Teaching Orthoptics to Ophthalmology Residents: A Needs Assessment Study

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ABSTRACT

Aims: This is a needs assessment study with the primary aim of examining the relevance of orthoptic tests to ophthalmology residents' practice, and their confidence in performing and interpreting the tests, to establish the need for further orthoptic education during residency.

Method: Participants were Years 1 to 5 ophthalmology residents from a tertiary hospital training program where no formal orthoptic training is offered. An online nine-question survey was conducted over four weeks to assess residents' perceptions of the relevance of orthoptic tests to their practice, their confidence in performing and interpreting ten common orthoptic tests, and preferences for curriculum content and delivery. Responses consisted of 5-point Likert scale options and selection of tests out of ten options. Data were analysed by descriptive statistics using median and range.

Results: Of 31 eligible residents, 23 (74%) responded. Relevance to practice was rated high among all respondents (median rating 4 out of 5, range 2 to 5) for all ten tests. Self-rated confidence in test performance was generally low (median rating 3, range 1 to 5). Confidence in test interpretation was higher (median rating 4, range 1 to 5). Respondents selected five tests for which they desired further training. Preference for e-learning was high, with 70% considering this modality 'very useful'.

Conclusion: Ophthalmology residents consider orthoptics to be relevant to their practice. Baseline self-reported confidence in test performance is low. They express a desire for further orthoptic training and e-learning is an acceptable teaching format.

Keywords: needs assessment, ophthalmology residents, orthoptic tests, e-learning, test confidence

INTRODUCTION

Orthoptic competencies are not well-defined among the required competencies for ophthalmology residency graduation.[1-4] Orthoptics is a field that specialises in the evaluation of ocular misalignments and binocular functions. The ophthalmology residency program trains doctors who have completed their undergraduate medical school, in the field of ophthalmology. The Royal College of Ophthalmologists residency curriculum lists performing 'orthoptic assessment' as an important learning outcome without defining curricular requirements to achieve competency.[1] There is a need for ophthalmology residents to graduate with the competencies of both performing and interpreting orthoptic tests to enable best clinical treatment decisions.[2,5] In the orthoptists' training curriculum, orthoptic topics are taught in multiple ways including didactics, hands-on skill practice with feedback and e-learning.[5,6] E-learning, defined as 'knowledge acquisition using electronic media and information technologies',[7,8] is already recommended for teaching in ophthalmology residency.[9,10] It has been demonstrated to be more effective and satisfying for learners than traditional didactic methods. This potentially translates into improved motivation and performance with better retention rates.[7-11] In addition, e-learning is asynchronous, can utilise multimedia including videos, and can be designed to be interactive using the Knowles model of self-directed learning.[12]

Little is known about how ophthalmology residents perceive their own need for orthoptic training. We therefore conducted a needs assessment among ophthalmology residents to determine its perceived relevance to their practice and to identify specific areas of learning need with the purpose of designing future curricula.[13,14]

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Our primary aim was to investigate the perceived relevance of common orthoptic tests to ophthalmology residents' practice, and their levels of confidence in performing and interpreting the tests. Our secondary aim was to explore their preferences for learning about different orthoptic tests and mode of curriculum delivery. We hypothesised that orthoptic topics would be perceived as relevant to ophthalmology residents, but confidence in test performance and result interpretation would be low.

METHODS

Setting and participants

Participants were Years 1 to 5 ophthalmology residents from a major tertiary hospital training program in Singapore, a Southeast Asian island nation with a population of 5.6 million. The 5-year residency program consists of three years of clinical training, followed by two senior years in general and subspecialty ophthalmology including oculoplastics, cornea, vitreo-retina, glaucoma, paediatric ophthalmology and neuro-ophthalmology.[15] The hospital assesses more than 300,000 patients per year in the Ophthalmology Department.[16] Thirty-one residents (15 males, 16 females) were available and eligible to participate in our study. Junior residents were defined as those in their first three years of residency while senior residents were those in the fourth and fifth years. Our institutional review board approved the study as exempt (CIRB reference number: 2017/2063).

