Henshaw & Reubens, 2014), and swivel seat desks (Henshaw, Edwards, & Bagley, 2011) have shown to increase classroom participation and engagement by allowing students to form small groups. McArthur (2015) found that classrooms featuring swivel chairs and tables on gliders, while heavily moderated by the instructor, substantially influence student learning. Too, roundtable classrooms facilitate dialogue and community building among students.

At many campuses, the classrooms available maybe a constraint when wanting to develop learning activities. The physical space is often not readily adaptable. In order to expand the operating learning space for us and for our students, the digital space maybe the one at our disposal. The question to be raised is then how the spaces are aligned to the intended purposes. To be coherent with our intentions, we need to take support in the same learning theories regarding the space, as we do when designing curricula.

The emergent literature on learning spaces in higher education articulates a desire to better engage academics and other stakeholders in the conceptualisation, design and development of university spaces. Learning spaces in Universiti Sains Islam Malaysia (USIM), were erected to promote learning and teaching in a more dynamic way, where the learning process should take place both in and outside of classroom wall. It also meant to provide conducive space for informal academic discussions, debates and idea generation, and in the long run will help in the development of critical, creative and courage values among USIM students.

To examine these issues, the researchers consider a selection of proposed mechanisms that aim to support students' wider participation in learning spaces design processes. The mechanisms examined take the form of activities where the object appears to be, in turn: consensus and ownership (vis-à-vis innovative spaces), the local experiences of space users, institutional processes (and their spatial implications), the development of design briefs and academic value in institutional identity.

Harvey and Kenyon (2013) argued that learning space planning is central for the success of higher education institutions. Studies of new classroom designs are producing helpful evidence that intentionally designed learning spaces improve classroom participation and learning outcomes. To address the need for more research, this study sought to describe experiences in an active learning, roundtable classroom in order to determine whether students and/or faculty perceive that they are effective in promoting interactive learning.

The initial proposal for USIM learning spaces was prepared by the Global Open Access Learning Centre, Immersive Technology and Quality Assurance (GOAL ITQAN), USIM on July 9, 2015. This proposal was presented to the Deputy Vice Chancellor (Academic & International) for initial feedback and improvement. The first learning spaces discussion was held on July 13, 2015, organised by the Centre

for Information Technology (PTM). Subsequently GOAL ITQAN has conducted site visit together with the administrative members of the faculties involved on 10 and 11 August 2015 to identify several areas suitable for the development of learning space.
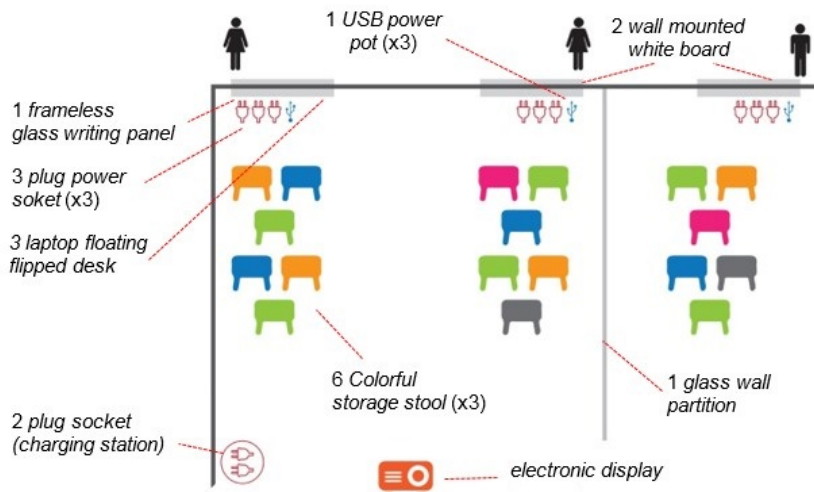

Figure 1. Design of a Learning Space

Following deliberate discussion, 4 units of learning spaces have been built at:
i)   Faculty of Leadership and Management (FKP).
ii)   Faculty of Quranic and Sunnah Studies (FPQS).
iii)   Faculty of Sharia and Law (FSU).
iv)   Faculty of Medicine and Health Sciences (FPSK).

