



Learning Style Preferences of Medical Students in Perdana University-Royal College of Surgeons in Ireland School of Medicine, Malaysia

Kye Mon Min Swe^{1*}, Chai Ai Wen¹, Sathish Jaya Kumar¹ and Amit Bhardwaj²

¹Perdana University-Royal College of Surgeons in Ireland, School of Medicine, Malaysia.
²Hospital Sultan Ismail, Johor, Malaysia.

Authors' contributions

This work was carried out in collaboration between all authors. Authors KMMS and AB designed the study. Author KMMS wrote the protocol and the first draft of the manuscript. Authors CAW and SJK managed the literature searches. Authors CAW and KMMS managed the analyses of the study. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2016/29089

Editor(s):

(1) S. U. Fuhong, ICU Laboratory, Erasme Hospital, Free University Brussels, Brussels, Belgium.

Reviewers:

- (1) B. Chametzky, Ozarks Technical Community College, USA.
(2) Maria Lucia S. G. Jorge, Universidade Federal do Paraná- UFPR, Brazil.
(3) Heethal Jaiprakash, MAHSA University, Malaysia.

Complete Peer review History: <http://www.sciencedomain.org/review-history/16507>

Original Research Article

Received 22nd August 2016
Accepted 27th September 2016
Published 11th October 2016

ABSTRACT

Background: Learning styles referred to individuals' preferred methods to gather, process, interpret, organize and analyses information. The visual, aural, read/write and kinesthetic (VARK) learning inventory developed by Neil Fleming provides learners with a profile of their preferred modes of taking in information.

Aims: The aim of this study is to assess the learning style preferences of medical students in (PU-RCSI) and objectives are to compare learning style preference difference in terms of gender and level of medical education (pre-clinical year versus clinical year).

Study Design: University based cross sectional study.

Place and Duration of Study: The study was conducted at Perdana University - Royal College of Surgeons in Ireland School of Medicine (PU-RCSI), Malaysia from April to June 2016. VARK inventory (Version 7.1) which was used to sample sensory preferences of learning with the permission of the author.

*Corresponding author: E-mail: khmoneminswe@gmail.com;

Methodology: Pretested Structured questionnaires were used for demographic information and students' preferences of different teaching-learning methods and VARK inventory (Version 7.1) was used to sample sensory preferences of learning with the permission of the author. The study protocol was approved by the Institutional Review Board. Data were analyzed by using SPSS, version 22.0.

Results: There were 259 students participated in study and majority of the participants 225(86.7%) were aged group between (21-25) and 166(64.1%) were female students. For preferred teaching style, the students enjoyed learning in small group teaching (48.6%) and bedside clinical teaching (47.9%) compare with lectures. Regarding learning style preference, most of the students 165 (63.7%) had multimodal learning style and 94 (36.3%) students preferred unimodal. Among the multimodal learners, the most preferred mode was quadri-modal 90 (34.7%), followed by bimodal 38 (14.7%) and trimodal 37 (14.3%). Of the unimodal learners, the most preferred modality was Kinesthetic.

Conclusion: The majority of PU-RCSI medical students preferred to study alone. They preferred multiple modalities with Kinesthetic being the most prevalent mode. There was no significant difference in VARK modalities in terms of gender and academic year.

Keywords: Learning style; medical students; teaching.

1. INTRODUCTION

Learning preference can be defined as the most effective and efficient modality or manner in which a learner has a natural preference to perceive process, store and recall new information [1]. Learning style is the composite of cognitive, affective and physiological characteristics that indicate how a learner perceives, interacts and responds to the learning environment. Pursuing medical education is challenging task for the medical student and it requires integration and application of knowledge, skill and attitude learnt in theory as well as in the environment of a hospital. In order to tailor teaching strategies to the needs of a particular group of students, it is important to identify student's learning preferences [2].

As medical education requires the coverage of extensive syllabus within limited time period, effective teaching should be employed as it correlates strongly with academic performance [3-4]. Besides traditional lectures, initiatives have been taken to emphasize on student-centered learning for effective teaching [3-5]. However, tailoring teaching to students' learning styles is practically impossible and has no empirical justification due to the absence of correlation between style-based instructions and academic performance. Instead, delivery of each style preference to a reasonable extent in a balance manner during instructions avoid instructions being unfair and ineffective [6].