Study design

This is a descriptive cross-sectional online survey study. As there was no existing survey that addressed our research aim, we designed a nine-question survey using consensus agreement among a team of educators consisting of two expert orthoptists and a residency program director. We piloted the survey on two senior ophthalmologists who provided feedback that allowed further survey refinement. The survey asked questions in three domains relevant to orthoptic education and used a 5-point Likert scale from 1 to 5 with higher numbers indicating greater importance, relevance, confidence or usefulness. The three domains were: Relevance of orthoptic tests to practice and level of confidence in orthoptic test performance and result interpretation (four questions); Selection of orthoptic tests for future training (one question); Delivery mode and content (four questions). Questions 1 to 3 referred to ten groups of commonly performed orthoptic tests. They were: stereoacuity tests, cover/prism cover test, Hirschberg/Krimsky test, ocular movements, convergence/prism fusion range, accommodative amplitude/facility, visual acuity tests for children, Worth Four Dot test/Bagolini striated glasses test, double Maddox Rod, and Hess screen test/field of binocular single vision (BSV) test (Table 1). The survey also captured demographic information including year of residency.

Data was collected using an anonymised link administered by Google Forms®. The email link was sent out to all residents by a program administrator twice over four weeks; the second time as a reminder to encourage participation by non-respondents. The email invited residents to complete the survey to help educators understand their need for learning orthoptics, and their openness to learning by electronic modules.

Table 1. Needs assessment survey questions

Survey Domains	Number	Questions/format
1a. Relevance of orthoptic tests 1b. Level of confidence in orthoptic test performance and result interpretation	1	Please rate the following tests according to their relevance to your current or future practice 1 = least relevant, 2 = slightly relevant, 3 = relevant, 4 = fairly relevant, 5 = most relevant (5-point Likert scale)
	2	Please rate the following tests according to your level of confidence in performing them 1 = least confident, 2 = slightly confident, 3 = confident, 4 = fairly confident, 5 = most confident (5-point Likert scale)
	3	Please rate the following tests according to your level of confidence in interpreting their results 1 = least confident, 2 = slightly confident, 3 = confident, 4 = fairly confident, 5 = most confident (5-point Likert scale)
	4	How important do you think orthoptics is to your work? 1 = least important, 2 = slightly important, 3 = important, 4 = fairly important, 5 = most important (5-point Likert scale)
2. Selection of orthoptic tests	5	Which 5 tests would you most like to see featured in the teaching video(s)? (Checkboxes)
3. Delivery mode/content	6	How useful do you think the teaching videos will be for learning orthoptics? 1 = least useful, 2 = slightly useful, 3 = useful, 4 = fairly useful, 5 = most useful (5-point Likert scale)
	7	Select the orthoptic content you wish to see covered in video format (Checkboxes)
	8	What is your preferred mode of learning for orthoptic curricula and who do you think should teach it? (Open question)
	9	What is your opinion about learning via videos vs conventional lectures for orthoptics? (Open question)

Domain 1 (Questions 1 to 4) addressed the relevance and importance of orthoptics, as well as the residents' confidence in performing and interpreting tests. Domain 2 (Question 5) asked residents to select five from among ten commonly performed orthoptic tests that they would like to learn more about. Domain 3 (Questions 6 to 9) addressed the usefulness of teaching videos and invited respondents to select their preferred orthoptic content and mode of delivery. Respondents were asked to choose any number from a list of seven choices. The choices were 'Features of the orthoptic tests', 'Test techniques', 'Case studies', 'Real patient assessment', 'Patient management', 'Recording techniques', and 'Interpretation of test results'. Questions 8 and 9 were open-ended and residents typed in their responses to each question with no word limit imposed.

Data analysis

Data captured on the 5-point Likert scale was exported into Excel format and data analysis was performed using descriptive statistics, reporting median and range. Subgroup analysis comparing junior versus senior respondents was performed via the Mann-Whitney U test using SPSS version 24.0 (IBM Corp, 2016).