Objectives
The objectives of this study:
i.   To investigate the level of design effectiveness of the learning spaces in USIM.
iii.   To gather the recommendation from learning space users to be utilised on the design improvement for the next learning spaces in USIM.

Materials and Methods
Research Design
     Survey were grouped into 4 main parts namely the demographical data comprised of 5 questions, the design effectiveness of the learning spaces comprised of 7 questions, while the relevancy of learning spaces towards educational activities represented by 6 questions. The remaining 3 questions reflect the general acceptability of the available learning spaces to the respondents.

This survey uses 5 Likert scale questionnaire, with the qualitative values is defined as below:
1. Value A: 1 represents 'Satisfactory' level, 2 for 'Poor', 3 for 'Fair', 4 for 'Good',

and 5 for 'Very Good'.

2. Value B: 1 represents 'Very not suitable', 2 as 'Not suitable', 3 as 'Fair', 4 for 'Suitable', and 5 for 'Very Suitable'

These numbers are supported by an open-ended question asking for recommendations to improve the available learning spaces. The ability to ask open-ended questions is very important in many vocations, including education, counselling, mediation, sales, investigative work and journalism. Open-ended questions used in this study were designed to encourage a full, meaningful answer using the subject's own knowledge and/or feelings. It is the opposite of a closed-ended question, which encourages a short or single-word answer. Open-ended questions also tend to be more objective and less leading than closed-ended questions.

Sample and Data Collection

This study set open to all USIM students, academics, and administrative staff. Targeted participants are those who have utilised the learning spaces. Data collection were conducted using Google Form and was completed via online. Link to this form was circulated via several channels; e-mails, printed posters and online banners. E-mails were sent via USIM staff mail and general info mail (infoPRO) twice on 21st June 2016 and 19th August 2016, while printed poster with the URL and QR code linked to the online form were display on the learning spaces itself. Online banners were display in the GOAL-ITQAN, and faculties official website, and also on USIM learning management system (GOALS).

Findings

These results are based on 38 respondents who completed all the survey items. The determination of sampling size in the formative evaluation of small group and field user testing sessions was done based on Tessmer (2013) who has mentioned the usability of less than 20 participants in small groups evaluation and between 20 and 30 participants for field test evaluation. The data retrieved are then tabulate according to the objectives of this survey bearing the highest and lowest values of the data.

The demographical data of the respondents are determined according to the gender, age, the individual role in the faculty, and faculty they represent (Table 1).

Table 1

Demographic Information of Students

Gender:	Age:				
Male	20	%53	25-13	16	%42
Female	18	%47	38-26	11	%29
			51-39	9	%24
			65-52	2	%5
	38	%100		38	%100

Table 2

Demographic Information of Students

Position			Faculty		
Academic	22	%58	FEM	1	%3
Student	16	%42	FKP	10	%26
Staff	0		FPBU	4	%11
			FPQS	9	%24
			FST	7	%18
			FSU	3	%8
			Tamhidi	2	%5
			FKAB	1	%3
			FPSK	1	%3
	38	%100		38	%100

The design effectiveness of the learning space was measured according to the ambience, colour of the wall and furniture, tools (writing board, stools, and wall plug), positions of the tools, lighting, location of the learning space, and conduciveness. The results are shown in Table 3 to Table 9.

Table 3

The design effectiveness

	Ambience %	Colour of wall %	Tools %	Tool position %	Lighting %	Location %	Conduciveness %
1. Satisfactory	3	3	3	3	5	3	3
2. Poor	21	21	24	24	21	26	29
3. Fair	29	13	13	21	26	26	24
4. Good	29	34	34	34	34	26	32
5. Very Good	18	29	26	18	13	18	13
	100	100	100	100	100	100	100

The levels of relevancies provided by the learning spaces toward educational activities were measured according to the suitability of these spaces for group discussion, tutorial session, presentation, and group activities. The relevancies were also inferred by the participations of individuals during the activities, and the most common time of utilisations. Respondents can answer more than once for these 2 questions. The results are shown in Table 4 and 5.