In literature, we can find different learning styles and theories such as David Kolb's model, Peter

Honey and Alan Mumford's, Anthony Gregorc's, Cognitive approach to learning styles etc. Among them Neil Fleming's VAK/VARK is one of the most common and widely used learning styles. The visual, aural, read/write and kinesthetic (VARK) learning inventory developed by Neil Fleming provides learners with a profile of their preferred modes of taking in information. The aural (A) learners prefer to hear information. The read/write (R) learners prefer information in the form of written words while the kinesthetic (K) learners prefer hands-on, practical experience. Learners may prefer only one particular mode strongly (unimodal) or may have dual (bimodal), triple (tri-modal) or all four preferences (quadri-modal). Multimodal learners require input from different modes to fully understand a concept whereas unimodal learners usually require input in their corresponding mode only [7].

Previous studies evidenced that the knowledge on the learning styles has implications for medical students. When the students aware about their learning preferences, it will help to use appropriate learning strategies during learning and that can maximize their true potential. If the teachers aware of the overall students' learning styles, they can incorporate teaching-learning strategies to meet the students' needs. This would not only create an efficient learning environment, but it would also motivate the students to achieve academic success [8]. As a result, the aim of this study is to assess teaching and learning style preferences of medical students in Perdana University-Royal College of Surgeons in Ireland School of Medicine (PU-RCSI) Malaysia with the use of

VARK inventory questionnaire. The study also aims to compare learning style preference difference in terms of gender and level of medical education (pre-clinical year versus clinical year).

2. MATERIALS AND METHODS

A cross sectional study was conducted at Perdana University - Royal College of Surgeons in Ireland School of Medicine (PU-RCSI), Malaysia from April - June 2016. All 294 medical students of PU-RCSI (Year 1-5) in academic year 2015/2016 were invited to participate in the study.

Structured questionnaires consisting two section, general demographic information (age, gender) and students' preferences of different teaching-learning methods depending on their efficiency in first section and the second section contained the VARK inventory (Version 7.1) which was used to sample sensory preferences of learning with the permission of the author [2]. The VARK questionnaire was selected because it is concise, freely downloadable from website with satisfactory level of reliability and validity. It consists of 16 questions describing situations occur commonly in daily life with four options available as answers. Each answer represents a sensory modality preference and students can choose multiple options or leave blank any question as long as their preferred response(s) could be adequately described within the situation. Selection of answers representing the same sensory modality preference was added to obtain the score for each VARK component. Printed copies of VARK questionnaire were distributed to students in different sessions without interrupting on-going lectures. Explanation was provided and written informed consent was obtained before administration of questionnaire. Completed questionnaires were collected from respondents subsequently over the weeks. The study protocol was approved by the Institutional Review Board.

2.1 Statistical Analysis

Data was analyzed using SPSS, version 22.0. Descriptive statistics was performed to analyze students' preferences of the various VARK components, and teaching-learning methods. Mean individual VARK components scores with standard deviations were calculated. Chi square test was used to detect association between learning preferences with gender and clinical

year exposure (pre-clinical or clinical year). Comparison of mean individual VARK component scores based on gender and clinical year exposure was done using Students' t-test. Any p-value <0.05 was considered as statistically significant. The data were analyzed into VARK categories by using both the research VARK algorithm and the standard VARK algorithm by Neil D Fleming, the designer of the VARK Questionnaire.

3. RESULTS AND DISCUSSION

Among 294 students studying at PURCSI in an academic year of 2015-2016, 259 students participated in the study with response rate of (88.1%). Most of the participants were aged group between (21-25) 225(86.7%) and most of them were female students 166(64.1%). Among them 97(37.45%) were preclinical and 162(62.55%) were clinical years students. The sociodemographic character of the respondents were shown in Table 1. Regarding learning method they preferred, most of the students 222 (85.7%) preferred to study alone, 30 (11.6%) students preferred to study with best friend and 28 (10.8%) students preferred to study with a groups of friends. In terms of efficiency of teaching method, students reported learning more in small group teaching (48.6%, n=126), followed by bedside clinical teaching (47.9%), self-directed learning (24.3%) and large group lecture (12%). Around half 141(54.4%) of the students had the same learning preference since young. It was found out that the clinical students were more likely to study with a group of friends than pre-clinical students (14.1% vs 5.2%).

