



# HOW TO IMPROVE LEARNING ACHIEVEMENT OF MEDICAL STUDENTS REGARDING INTERPRETATION OF HEMATOLOGY SLIDES

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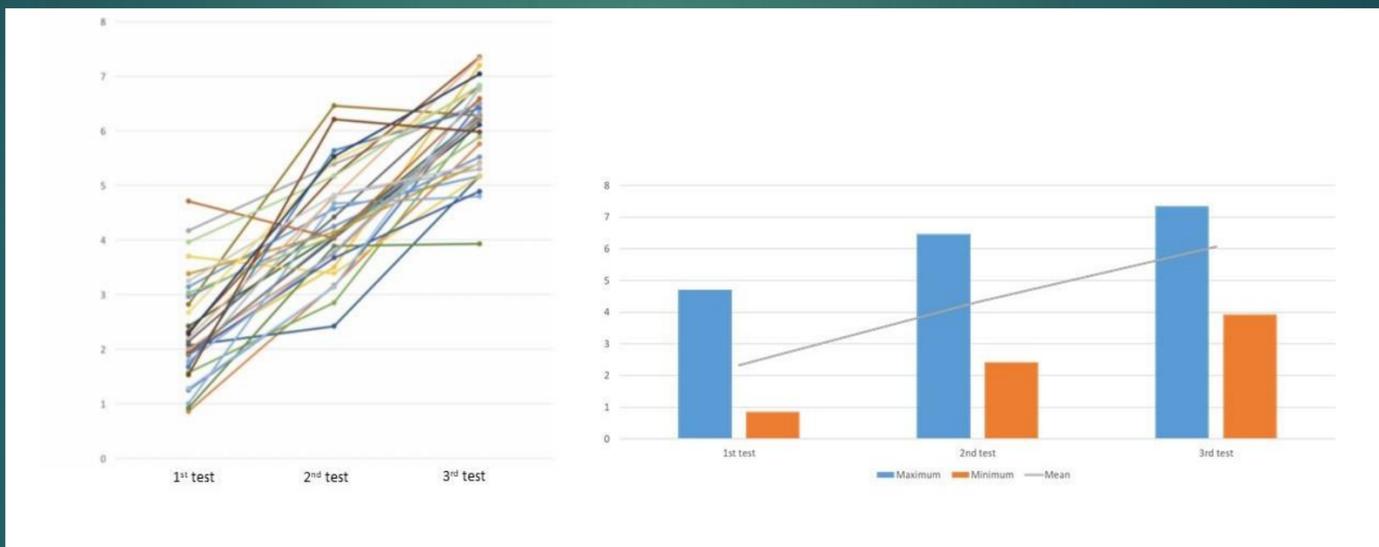


**Background:** It is essential that Thai medical students learn how to interpret abnormalities of red blood cells, white blood cells and platelets from peripheral blood smears of the common hematologic diseases in Thailand. Because of time constraints, high student to teacher ratios, there is a particular need for various teaching methods to improve learning outcomes.

**Objective:** To know the efficiency of learning methods by using an examination and immediate answer feedback of peripheral blood hematology slides and progression after each test.

**Methods:** Before learning, the medical teacher gave the third year medical students a paper on how to interpret a peripheral blood smear, for self-study. Two days later, the medical teacher presented the first session, called demonstration slides (14 diseases) as seen using a light microscope. This was conducted in an OSCE-examination style, 5 minutes per station. Immediately after the demonstration test, the teacher gave the answers and pictures from the light microscope online to all students, via Google classroom. In the afternoon of the same day, the teacher conducted a second test, with slides of 14 different diseases and collected the scores from each student. Again, following completion, the students were able to check their results online. One week later, at the time of final examination, slides of 23 diseases (some diseases were repeated but different questions or from different patients) were presented, the teacher then compared the scores from this last test to the second test. One way ANOVA test was used for analyzing mean differences between tests with p-value < 0.05 at 95% confidential interval (CI) was considered to be significant.

**Results:** There were 32 medical students in the class. Thirty of 32 students (93.8%) showed improved scores from the first to the second test. Thirty of 32 students (93.8%) had improvement from the second test to the final examination. Mean points  $\pm$  S.D. scores from the first test were  $2.33 \pm 0.97$  compared to  $4.33 \pm 0.97$  in the second test and  $6.07 \pm 0.81$  in the final examination. All 32 students achieved significantly improved scores ( $p < 0.001$ ) from the first to the final test, confirming increased learning achievement



Mean $\pm$ S.D.			One-way ANOVA				Mean points difference comparisons	p-value
1 <sup>st</sup> test	2 <sup>nd</sup> test	3 <sup>rd</sup> test	Levene statistics	p-value of test of homogeneity of variances	F	p-value of One-way ANOVA		
$2.33 \pm 0.97$	$4.33 \pm 0.97$	$6.07 \pm 0.81$	0.551	0.578	132.65	< 0.001*	2 <sup>nd</sup> test > 1 <sup>st</sup> test	< 0.001*
							3 <sup>rd</sup> test > 2 <sup>nd</sup> test	< 0.001*
							3 <sup>rd</sup> test > 1 <sup>st</sup> test	< 0.001*

**Conclusion:** The examination-based teaching was shown to be an effective way to improve the learning of hematology slides. This teaching concept was stimulating, consumed less time, cost-effective, had no requirement for high technology equipment and the students were able to learn many diseases at the same time. The immediate feedback of answers, linked to pictures from the light microscope, was a key factor leading to this success. However, the retention of knowledge needs either repetitive examination or promotion of active learning, by consistent self-study, depending on the needs of different individuals.