Table 4

The levels of relevancies

	Relevancy for group discussion %	Relevancy for tutorial sessions %	Relevancy for presentations %	Relevancy for group activities %
1. Very not suitable	8	16	16	8
2. Not suitable	16	21	18	11
3. Fair	13	18	18	21
4. Suitable	37	29	34	29
5. Very Suitable	26	13	13	32
	100	100	100	100

Table 5

Most common time of learning spaces utilisations Overview of Existing Marking and Managing Systems

	Number	Percentage %
Morning	17	30
Afternoon	17	30
Evening	17	30
Late evening	4	7
Night	2	4
	57	100

The general acceptability of the available and future learning spaces was measured by asking do they wish to see more learning spaces to be built in USIM, is it the right time to have learning space in USIM, and overall rating (from 1-5) for USIM learning spaces. The results are shown in Table 6 to Table 8.

Table 6

Learning spaces being built in USIM

	Number	Percentage %
Yes	32	84
No	6	16
Don't Know	0	0
	38	100

Table 7
Time to have learning space in USIM operating system Game will not be able to mark it

	Number	Percentage %
Yes	33	87
No	5	13
Don't Know	0	0
	38	100

Table 8
Overall rating for USIM learning space

	Number	Percentage %
1 lowest	8	21
2 low	3	8
3 neutral	9	24
4 high	12	32
5 highest	6	16
	38	100

The result of open-ended question allows the researchers to gather more feedbacks from the learning spaces visitors and users (translated from the real transcripts) as shown on Table 9.

Table 9
The result of open-ended question

	Feedback
1.	Students need more conducive learning spaces with WiFi
2.	USIM needs to have learning space because it will help students to discuss.
3.	USIM should help on the budget for any faculty that still does not have any learning space like in FST. The students in FST have no proper room for discussion while waiting for the next lecture like in FPQS where they have proper room with bench for students to study and discuss.
4.	Provide a computer and printer for the use of all students. It is easier for the learning activities and session.
5.	Is there any learning space as above picture provided in Tamhidi Centre? Our students at the moment are using the marble benches outside of the cafeteria to conduct group meetings.
6.	Sometime the discussion turns out too noisy.

7.	Improve the Colour of the wall and furniture. I would recommend the use of glass door/divider, lots of white space with wall skirting. 2-1 colours on borders. Use classy wall colours. Best to consult some interior designing experts or at least staff at architecture program.
8.	A more up to date learning spaces are required in USIM in support of OBE and interactive teaching and learning activities. Learning spaces of private institutions/universities/colleges can be of examples.
9.	Build a divider to separate each learning space. Provide 1 or 2 power outlet for projector/multimedia usage.
10.	Make it more friendly and practical for tutorial as the picture above does not display that at all. Not child-like colour. I mean the colour pallets above are not that suitable as it seems for kindergarten's students instead of higher education's students.
11.	Maybe we need to have more power points (sockets) at the learning space. Maybe we need to have more learning space in USIM; e.g. at every faculty/departments (if possible)
12.	I hope this learning space can press students to preparing more before they attend to lectures or tutorials.
13.	Probably could have this learning spaces in library as well. It would be more conducive (air con). I've visited this type of learning space in library in one of the UA in Malaysia (UTHM) and it is very convenient and conducive. Plus, the sitting arrangement could be vary (boardroom style, herringbone style, U-shape, hollow square, Japanese style etc) according to each room or spaces. Plus, would appreciate if there is a fixed LCD at that particular space because sometimes we need to use it and would be difficult to bring one since we have to loan it from the faculty and if we are not from that particular faculty the process of borrowing one would be a nuisance. Furthermore, it would be good to give tables and more spaces to write on (more whiteboard), would also be good if the learning space is not that formal (different from class setting).