Table 1. Sociodemographic character of the respondents

		Frequency	Percent
Age groups	16-20 years	34	13.1
	21-25 years	225	86.9
Gender	Male	93	35.9
	Female	166	64.1
Academic years	Preclinical	97	37.45
	Clinical	162	62.55
Total		259	100

3.1 VARK Modalities and Scores

The majority 165 (63.7%) of the students had multimodal learning style with only 94 (36.3%) students being unimodal (Fig. 1).

Table 2. Information related with learning preferences

		Frequency	Percent
Study companion preference	Preferred to study alone	222	85.7
	Preferred to study with best friends	30	11.6
	Preferred to study with groups of friends	28	10.8
Total		280	108.1
Change in learning preference	Always same since young	141	54.4
	Different depend on the age	118	45.6
Total		259	100

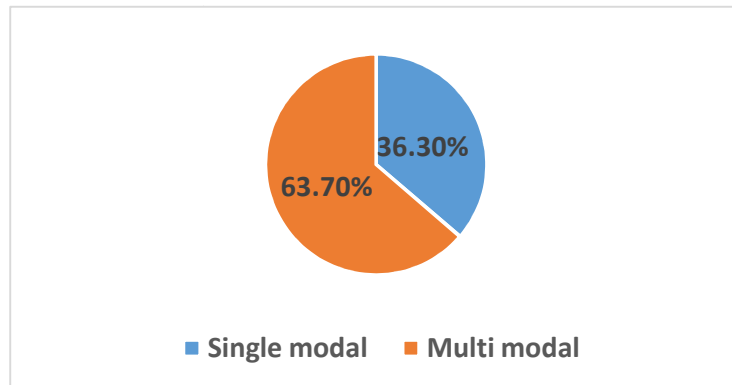


Fig. 1. The percentages of students with singular and multimodal learning preferences (Multimodal consists of bimodal, trimodal and quadrimodal learning preferences)

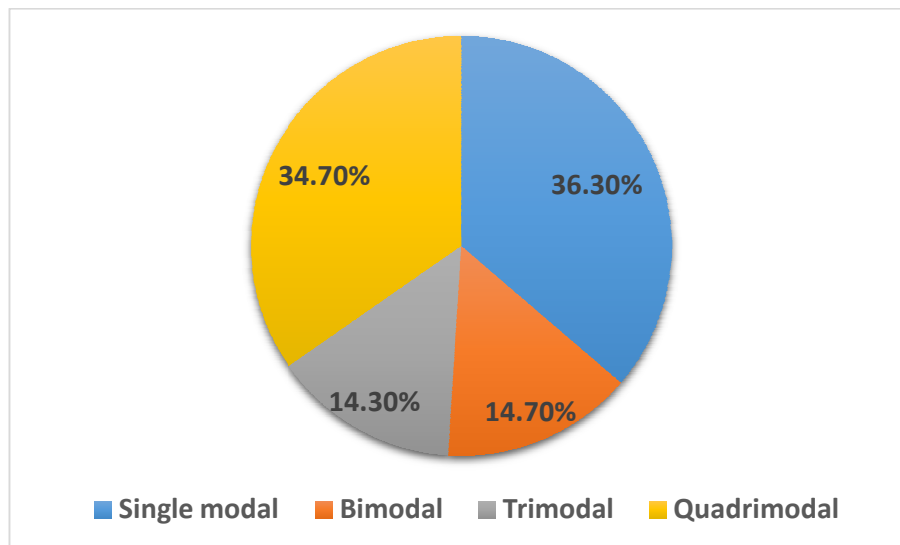


Fig. 2. The percentages of students with singular and different types of multimodal learning preferences

Among the multimodal learners, the most preferred mode was quadrimodal 90 (34.7%), followed by bimodal 38 (14.7%) and trimodal 37 (14.3%). (Fig. 2) of the unimodal learners, the most preferred modality was Kinesthetic as shown in (Fig. 3). Overall, the individual VARK

components with the highest mean score was Kinesthetic (7.18, n=217) as shown in Table 3.

There was no significant difference in VARK modalities in terms of gender and academic year as shown in Tables 4 and 5 respectively. A

significant association was seen between academic year and preference of studying with groups of friends, Chi square=5.146, p=0.023.

