Original article:

Medical Student'sPerceptions Toward Integrated Histology Practical Class: A Quantitative and Qualitative Study

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Abstract:

Objectives : This study was performed to gain an understanding about perceptions of integrated practical class between histology and anatomical pathology among medical students in Universitas Indonesia, and to evaluate the quality of current histology learning method. ***Materials and Methods:*** The students learnt histology by means of histology alone or integrated with anatomical pathology. Two hundred and fifty-seven students (n=257) completed the anonymous questionnaire-based survey. The post-test's score from the last two years were achieved and compared from the archive. ***Results and Discussion:*** The results of the study revealed two contrasting perceptions; while the majority of the students agreed that this learning method was considered useful, it nevertheless brings a great deal of stress considering the amount of materials they have to learn in short time. This generates a range of negative feelings in students that affected their learning performance .***Conclusion :*** Integrating the subjects is an effective way to improve students understanding of normal and abnormal condition of an organ. However, this method requires a longer time for students to understand the crowded material for the effectiveness. Further research is needed to refine the better strategy to deliver the integrated histology material effectively.

Keywords: Histology Learning,Student's Perception, Integrated Class, Quality of Learning Method

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Introduction

Histology is one of the basic biomedical sciences in medical education. It is the study of the microscopic structure of normal cells and tissue, in which, medical students will observe the microscopic structure of cell and tissue and relate the structure with its biological function[1]. The knowledge in histology will be needed in learning the physiology and pathophysiology and helping them understanding the pathology structures of organs.

Traditionally, histology is learning after biology course and needed to be mastered first before students were introduced to the Anatomical Pathology (PA), a branch of medicine that studies the structural changes accompanying the disease[1]. Histology course in traditional medical school will be given by means of lecture and practical activity during first and second year of medical study before students learn about the disease.

However, global changes in medical schools have enforced medical schools to adopt new approaches and strategies to ensure the better and newer curricula. The integrated problem-based learning (PBL) has been believed to accommodate the need of better medical school graduates by allowing the students to fit things together and see the medicine in one big picture[2]. The Faculty of Medicine Universitas Indonesia (FMUI) has undertaken the integrated practical class (IPC) to suit the student's need in learning based on core curriculum of international standards by World Federation for Medical Education and based on Medical Education Curriculum of Indonesia (KIPDI).

One of the changing made in FMUI was integrating some of biomedical sciences in means of practical activities, in this case, integrating the

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histology with PA to enforce the learning process of normal and abnormal cells, tissues and organs structures.The students will get the histology course throughout the pre-clinical study in IPC and/or non-IPC (nIPC).

The students in traditional practical classes usually followed the procedures described in guidebook precisely without elaborating the topic deeply[3]. By integrating the subjects together, we believed that the students could directly see the relationship between normal tissue in histology and abnormal tissue in PA by comparing two different but related images and delve in deep thinking about the pathophysiological processes.

Many studies have mentioned that integrating the courses provide an opportunity for students to learn knowledge across many disciplines [4]. The system allowed the students tobe more active in learning[5], thus enhanced the learning processes [6]. Moreover, the students with integrated PBL are believed to have more understanding in process of disease[2]. Unfortunately, not many studies about integrated PBL focused on histology subject. As one of the best medical school in Indonesia, FMUI try to provide the best medical curriculum. Evaluating the effectiveness of new applying method is needed to ensure that students were achieving the goal of curriculum. As such, this study is aimed to explore the perception of medical students of FMUI regarding the histology practical activity with both IPC and nIPC methods.

Materials and Methods

Learning methods. The students of FMUI were divided into a class consisted of sixty (60) students with 6 tutors (3 tutors from Histology and 3 tutors from PA) to assist the students during the practical class. The pre-practical lecture was given 15 minutes before the class begins to review the knowledge of the modules. Sixty (60) microscopes were equipped with the different of normal structure (Histology) and abnormal structure (PA) glass slides and the students got the opportunity to compare and discuss the different images provided. The students have to learn all the glass slides provided for basic and clinical structure of organ in 120 minutes.

While some modules have been running in IPC, some modules taught histology in nIPC. The number of students and tutors are similar with IPC, but we only provided the histology normal glass slides in nIPC and the students do not have any pathological image to compare. At the end of the both classes, the post-test was held to measure the students understanding of practical activity.

*Study designs.*This report used a quantitative and qualitative design study to collect the student's perception of integrated practical experiences. An anonymous questionnaire-based survey was undertaken in FMUI. The questions were taken from questionnaire explained in previous papers [2,7]. The questionnaire consisted of four different parts; the first part about pre-practical class lecture; the second part consisted of questions about the histology slides provided in practical class; the third part asked about student's opinion regarding the IPC; and the last part was two open ended questions to seek deep understanding about student's attitudes toward their perspectives.