Discussion

53% (20/38) of the respondents are male and 47% (18/38) are female, with majority of the respondents aged from 13-25 represented by 42% (16/38), while the smallest proportion of respondents aged 52-65 with 5% (2/38). This result may suggest that majority of learning spaces users are younger audients aged below 25 years old, which might also logical to assume that this number represent the students.

53% (22/38) of the respondents are academics staff of the faculties, while 47% (16/38) of the respondents are students. The equitable numbers might suggest that the learning spaces were used both by the students and the academics.

High number of the respondents are from the Faculty of Leadership and Management (FKP); 26% (10/38), along with the Faculty of Quranic and Sunnah Studies (FPQS); 24% (9/38) is accord to the location of the two available learning spaces one in each faculty. The rest of the respondents come from 7 other faculties comprised by range of number from 3% (1 respondent) to 18% (7 respondents).

Studying the data on the design effectiveness on both learning spaces, most of the numbers are consider equal should we look at the cumulative percentages of low and high scores. Relating this number to the open-ended question, most significant different between high score to low score is on the colour of the wall and the furniture. While the number of high scores is 63% compared to 37% of low scores, respondents had suggested that the bright and cheerful colours are not suitable for the higher education populations, and look childish. More simplistic, open concept of modern design might be the proper blend between vibrancy and sophistication.

Intromitting input from architectural students is also a good suggestion that will be taken into account in the designing process of the next learning spaces. Positioning the learning spaces in a more open area will definitely help in better air ventilations, and will tackle the high temperature problems during mid-day. Open spaces will also allow for more natural lighting which is beneficial in productivity improvement as deposited by Edwards & Torcellini (2002). Considering financial limitation, ethnographical insight, and security issues, some of the suggestion will be put on hold although it is a beneficial addition to the concept of future learning spaces such as to provide computer and printer at the learning spaces, or to add fixed LCD.

Dissecting the data on the relevancy of academic activities to be conducted at learning space, highest score is for group discussion and activities which bear 63%, and 61%. These data might suggest that the design effectiveness will increase as the focus of learning spaces is to cater for group activities to vary the sitting arrangement such as in the form of boardroom style, herringbone style, U-shape, hollow square, or even Japanese style. The use of moveable table and chair that can fit into several configurations will help this purpose especially in a dynamic academicals activities. The time of the use are majority during the day light with only 11% (6/38) of respondent use this spaces at night and late evening. This might suggest that faculty member utilised this spaces during waiting hours for lecture or students might also using this area while utilising the internet connection of the space.

Polling out the numbers on the general acceptability of the available and future learning spaces, 87% (33/38) of the respondents agree for more learning spaces in the future, and 87% agree that the development of learning spaces is in time to support vast learning style in higher education. Relating the high acceptability number to the average rating of the available learning space, this might strongly suggest that the learning spaces design need to be relooked and carefully detailed with the support of pedagogical expertise, psychological input, and architectural insight.

Conclusion

In this paper, we have begun to lay a foundation for research investigation on the most effective and efficient design of learning spaces in university to cater for dynamic learning activities. Our finding suggest that well designed learning spaces is necessary in each faculty as indicated from the high percentage of respondent

answering, "yes should they wish to have more learning space being built in USIM". For future research, we should seek to understand more about the correlation of student time spend in the university to the utilisation of learning spaces, and the amount of group activities to student understanding in lecture session. This practice is in line with the deployment of hybrid learning techniques, flipped classroom methods, or event based learning that will be the basis on pedagogical approach toward the 21st century learners.

With the right approach, the entire USIM campus can become a learning space. Our growing understanding of how people learn affects the configuration of learning spaces and the technologies supporting them. The constructivist paradigm supplants knowledge transmission as the guide for learning spaces, encouraging more thoughtful space planning. It also necessitates a proactive process to ensure that these learning spaces deliver value.

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