We educators acknowledged that importance of understanding learning style preference of students played a role in method of delivery of teaching effectively and efficiently. This study mainly aimed to assess the learning style preferences of PU-RCSI medical students but we studied the preference of teaching method which we found out the students preferred small groups teaching. Most (85.7%) students preferred to study alone which was also seen among medical students of AIMST University, Malaysia (71%) [9]. However, clinical students were more likely to study with a group of friends than pre-clinical students (14.1% vs 5.2%). This may be due to the approach of PU-RCSI dividing clinical students into smaller groups for all teachings throughout the semester, and hence promoting group learning.

Regarding our main objectives, learning style preferences, we found out that two-third of the students (63.7%) were multimodal learners with quadri-modal being the most prevalent (34.7%).

This was consistent with multiple studies conducted in other regions [3,10-18].

However, some studies also reported having predominantly unimodal learners, [9,19-20] or bimodal [2,21,22] and tri-modal [6,23,24] learners among the multimodal learners. Among the unimodal learners, most students preferred kinesthetic mode (17.4%) followed by aural mode (8%, n=259). Other studies had reported either kinesthetic learners [5,6,15,20,21] or aural learners [3,18,22,24] as the most prevalent unimodal learners. These variations seen could be due to different teaching methods used before entering medical education and early exposure to clinical teaching in the medical curriculum [2].

Table 3. Mean scores and standard deviation of individual VARK components of 259 PU-RCSI medical students

VAR K component	Mean (standard deviation)
Kinesthetic	7.18 (3.134)
Aural	6.16 (3.079)
Read/Write	5.39 (3.078)
Visual	5.39 (3.078)

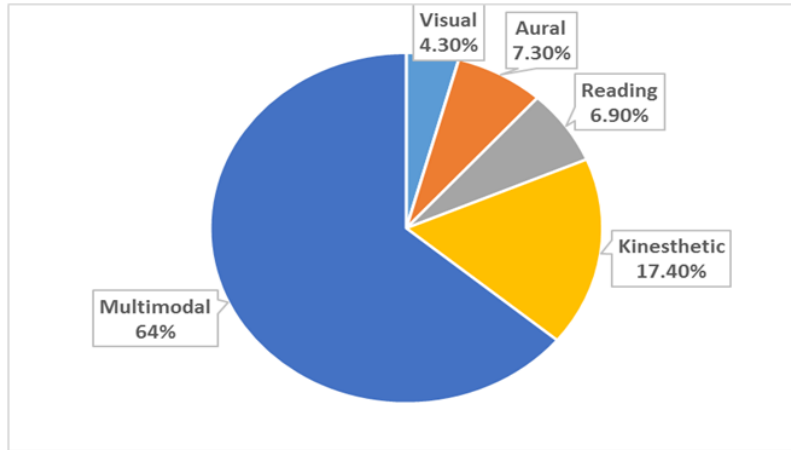


Fig. 3. The percentages of students showing different types of single modal and multimodal learning preferences

Table 4. Relation between gender and learning style preference among PU-RCSI medical students

Gender	VAR K modalities				
	Unimodal	Bimodal	Trimodal	Quadrimodal	
Male	36 (38.3%)	17 (44.7%)	13 (35.1%)	27 (30.0%)	χ ² =2.895 Df=3 p=0.408
Female	58 (61.7%)	21 (55.3%)	24 (64.9%)	63 (70.0%)	
Total	94 (100%)	38 (100%)	37 (100%)	90 (100%)	

Table 5. Relation between academic year and learning style preference among PU-RCSI medical students

Academic year	VARK modalities				
	Unimodal	Bimodal	Tri-modal	Quadri-modal	
Pre-clinical	37 (39.4%)	11 (28.9%)	14 (37.8%)	35 (38.9%)	$\chi^2=1.401$ Df=3 p=0.705
Clinical	57 (60.6%)	27 (71.1%)	23 (62.2%)	55 (61.1%)	
Total	94 (100%)	38 (100%)	37 (100%)	90 (100%)	

There was no significant gender difference seen in learning style preferences. This was contradicted by other studies showing that female had more diverse multimodal learning preferences [2,13,25] while male students were more likely to preferred kinesthetic mode [19,20]. However, more studies showed no significant gender difference in terms of learning style preferences [3,6,14,18,20,24]. There was also no significant difference in VARK modalities in terms of academic year. This was probably due to the early exposure of Year 1 & 2 students in PU-RCSI to clinical teachings according to the curriculum.