The rating '1' was described on the survey as 'least confident' and a rating of '5' defined as 'most confident'. We used '3' ('confident') as the mid-point to define values above '3' as 'high' and values of '3' and below as 'low'.

Narrative responses for the last two open-ended questions were collated and independently read and interpreted by the two researchers, who then met and discussed emerging themes. The themes derived from these two questions were combined, summarised and described.

Our primary outcome was the responses to Domain 1 (Questions 1 to 4). Our secondary outcomes were the responses to Domains 2 and 3 (Questions 5 to 9).

RESULTS

Participants

Of 31 eligible residents, 23 (74%) responded to the online survey. The response rate was 48% (15 of 31 residents) for the first email invitation and increased to 74% at the second mailing. Seven (30%) were Year 3 resident, six (26%) from Year 1, four (17%) from Year 4, and three (13%) each from Years 2 and 5.

Domain responses

Primary outcome (Domain 1):

For perceptions of the relevance of orthoptic tests to respondents' practice (Question 1), all ten listed orthoptic tests were highly relevant to practice (median rating 4 out of 5, range 2 to 5) (Figure 1).

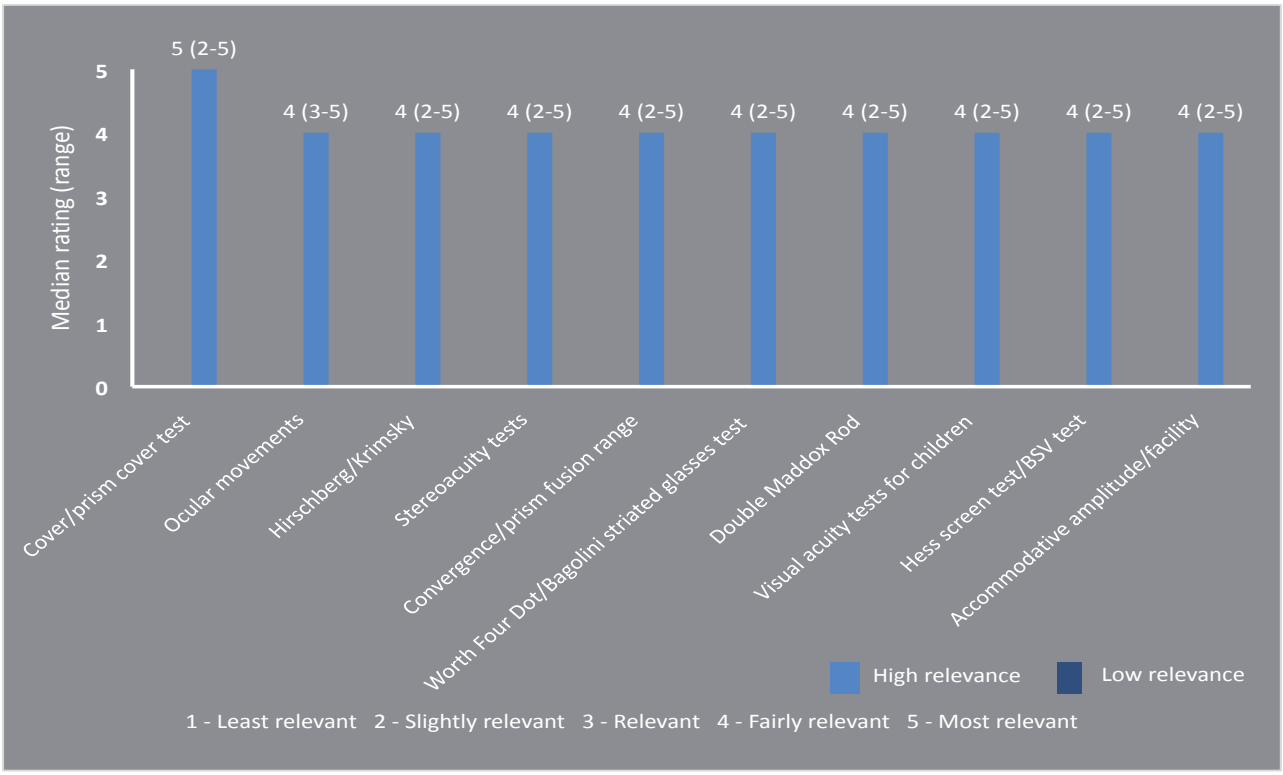

Figure 1. Ophthalmology residents' responses to 'Rate the relevance of orthoptic tests to your practice' (n=23) Singapore, 2017.

