

Significance of Actually Drawing Microscopic Images and Its Impact on Students' Understanding of Histology

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ABSTRACT

Objective: To explore the impact of drawing on students' understanding of histology. To determine if students who draw images can score better than those who do not.

Study design: Quasi experimental.

Place and duration of study: Histology Laboratory, Department of Anatomy, Shifa College of Medicine, Shifa Tameer-e-Millat University, from January 2017 to September 2017.

Methods: This histological study was carried out during the Endocrinology and reproduction module (ENR) in January, 2017. There students were divided into two groups, A and B of 50 students assigned by random sampling. During the first half of the module Group A drew the microscopic image of the slide in the practical notebook as a normal practice. Group B was shown images only and the task of drawing the images in the practical note-book was excluded. At the end of four weeks MCQ paper of 50 questions of higher order thinking to check their concepts of applied histology was given to students. For the next half of the module the groups were flipped over by a cross-over design and Group A only saw the microscopic image and Group B drew the histological image. A second test of MCQs of higher level of application of knowledge was given at the end of four weeks.

Results: Analysis of data showed that there is no statistically significant difference between the mean scores obtained by the drawing group and non-drawing group ($p>0.05$) in both test I and test II. However there is a statistically significant difference in the mean scores of the same group when they draw the microscopic image and when they do not ($p<0.05$).

Conclusion: Drawing microscopic images has a positive impact on learning. The traditional teaching strategy for histology should be explored further by research to help curriculum planners to include drawing of images in the teaching of histology.

Key words: Traditional histology teaching, drawing microscopic images.

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INTRODUCTION

Histology is a practical based discipline among the anatomical sciences¹. Teaching of image intensive disciplines like histology and pathology has undergone

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a major revolution over the past decade. Computer-aided instruction and virtual microscopy has replaced conventional microscopy. Students perform better while using the new techniques compared to the traditional learning method^{2, 3, 4}. The drawback of virtual microscopy and digital image photomicrography is that it has overthrown the concept of paper and pencil drawings for the concept of organization of basic tissues⁵. The traditional histologists hold the view of studying histology through the microscope, and in particular, making drawings. This view was assessed in a study in which the students were given the task of learning by text only, text plus illustration and text plus self-

generated drawing. The result showed that the last group performed significantly better than other two groups⁶. Tracing, labeling and drawing can increase the effect of picture processing and thereby have a positive effect on the learning outcome⁷.

A medical student has to process a large body of information, therefore the curriculum planners always encourage lowering the cognitive load of theoretical information and devising the teaching and learning strategies that promotes retention of knowledge and facilitate building of concepts and encourage application of knowledge¹⁰. Drawing facilitates retention of knowledge was assessed in a study in which the learners in the drawing group remembered significantly more than learners in no drawing group⁸. Similarly another study concluded that actual drawing of histological images is a helpful tool for long-term knowledge retention⁹.

The objective of the present study is to ensure that drawing is an essential learning tool and should not be abandoned while the regulatory bodies in Pakistan are encouraging integrated curricula where the time devoted to basic sciences has been reduced. So there is a need to realize that are we doing justice to the basic science teaching and its application later on in the clinical classes?

The overarching aim of this study is to establish that drawing of images by students actually has an impact on their knowledge of applied histology. So we hypothesize that students studying through drawing of the microscopic images score better in histology tests compared to students who study through microscopic image alone.

Study Design: Quasi Experimental

Study Setting: This study was carried out at histology practical laboratory of department of Anatomy, Shifa College of Medicine (SCM), Shifa Tameer-e-Millat University from January 2017 to September 2017.

METHODS

Complying with the institutional policy this experimental study was carried out after approval from the Institutional Review Board (IRB).

All students attending Endocrinology & Reproduction module of year II undergraduate medical curriculum were included in the study. On hundred students from second year MBBS were divided into two groups, A and B of 50 students each. The students' names along

with their college roll numbers were entered in a Microsoft Word Excel to generate a random number by a computer using random number function in Excel. The students were selected by purposive sampling technique and all the students who did not appear in the test were excluded. Students were assured that these marks would not be counted towards their summative scores.