Most students preferred kinesthetic modal followed by aural, reading and visual the least. The wide prevalence of kinesthetic learners may be due to the change from didactic learning to practicality and self-learning which were emphasized by medical education [22]. Kinesthetic learners preferred active learning strategies such as small group discussions and problem based learning [5] while aural learners prefer passive learning strategies such as lectures [5]. Learning process may be adversely affected when learning style and teaching did not match [3,5]. Undergraduate medical students of a study achieved higher scores when the course instruction matched with their learning style [26]. Hence, different strategies especially kinesthetic and aural may be incorporated in teaching method to meet students' preference in PU-RCSI.

3.2 Implication for Students

As most of the students prefer to study alone, study places such as the library may be designed in such a way where individual quiet personal spaces were available with at least the illusion of privacy [27]. Students' perception of their own VARK preferences may be contrary to their actual preference [3]. Increasing awareness of students regarding their own learning style and providing them with relevant strategies empower the students and may enhance the learning experience [21].

3.3 Study Limitation

The sample consists of medical students from PU-RCSI only and thus the results may not be generalizable to represent other medical universities locally or globally. The current study only assessed an aspect of learning preferences. There was little evidence supporting effectiveness of learning style as demonstration of improved academic performance due to change of teaching method had been hard due to lack of a definition for learning and methods to measure it [3,8,16].

4. CONCLUSION

The majority of PU-RCSI medical students preferred multiple modalities with Kinesthetic being the most prevalent mode. There was no significant difference in VARK modalities in terms of gender and academic year.

CONSENT

All authors declare that written informed consent was obtained from the participants for publication of this report and accompanying images.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee (Institutional Review Board, Perdana University) and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

ACKNOWLEDGEMENT

Author would like to acknowledge Neil D Fleming, the designer of the VARK Questionnaire for permitting us to use questionnaires and for his contribution in analysis.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Fleming NB, Baume D. Learning style again: VARKing up the right tree!. Available:<http://www.vark-learn.com/documents/educational%20developmentments.pdf> [Cited on 2016 Apr]
2. Kharb P, Samanta PP, Jindal M, Singh V. The learning styles and the preferred teaching-learning strategies of first year medical students. *Journal of clinical and diagnostic research: JCDR*. 2013;7(6): 1089–92.
3. Rathnakar P, Urval, Ashwin Kamath, Sheetal Ullal, Ashok K. Shenoy, Nandita Shenoy, Laxminarayana A. Udupa. Assessment of learning styles of undergraduate medical students using the VARK questionnaire and the influence of sex and academic performance. *Advances in Physiology Education*. 2014;38(3):216–20.
4. Ismail S, Rahman NA, Mohamad N, Jusoh N, Hood A, Arif L, et al. Preference of teaching and learning methods in a new medical school of Malaysia. *Journal of Applied Pharmaceutical Science*. 2014; 4(2):48.
5. Prithishkumar I, Michael S. Understanding your student: Using the VARK model. *Journal of Postgraduate Medicine*. 2014; 60(2):183–6.
6. Felder RM. Are learning styles invalid? (Hint: No!). *On-course Newsletter*. 2010; 1–7.
7. Fleming ND. I'm different; not dumb. Modes of presentation (VARK) in the tertiary classroom. In: *Research and Development in Higher Education, Proceedings of the 1995 Annual Conference of the Higher Education and Research Development Society of Australasia (HERDSA), HERDSA* [Internet]. 1995;308–13. Available:http://www2.coga.edu/TutorTrain/files/different_not_dumb.pdf [Cited 2016 May 8].
8. Rourke BP, Ahmed SA, Collins DW, Hayman-Abello WE, Warriner BP. Child clinical/pediatric neuropsychology: Some recent advances. *Clin Psychol*. 2002;53: 309-39.
9. Kumar L, Voralu K, Pani S. Predominant learning styles adopted by AIMST University students in Malaysia. *South East Asian Journal of Medical Education* [Internet]. 2009;3:1. Available:<http://thailand.digitaljournals.org/index.php/SEAJME/article/view/12232>
10. Robert J. Murphy, Sarah A. Gray, Sorin R. Straja, Meredith C. Bogert. Student learning preferences and teaching implications. *Journal of Dental Education*. 2004;68(8):859–66.
11. Leite WL, Svinicki M, Shi Y. Attempted validation of the scores of the VARK: Learning styles inventory with multitrait-multimethod confirmatory factor analysis models. *Educational and Psychological Measurement*. 2010;70(2):323–39.
12. Gardner JN, Jewler AJ, Barefoot BO. *Your college experience: Strategies for success*. Cengage Learning. 2008;355.
13. Mon A, Fatini A, Ye C, Barakat M. Learning style preferences among pre-clinical medical students. *Journal of Medical & Allied Sciences* [Internet]; 2014. Available:<http://search.proquest.com/openview/75367a19d98cc0dab29c5443dbb3fc79/1?pq-origsite=gscholar>
14. Kulkarni N, Patil P, Javali S. Learning styles preferences of first year medical students of JN Medical College Belgaum: A single institute experience in Karnataka, India. *National Journal of Integrated Research in Medicine* [Internet]; 2015. Available:<http://www.ejmanager.com/mnstepms/18/18-1435595851.pdf>
15. Heidi L. Lujan, Stephen E. DiCarlo. First-year medical students prefer multiple learning styles. *AJP: Advances in Physiology Education*. 2006;30(1):13–6.
16. Lasitha Samarakoon, Tharanga Fernando, Chaturaka Rodrigo, Senaka Rajapakse. Learning styles and approaches to learning among medical undergraduates and postgraduates. *BMC Medical Education*. 2013;13(1):1–6.
17. Brumpton K, Kitchener S, Sweet L. Learning styles in vertically integrated teaching. *The Clinical Teacher* [Internet]; 2013. Available:<http://dx.doi.org/10.1111/tct.12024>
18. Daud S, Kashif R, Chaudhry A. Learning styles of medical students. *South East Asian Journal of Medical Education* [Internet]. 2014;8. Available:<http://imsear.li.mahidol.ac.th/bitstream/123456789/166188/1/seajme2014v8n1p40.pdf>