For orthoptic test performance (Question 2), respondents generally rated low confidence (median rating 3, range 1 to 5) across six out of ten tests (Figure 2). They expressed high confidence in performing four of the ten tests: stereoacuity tests, Hirschberg/Krimsky test, cover/prism cover testh and ocular movements.

For test result interpretation (Question 3), respondents rated low confidence for only one test (median rating 4, range 1 to 5) (Figure 3). The test was accommodative amplitude/facility, which respondents also expressed low confidence in performing. They rated high confidence in interpretation for the other test results, while reporting low confidence in performing them.

Nineteen out of 23 respondents (83%) felt that orthoptics was 'very important' to their work while the remaining four responded that it was 'important' (Question 4).

Subgroup analysis was conducted between senior (n=7) and junior (n=16) respondents and a statistically significant difference in the perceptions of test relevance between them was found (p=0.005). The juniors perceived the orthoptic tests as more relevant than the seniors. No statistically significant differences were found for their levels of confidence in either test performance or interpretation (p=0.912, p=0.063, respectively).

Secondary outcomes (Domains 2 and 3):

For Question 5, the top five groups of orthoptic tests selected by residents for further training were: convergence/prism fusion range (74% of respondents), Worth Four Dot test /Bagolini striated glasses test (74%), double Maddox Rod (74%), accommodative amplitude/facility (74%) and Hess screen test/BSV test (57%).

For Question 6, all respondents reported that e-learning would either be 'very useful' (70%) or 'useful' (30%) for learning orthoptics.

For Question 7, respondents selected 'Interpretation of test results' (78%), 'Test techniques' (78%), and 'Case studies' (70%) as the top three orthoptic procedures that they would like to learn more about.

All 23 respondents provided narratives for the open-ended Questions 8 and 9. The length of each narrative ranged from 6 to 40 words. The researchers agreed on four common themes after independent coding. The most common theme that emerged was 'Orthoptics should be taught by hands-on clinical practice with patients, with observation and feedback'. The next was 'Orthoptics should be taught by orthoptic faculty and clinicians', followed by 'Videos on orthoptic tests allow me to learn at my own pace' and 'Blended learning with a combination of video demonstration and didactic lectures is the best strategy'.