Endocrinology and Reproduction module was chosen because it matched the project timeline. The duration of module also facilitated the crossover of the two groups after four weeks duration.

The experimental intervention was scheduled and executed in a weekly timetable. The instructional strategies included lectures, self-study assignments and practical laboratory sessions. Content was delivered in two halves of module; duration of each half was four weeks.

A senior faculty taught the histological organization of the organ in a large class format, followed by a practical session in the histology laboratory. In the first four week, course I, Group A and Group B were the Drawing group and no drawing group respectively.

The instructor demonstrated the slide on a closed circuit television screen to indicate the area of the mounts where the students needed to focus their attention. Students were encouraged to explore the mounts on their own, to search for the previously determined structures. The students in drawing or intervention group were required to draw the histological picture by taking help from the microscope, image displayed on LCD and histology atlas. The working time was one hour.

Similar procedure was adopted for control group; they did not draw the histological image.

For the next four weeks, groups were flipped over by a cross-over design. Group A saw microscopic image and did not draw it and Group B draw the histological image.

Collection of data (Procedure) By the end of four weeks, MCQ paper, (30 questions of higher order thinking and few based on recall level) was given to the whole class. Similarly at the end of the next four weeks a second test of MCQs was given to the whole class.

The scores in the two tests were entered in SPSS version 23 and statistical tests were run. The dependent variable is the score in MCQ test I and score in MCQ test II. The independent variables are microscope slide image with no drawing and microscope slide image with drawing.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Informed consent was obtained from all patients for being included in the study.

RESULTS

99 Students participated in MCQ test I and 91 students participated in MCQ test II. Type-A MCQs (higher order thinking and application of knowledge) were administered at the four and eight week intervals. The control (No drawing) and experimental (drawing) groups were administered the same test at the same time. The independent sample t test was applied for statistical analysis of the data. The scores obtained in the MCQ tests were compared to explore any significant difference regarding application of knowledge of histology between drawing and no drawing groups. Difference in mean scores of the same group with and without drawing images was compared using the paired sample t test to determine any significant difference in the mean scores.

Table 1: Mean Scores Obtained in test 1

TEST	GROUP	INTERVENTION	SCORES (Mean ± SD)	P VALUE
I	A(n=47)	Drawing	14.53 ± 3.2	p>0.05
	B(n=52)	No Drawing	11.79 ±	
II	A(n=47)	No Drawing	11.27 ± 3.7	p>0.05
	B(n=44)	Drawing	15.14 ± 3.5	

N= Number of students

Table 2: Mean Score Obtained By the Same Group

GROUP	TEST	(Mean ± SD)	P VALUE
GROUP A	Test I (n=47)(Drawing)	14.3 ± 3.2	p>0.05
	Test II (n=44)(No drawing)	11.2 ± 3.7	
GROUP B	Test I (n=51)(No drawing)	11.7 ± 4.9	p>0.05
	Test II(n=47)(Drawing)	15.4 ± 3.5	

N= number of students

P<0.05*= Significant

Mean Score of drawing and no drawing groups In Test 1 & 2

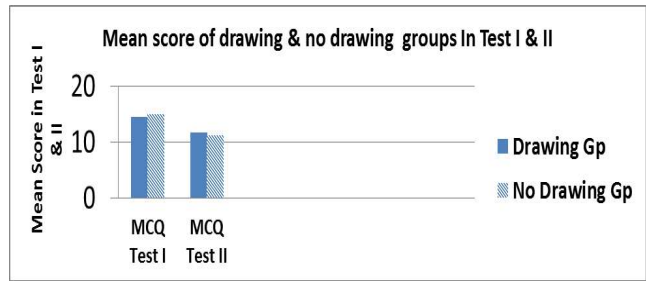


Figure 1 : Mean score of drawing and no drawing groups in test 1 & test 2.

Mean score obtained by the same group with drawing and no drawing task.