19. Almigbal T. Relationship between the learning style preferences of medical students and academic achievement. Saudi Medical Journal [Internet]; 2015. Available:<http://dx.doi.org/10.15537/smj.2015.3.10320>
20. Siaw-Cheok Liew, Jagmohni Sidhu, Ankur Barua. The relationship between learning preferences (styles and approaches) and learning outcomes among pre-clinical undergraduate medical students. BMC Medical Education. 2015; 15(1):44.
21. Nirmal Kumar Sinha, Amit Bhardwaj, Simerjit Singh, Adinegara Lutfi Abas. Learning preferences of clinical students: A study in a Malaysian medical college. International Journal of Medicine and Public Health. 2013;3(1):60.
22. Mustafa S, Farooque I, Mohammad F. Learning style preferences of first year undergraduate medical students. Journal of Evidence based Medicine and Healthcare [Internet]. 2014;1:11. Available: www.jebmh.com
23. Ayesha Nuzhat, Raneem Osama Salem, Nasser Al Hamdan, Nada Ashour. Gender differences in learning styles and academic performance of medical students in Saudi Arabia. Medical Teacher [Internet]. 2013;35(sup1). Available:<http://dx.doi.org/10.3109/0142159X.2013.765545>
24. Ayesha Nuzhat, Raneem O. Salem, Mohammed S. A. Quadri, Nasir Al-Hamdan. Learning style preferences of medical students: A single-institute experience from Saudi Arabia. International Journal of Medical Education. 2011;2:70–3.
25. Slater JA, Lujan HL, DiCarlo SE. Does gender influence learning style preferences of first-year medical students? AJP: Advances in Physiology Education. 2007; 31(4):336–42.
26. Kumar L, Pani SP, Sethuraman KR. Association of kinesthetic and read-write learner with deep approach learning and academic achievement. Canadian Medical Education Journal [Internet]. 2011;2:1. Available: <http://dx.doi.org/10.1111/j.1365-2923.2010.03842.x>
27. Andrews C, Wright S, Raskin H. Library learning spaces: Investigating libraries and investing in student feedback. Journal of Library Administration [Internet]; 2015. Available:<http://dx.doi.org/10.1080/01930826.2015.1105556>

© 2016 Swe et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

*The peer review history for this paper can be accessed here:
<http://sciencedomain.org/review-history/16507>*