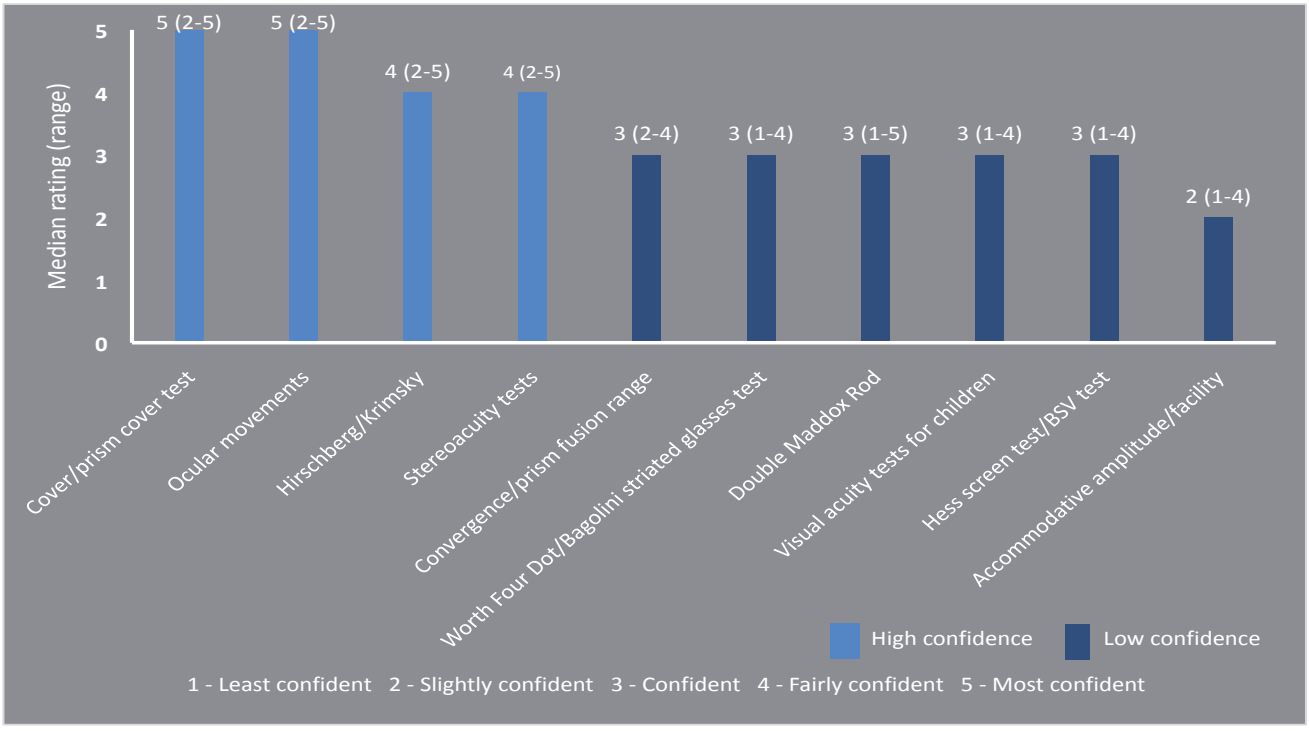

Figure 2. Ophthalmology residents' responses to 'Rate your level of confidence in performing orthoptic tests' (n=23) Singapore, 2017.

