

## Case-based vs lecture-based instruction method in Optometry: A four-year perspective

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### Background

- ❖ Diploma in Optometry trains optometrists who cater for the primary eye care needs in the local community. The three years program covers basic sciences to optometry related modules such as ocular diseases, clinical optometry, binocular vision and contact lenses. During the course, students are rotated into various clinical training sessions to conduct comprehensive eye examinations, diagnose various eye anomalies and devise the management plans.
- ❖ In the past, clinical case scenarios have always been used to enhance student learning by preparing their ability to differentially diagnose a condition and provide appropriate management plans. Students diagnosed and managed an ocular condition based on the information provided by the teacher. The teacher was the main information provider in this learning method.
- ❖ New teaching method was therefore warranted to develop a critical thinker, inspired self-directed learner and enable students to apply learning to robust situations in real world.

### Purpose

- ❖ To evaluate the effectiveness of case-based learning (CBL) versus the traditional lecture-based learning (LBL) in teaching Diploma in Optometry students.
- ❖ To date, there were no reports on the effectiveness of CBL vs LBL in optometry education.

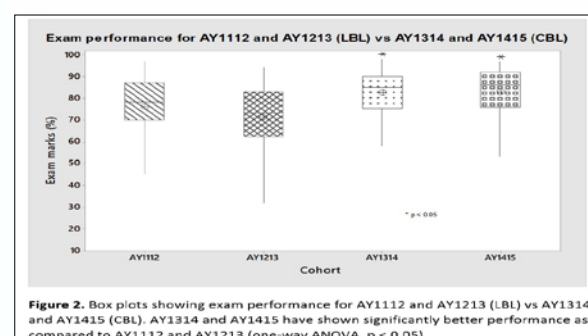
### Results: Students' performance in end-semester exam

#### Observation 1

- ❖ Significant improvement in the average marks for the CBL cohorts.
- ❖ Mean marks for CBL was shown to be significantly higher (82.4 for AY1314 and 82.8 for AY1415) as compared to LBL (76.0 for AY1112 and 71.1 for AY1213) (one-way ANOVA,  $p < 0.05$ ) (Table 1 and Fig. 2)

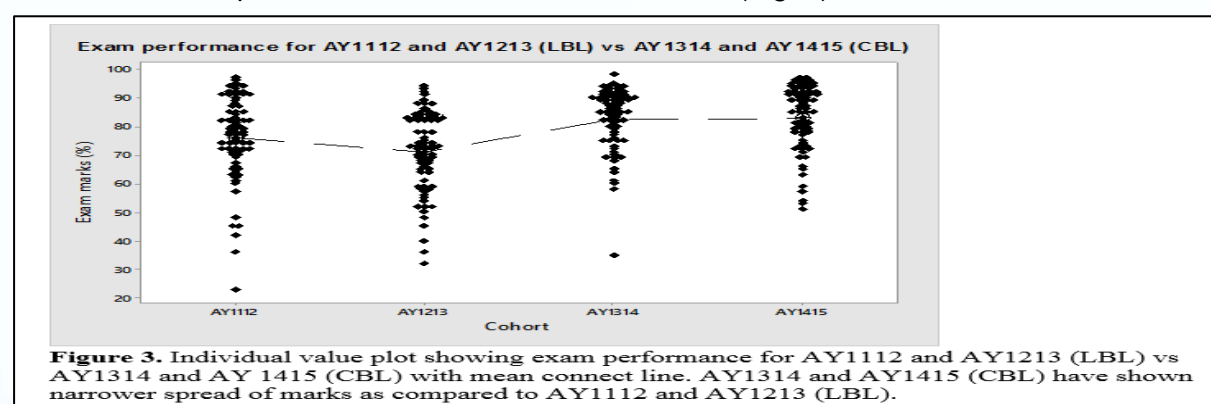
Cohort	Module offered semester	Exam marks (%) (mean ± SD)	95% CI	p value (one-way ANOVA)
LBL	AY1112 (n = 76)	76.0 ± 14.7	(73.0, 79.0)	a b b b
	AY1213 (n = 77)	71.1 ± 13.9	(68.2, 74.0)	
CBL	AY1314 (n = 72)	82.4 ± 11.0	(79.4, 85.4)	
	AY1415 (n = 73)	82.8 ± 11.7	(79.8, 85.8)	

SD = standard deviation  
a = 0.05, Tukey pairwise comparisons  
b = 0.01, Tukey pairwise comparisons