Participants. All students who have completed both histology IPC and nIPC before the survey begin were included in the study. Furthermore, all year two and year three medical students of FMUI (batch 2017/2018 and 2018/2019) (n=350) were participated. The questionnaire was administered after class. The purpose of the study were delivered and verbal consent were taken after explaining the purpose of the study. The statistical analysis were performed to analyze the collected data

*Short-term retention.*Post practical test assessments were administrated at each of the end practical classes to evaluate the student's short-term retention in all modules.Score of histology practical assessment from both IPC and nIPC for the last two years (2017/2018 and 2018/2019) were obtained from the archive. The data were reported as mean ±SD and number of distributions of the students with score ≥55. The difference between groups was analyzed using t-test.

Statistical analysis. The SPSS 25 for Mac was used to analyze all the data in this report. The differences in nominal data were analyzed using chi-square test. All the qualitative comments were typed out and the similar responses were put in one group. A p value of <0.05 was considered significant

Results

All of second- and third-year regular class students of FMUI in the 2019/2020 academic year (n:350) who had been partake in both histology IPC and nIPC were qualified to participatein this study. Out of 350 students enrolled, only 73.4% (n=257) returned the questionnaire-based survey assessing their opinion toward IPC of histology.

61.5% of respondents answered the questionnaire were female. The mean age of participant was 19.25 ± 0.5; the minimum age was 16 and the

Table 1 : Sex, Age and Batch of medical students participated in this study, Age is in year old. (n=257).

		Frequency	Percent
Sex	Male	95	37.0%
	Female	158	61.5%
Batch	2017/2018	138	53.7%
	2018/2019	119	46.3%
Age	16	1	0.4%
	17	4	1.6%
	18	35	13.6%
	19	117	45.5%
	20	87	33.9%
	21	11	4.3%

maximum was 21 years old. The majority of the students were 19 years old (45.9%).

The first topic to evaluate was the pre-practical lecture. Before each practical class, IPC and nIPC, the lecturer delivered 15 minutes of brief review about the topic. The results were shown in Table 1. The majority of the students (225/ 99.2%, *items* 1, Table 1) agreed that the lecture was given clearly and in accordance with the running module. Additionally, (96.9%) of them agreed that the lecture provided in the IPC was correlated between courses (Histology and PA) and 97.9% of them thought that the lecture was very helpful in recalling the normal condition of an organ and their relationship with the pathological processes. Meanwhile, 78.2% of them reported lack of time in pre-practical lecture (*Items* 2-4. Table 1) and 7% of them reported that time for discussion was not sufficientthus they were still not fully understanding the material when the laboratory activity begins.

Table 2. Student'sassessment for the pre-practical class lecture . n=257

No	Items	Yes n(%)	No n(%)	Not sure n(%)
1	The preliminary lecture was delivered clearly and in accordance with the running module	255 (99.2%)	1 (0.4%)	1 (0.4%)
2	The preliminary lecture of histology in IPC were delivered sequentially and interrelated with PA's lecture	249 (96.9%)	4 (1.6%)	4 (1.6%)
3	The preliminary lecture helps me understand the basic histology concepts and their relation to the pathological processes	251 (97.7%)	3 (1.2%)	3 (1.2%)
4	The time provided for preliminary lectures is sufficient	201 (78.2%)	45 (17.5%)	11 (4.3%)
5	Lecturers give students time to discuss questions before starting the practical class	255 (87.5%)	18 (7%)	14 (5.4%)

The next topic in questionnaire was to evaluate the facility provided by University in practical class, i.e. the glass slides used in the laboratory, as shown in Table 2. Overall, the majority of students agreed that the histology slides provided were enough, clear, related with another courses, easier to compare and helpful (89.9%, 83.3%, 75.5%, 86.0%, 77.8%; respectively), (*Items* 6-9, *Items* 11,

Table 3. Student's assessment for slides provided in practical class. n=257

NO	*Items*	Yes n(%)	No n(%)	Not sure n(%)
6	The histology microscopic slides provided were quite numerous	231 (89.9%)	18 (7.0%)	18 (7.0%)
7	The histology glass slides presented were quite clear to see	214 (83.3%)	29 (11.3%)	14 (5.4%)
8	Histology glass slides (normal tissue) provided were related to anatomical pathology (abnormal tissue) glass slides	194 (75.5%)	20 (7.8%)	43 (16.7%)
9	The identification of PA slides (abnormal tissue) was easier to understand after comparing it with the histology slides (normal tissue)	221 (86.0%)	18 (7.0%)	18 (7.0%)
10	The time provided to understand the histology, and PA slides in laboratory activities is sufficient	169 (65.8%)	72 (28%)	16 (6.2%)
11	The available histology images help me to identificate the pathological process with its histological basis	200 (77.8%)	34 (13.2%)	23 (8.9%)

Table 3).