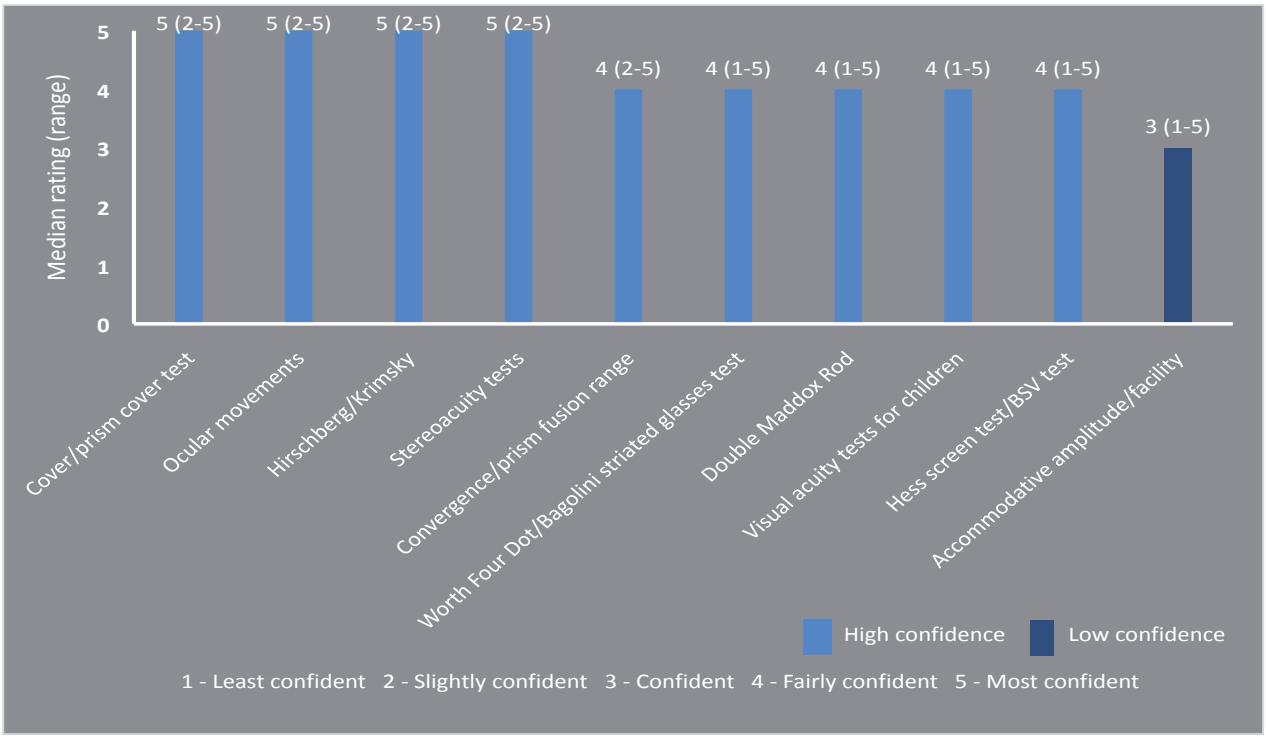

Figure 3. Ophthalmology residents' responses to 'Rate your level of confidence in interpreting orthoptic test results' (n=23) Singapore, 2017

DISCUSSION

Needs assessment is an important aspect of curriculum development to generate baseline data to best meet learners' needs.[13,14] We conducted a learner needs assessment using an online survey, on ophthalmology residents from one program to determine their interest and need for orthoptic training. We hypothesised that all residents would perceive orthoptics as relevant to practice and we met this hypothesis. We found a mismatch between the residents' confidence in performing and in interpreting orthoptic tests. This could be attributed to their reliance on reading as a basis for learning about the tests, as opposed to performing the tests on patients themselves. This mismatch could be addressed by an interactive and visually-guided curriculum exposing them to specific test performance requirements, as well as by observed practice with feedback. Furthermore, it is not uncommon for learners to overestimate their own knowledge and abilities which can question the accuracy of self-assessments.[17,18]

Orthoptics as a subject has not been well addressed in residency curricula, despite its relevance to the practice of ophthalmology,[2-4,15] yet no published study has examined residents' attitudes toward learning orthoptics. Our study is unique in finding strong interest among all levels of ophthalmology residents for orthoptic curriculum. Junior residents especially considered orthoptic tests to be highly relevant to their practice. This could result in greater acceptance of the curriculum designed for them.

We found that the top five of ten tests residents selected for greater exposure were those for which they expressed the lowest confidence in performing. Some were tests that they were less likely to be exposed to in their routine patient care such as the double Maddox Rod, tests of accommodation and Hess screen/BSV tests. This is not surprising, and the information allows planning and prioritising when designing future orthoptic curricula.

Using e-learning with videos as a teaching strategy to deliver curriculum has not been widely explored in the field of orthoptics. We are not surprised that the residents showed a preference for this modality because e-learning facilitates a learner-centred approach and interactive learning at their own pace, allowing them to monitor their progress via immediate feedback.[19] 'Case studies' was one of the top three content areas selected for presentation in an orthoptic curriculum. This reflects and supports residents' need to apply theoretical knowledge to practical application.[20]

The strengths of our study are the high response rate and representation by all levels of residents producing consistent findings. One study limitation is the small sample size

which did not have the power to compare responses across subgroups. This limitation is common to most ophthalmology residencies which tend to be small. Future studies will involve multiple programs to capture a larger sample size. A second limitation is that some residents may have had prior exposure to orthoptics through working with orthoptists and the variability in baseline knowledge may have confounded responses. However, the lack of significant differences found between junior and senior residents in terms of their confidence levels in performing and interpreting orthoptic tests suggests that any prior exposure had limited impact on their responses. It could be argued that not using a neutral grade might have contributed towards a more positive response. On the other hand, having a neutral grade might attract respondents who are undecided and it is harder for the ambivalent responses to be interpreted meaningfully. Finally, the survey reflects self-reported data; future studies should also address faculty-reported data on residents' knowledge and performance skills.