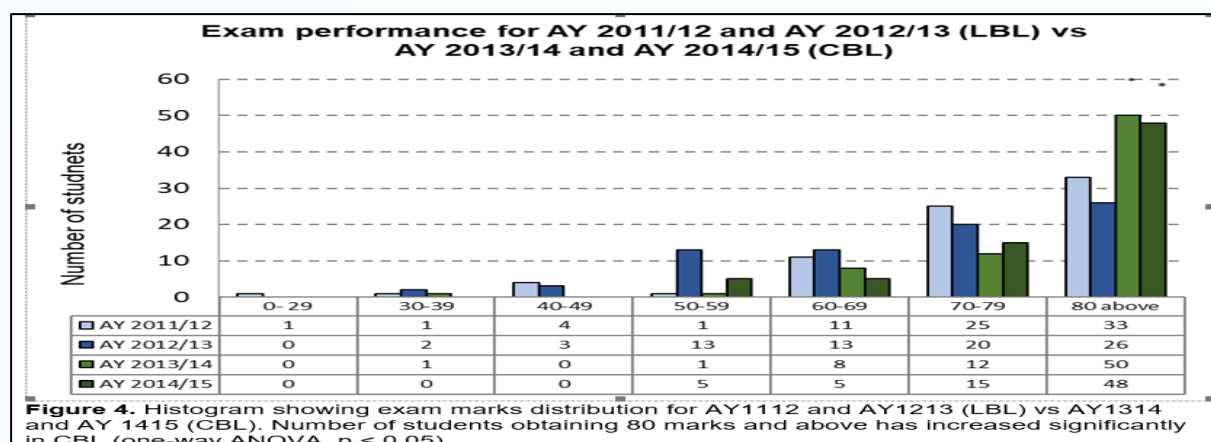
#### Observation 2

- ❖ The spread of marks was narrower in the CBL cohort.
- ❖ Marks SD was lower (Table 1) and the spread of marks was narrower in cohorts taught by CBL (AY1314 and AY1415) as compared to cohorts taught by LBL (AY1112 and AY1213) with a 'trend-up' mean connect line from LBL to CBL (Fig. 3).



#### Observation 3

- ❖ Number of students obtaining 80 marks and above had increased significantly in the CBL cohorts.
- ❖ Referring to the histogram showing exam marks distribution for the four studied cohorts, number of students obtaining 80 marks and above has increased significantly in the CBL cohorts as compared to the LBL cohorts (one-way ANOVA,  $p < 0.05$ ) (Fig.4).

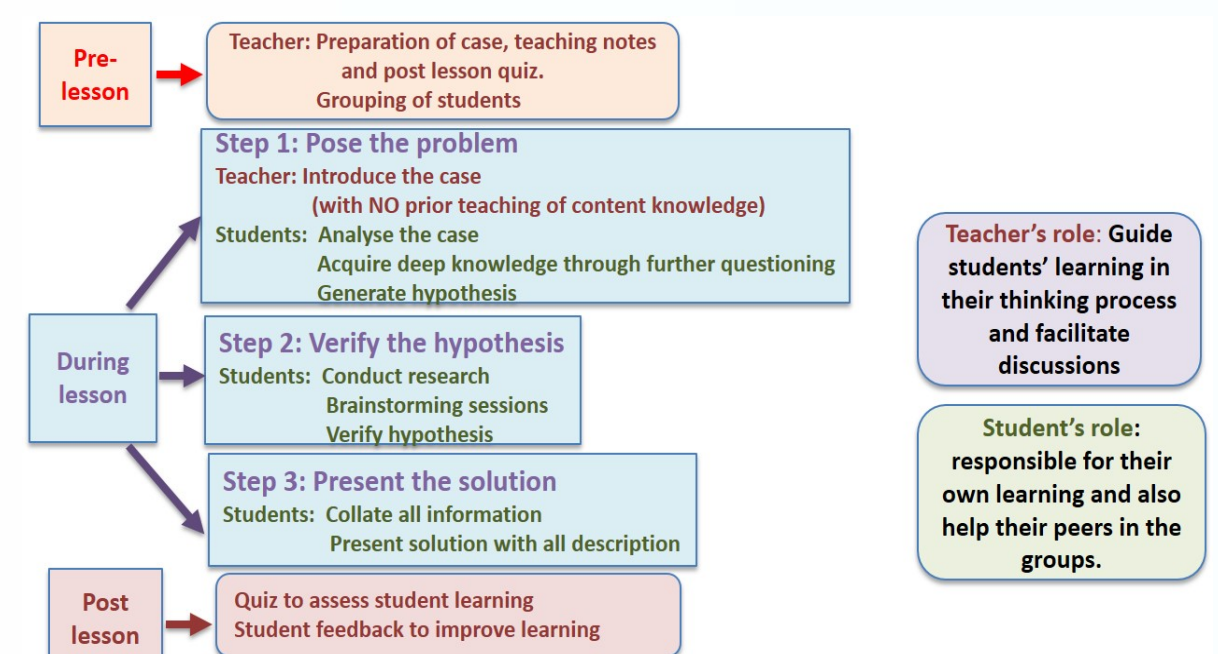


### Methods

- ❖ In this paper, the effectiveness of the two tested teaching pedagogies was evaluated using
  - student's performance in end-semester exam and
  - students' evaluation/feedback implemented in a year 2 module, CP3056 Ocular Disease 1
- ❖ Four optometry cohorts were compared and studied:
  - ❖ AY1112 and AY1213: the cohorts with LBL
  - ❖ AY1314 and AY1415: the cohorts with CBL
- ❖ This study was granted exempt status by the Institutional Review Board of the Singapore Polytechnic.