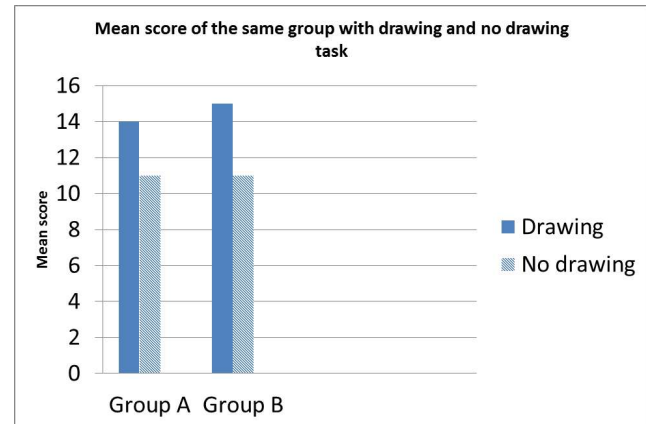


Figure 2: The mean score obtained by Group A and Group B

Data is presented as Mean ± SD, *P < 0.05

Analysis of scores obtained by group A & B in MCQ Test I:

MCQ-I test was taken at the end of first four weeks of the Endocrinology and reproduction module. The histology of endocrine system was assessed among the control and intervention group. The statistical analysis of the data by independent sample t- test in MCQ test I (Table I, Fig. I) showed no statistically significant difference between the mean ± SD of scores obtained by the drawing and no drawing groups. (p>0.05)

Analysis of scores obtained by group A & B in MCQ Test II

MCQ test –II was conducted at the end of the second half of the module. The intervention or drawing and control or no drawing groups were flipped over in a cross over design. Histology of the reproductive system was assessed. Independent sample t- test showed that

difference in the mean score values obtained by drawing group compared with the mean score of the no drawing group were statistically insignificant. (Table I, Fig. I).

Analysis of scores obtained by group A: The pair sample t- test showed that the mean score obtained by group A in test I (drawing) and test II (no drawing) is statistically significant difference ($p < 0.05$). Group A scored better in test I where they draw the microscopic images. (Table II, Fig II)

Analysis of scores obtained by group B: The pair sample t- test showed that the difference mean score obtained by group B in test I (No drawing) and test II (drawing) is statistically significant ($p < 0.05$). (Table II Fig II)

DISCUSSION

This study was conducted to see the effect of drawing on comprehension and understanding of knowledge of histology and its application. There is a common belief among the physicians and medical educators that a substantial portion of the basic science information learned in the traditional preclinical years in medical school is lost during the final, predominantly clinical years. This is no doubt a long standing concern in medical education, as there are many studies that address the loss of retention of basic science knowledge^{10,11,12}. So this study aims to reassure the significance of drawing for the retention of the basic science knowledge and its application later on in clinical years. The cross-over design ensured that each student participated once in the experimental (drawing) group and once in the control (no drawing) group. The possible confounding factors were eliminated by using randomly assigned groups and the intervention was set up in such a way that the time on task was the same for the drawing and the no drawing groups. Studies have proven that drawing improves retention of knowledge however there is lack of evidence that students' application of knowledge of histology is increased when they draw histological images.

In this study the Type-A MCQs were used as an assessment tool that assesses the comprehension, understanding and application of knowledge. The students in this study perform better when they draw the image as shown by the result when the same group was compared using the drawing and no drawing strategy. So the result of our study complies with our hypothesis that drawing has impact on learning and application of knowledge. Our result also corresponds

with the previous study that concludes that drawing has positive effect on learning¹³. Our study also provides the opportunity of self-reflection to each student.

Time interval can be one of the reasons for the insignificant result between the different drawing and no drawing groups. It can be explained by this that in our study the test was taken after four weeks of intervention, which is small interval for the assessment of retention of knowledge. Studies on knowledge retention had assessed after a longer interval of time¹⁴. So time factor can be another possible factor affecting the results. Another reason might be the large class format sessions of applied histology before the practical lab. Although this study did not show the significant results between intervention and control group but it can form a foundation for further research in the use of drawing for retention and application of knowledge. It can be done by assessing the students for labeling and drawing of the images because studies have shown that labeling and drawing have their role in knowledge retention and its application later on¹⁵

CONCLUSION

Drawing of microscopic images has a positive impact on learning. Additional research should be carried out to better understand the differences in comprehension and understanding of the text that interact with drawing and no drawing teaching strategy. It also helps remind the curriculum developers that traditional method of teaching histology by drawing images should not be rejected without careful consideration.

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