In conclusion, ophthalmology residents at all levels identify a need to learn more about orthoptics, especially around test performance, and are open to an e-learning curriculum presenting common orthoptic tests using a video format.

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REFERENCES

1. The Royal College of Ophthalmologists. Learning outcomes; 2016 [Cited 2018 25th Jan] Available from: https://www.rcophth.ac.uk/curriculum/ost/learning-outcomes/.
2. International Council of Ophthalmology. ICO residency curriculum; 2018 [Cited 2018 25th Jan] Available from: http://www.icoph.org/refocusing_education/curricula.html#ICO Curricula in Development.
3. Accreditation Council for Graduate Medical Education. ACGME program requirements for graduate medical education in ophthalmology; 2017 [Cited 2018 25th Jan] Available from: https://www.acgme.org/Portals/0/PFAssets/ProgramRequirements/240_ophthalmology_2017-07-01.pdf.
4. The Royal Australian and New Zealand College of Ophthalmologists. Curriculum standards; 2016 [Cited 2018 25th Jan] Available from: https://ranzco.edu/education-and-training/vocational-training-program--vtp-/curriculum-standards.
5. British & Irish Orthoptic Society. Orthoptics curriculum framework; 2016 [Cited 2018 25th Jan] Available from: https://orthoptics-org.wildapricot.org/news/4173500.
6. La Trobe University. University handbook 2017: Bachelor of Applied Science and Master of Orthoptics; 2017 [Cited 2018 25th Jan] Available from: https://www.latrobe.edu.au/handbook/2017/undergraduate/she/health-sciences/double-degrees/bapplscmorth.htm.
7. Aryal KR, Pereira J. E learning in surgery. Indian J Surg 2014;76(6):487-493.
8. Sinclair P, Kable A, Levett-Jones T. The effectiveness of internet-based e-learning on clinician behavior and patient outcomes: a systematic review protocol. JBI Database System Rev Implement Rep 2015;13(1):52-64.
9. Mahoney NR, Boland MV, Ramulu PY, Srikumaran D. Implementing an electronic learning management system for an ophthalmology residency program. BMC Med Educ 2016;16(1):307.
10. Iyeyasu JN, Castro SM, Sabbatini RM et al. The development and evaluation of a distance learning system in ophthalmology. Rev Bras Educ Med 2013;37(1):96-102.
11. Ruiz JG, Mintzer MJ, Leipzig RM. The impact of e-learning in medical education. Acad Med 2006;81(3):207-212.
12. Mitchell EL, Arora S. How educational theory can inform the training and practice of vascular surgeons. J Vasc Surg 2012;56,530-537.
13. Grant J. Learning needs assessment: assessing the need. BMJ 2002;324(7330):156-159.
14. Walsh K. How to assess your learning needs? J R Soc Med 2006;99(1):29-31.
15. SingHealth Residency. Ophthalmology; 2016 [Cited 2018 25th Jan] Available from: http://www.singhealthresidency.com.sg/Pages/Ophthalmology.aspx.
16. Ministry of Health Singapore. Opening Address by Mr Gan Kim Yong, Minister of Health, at the Singapore National Eye Centre 25th Anniversary International Meeting; 23 May 2015 [Cited 2018 14th May] Available from: https://www.moh.gov.sg/content/moh_web/home/pressRoom/speeches_d/2015/opening-address-by-minister-for-health--mr-gan-kim-yong--at-sing.html.
17. Sundström A. Self-assessment of knowledge and abilities: a literature study. Umeå University; 2005 [Cited 2018 14th May] Available from: http://www.nmd.umu.se/digitalAssets/60/60577_em541.pdf.
18. Ehrlinger J, Mitchum AL, Dweck CS. Understanding overconfidence: theories of intelligence, preferential attention, and distorted self-assessment. J Exp Soc Psychol 2016; 63:94-100.
19. Banz R. Self-directed learning: implications for museums. J Museum Educ 2008;33(1):43-54.
20. Thistlethwaite JE, Davies D, Ekeocha S et al. The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. Med Teach 2012;34(6):e421-e444.