**LBL process:** using didactic lectures and tutorials with case-studies.

**CBL process:** Implemented as per the diagram shown below:



### Results: Students' evaluation/feedback

Statement	Rating
A-1 Maintain a keen interest in research	3.54 3.67
A-2 Feel inspired to discover new knowledge in my area of study	3.65 4.05
A-3 Apply learning to real-world applications	3.97 4.19
A-4 Conduct information search	3.92 3.85
A-5 Learn independently	3.86 4.05
A-6 Find ways to overcome obstacles in learning	3.35 3.76
A-7 Handle tight deadlines	3.78 3.47
A-8 Contribute to team goals effectively	3.78 3.96
A-9 Better understand the opinions of team members	3.76 3.66
A-10 Identify my strength(s) as a team member	3.78 3.65
A-11 Write in a more organised manner	3.54 3.92
A-12 Enjoy my class	3.51 4.22
A-13 Be actively engaged	3.43 3.87
A-14 Identify a set of possible causes to a problem	3.76 4.07
A-15 Possess better analytical skills	3.95 4.18
	3.71 ± 0.19 3.91 ± 0.23

Comparing the student feedback score among the AY1314 and AY1415 cohort, we observed that the feedback improved positively in most aspects (Mean ± SD score 3.71 ± 0.19 for AY1314 and 3.91 ± 0.23 for AY1415, Table 2).

Statement	Strongly disagree % (n)	Disagree % (n)	Neutral % (n)	Agree % (n)	Strongly agree % (n)
A1 Maintain a keen interest in research	1.1 (1)	5.4 (5)	35.9 (33)	45.6 (42)	12.0 (11)
A2 Feel inspired to discover new knowledge in my area of study	1.1 (1)	1.1 (1)	27.2 (25)	48.9 (45)	21.7 (20)
A3 Apply learning to real-world applications	1.1 (1)	1.1 (1)	15.2 (14)	52.1 (48)	30.4 (28)
A4 Conduct information search	1.1 (1)	1.1 (1)	23.9 (22)	56.5 (52)	17.4 (16)
A5 Learn independently	1.1 (1)	3.3 (3)	16.3 (15)	55.4 (51)	23.9 (22)
A6 Find ways to overcome obstacles in learning	1.1 (1)	6.5 (6)	34.8 (32)	46.6 (43)	10.9 (10)
A7 Handle tight deadlines	4.4 (4)	5.4 (5)	34.8 (32)	36.9 (34)	18.5 (17)
A8 Contribute to team goals effectively	0.0 (0)	4.4 (4)	18.5 (17)	60.9 (56)	16.3 (15)
A9 Better understand the opinions of team members	1.1 (1)	5.4 (5)	27.2 (25)	54.3 (50)	12.0 (11)
A10 Identify my strength(s) as a team member	1.1 (1)	4.4 (4)	33.7 (31)	44.5 (41)	16.3 (15)
A11 Write in a more organised manner	0.0 (0)	5.4 (5)	33.7 (31)	39.1 (36)	21.7 (20)
A12 Enjoy my class	1.1 (1)	3.3 (3)	18.5 (17)	55.4 (51)	21.7 (20)
A13 Be actively engaged	0.0 (0)	3.3 (3)	35.9 (33)	48.9 (45)	12.0 (11)
A14 Identify a set of possible causes to a problem	1.1 (1)	2.2 (2)	22.8 (21)	48.9 (45)	25.0 (23)
A15 Possess better analytical skills	1.1 (1)	1.1 (1)	19.6 (18)	44.5 (41)	33.7 (31)

1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

Self-rated opinions shown that CBL enabled students to contribute to team goals effectively (A8, 60.9%), to learn independently (A5, 55.4%) and to conduct information search (A4, 56.5%). They enjoyed their classes (A12, 55.4%) and that the knowledge enabled them to apply learning to real-world applications (A3, 52.1%) (Table 3)

### Discussion and Conclusion

- ❖ Students claimed that using CBL, they were
  - ✓ able to relate learning to **real-world applications**
  - ✓ comfortable with **self-directed learning**
  - ✓ improved in their **analytical skills**
  - ✓ improved in their **communications skills**
- ❖ CBL can be the **future** direction in **optometry education** as it develops self-directed learners, enhances analytical and communication skills as these are the few essential skills for optometrists.

Disclaimer: This work was published at Tan LL and Kallakuri S. Lecture-Based Vs Case-Based Instruction Method in Optometry. A Four-Year Perspective. *Austin Ophthalmol.* 2018; 3(1): 1012.