Furthermore, only 65.8% of students agreed that the time provided for practical class was adequate *(Items* 10, Table 3). This and previous result (*Items* 4, Table 1) showed that a quite number of the students think that they need more time to understand the histology both in pre-practical lecture and practical activity.

The last part of questionnaire was to see the student's opinion regarding the IPC. The result was shown in Table 3.

Majority of the students agreed that IPC increased their knowledge in pathophysiological process of disease, increased their interest and motivation of learning histology, trigger the critical thinking of pathophysiological processes and increased long-term memory (77%, 72.8%, 79.4%, 69.6%, respectively) (*Items* 12-15; Table4). Moreover, the majority of students agreed that by integrating the

Table 4. Student's assessment for IPC in histology. n=257.

NO	*Items*	Yes n(%)	No n(%)	Not sure n(%)
12	IPC helps me understanding the concept of basic pathological processes of disease in relation to the histology and pathological structure	198 (77%)	25 (9.7%)	34 (13.2%)
13	IPC encourages my independet study to understand histology	187 (72.8%)	41 (16%)	29 (11.3%)
14	IPC encourages me to think critically in understanding normal organs and the process of disease	204 (79.4%)	32 (12.5%)	21 (8.2%)
15	IPC increased my long-term memory of the structures of normal and abnormal tissue	179 (69.6%)	43 (16.7%)	35 (13.6%)
16	I got good feedback from the staffs after every practical classes	154 (59.9%)	52 (20.2%)	51 (19.8%)
17	IPC provides me an opportunity to use my time appropriately for study	220 (85.6%)	18 (7.0%)	19 (7.4%)
18	IPC teaching method has increased my stress load	102 (39.7%)	126 (49%)	29 (11.3%)
19	IPC did not have much benefit in helping me learn the pathophysiology of a disease / disorder	56 (21.8%)	179 (69.6%)	22 (8.6%)

classes, they have optimal time to study effectively and the integrated classes was very helpful in their learning process (85.6%, 69.6% respectively), (*Items* 17 and *Items* 19;Table 4)

With regards to the staffs' feedback, only 59.9% of students agreed that the lecturers gave feedback

Table 5. Student's perspectives of IPC. Q20 was " I prefer the integrated practical class than non-integrated practical class". n = 257.

Q20					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	96	37.4	37.4	37.4
	No	115	44.7	44.7	82.1
	Not sure	46	17.9	17.9	100.0
	Total	257	100.0	100.0	

after practical class, 20.02% was not agreed and 19.8% was not sure (*Items* 16, Table 3). Contrastingly, almost half of the students agreed that the integrated class had stressed them out in learning the modules (*Items* 18; Table 4)

Interestingly, although the student's responses about IPC were positive (Table 4), when asking about whether they prefer IPC than nIPC, only 37.4% students agreed to IPC method (n = 96), while 44.7% (n=115) did not agree with IPC, and

Table 6. Correlation between student's perspective of IPC and their preference method of studying. p<0.05 was considered significant

Variable	n	p-value
Time allotment (I10)	257	0.015
Optimal time to study (I17)	257	0.000
Stressing level (I18)	257	0.001
The benefit of IPC (I19)	257	0.000

17.9% (n=46) was not sure (Table 5).

The student'spreference method of IPC (Table 4) was then further evaluated to see perception based on age, gender and year academic, and no significant correlation was found. We then analyze this preference method with their answer in previous questions, and we found that their preferences was significantly correlated with time allotment (*Items* 10); optimized time to study (*Items* 17); stress level (*Items* 18); and their perception of usefulness of IPC (*Items* 19).

Qualitative comments. Only 87.15% of all participants replied the open-ended questions in the questionnaire collected, respectively. We incorporated here the comments collected from both academic year classes. The open-ended questionswere typed out and the similar comments were included in some group.

The student's responses to the first question, "your opinion regarding the IPC", were typed out as either positive or negative. Interestingly, although only 37.4% students preferred IPC in previous question (Table 4), the result of open-ended question showed that only 25% students gave negative comments regarding the IPC with majority comments was "Lack of time". Only 5.8% of the students totally rejecting the idea of IPC and think that "it is better not to integrate the courses" or "We need to learn histology first before PA". The rest of comments were positive and totally support the IPC method.

We also grouped the free response the students provided to the second question, "your advice to the histology practical class", based on repeated comments. The three major group comments were regarding the (1) Time (2) material of teaching and (3) Tutor.

27.6% of students responded that they are actually agreed to IPC, but the time was not equivalent to the learning material that they have to learn in span of 2 hours. Majority of the students that complaint about lack of times were from third year class (53.4%) in which they thought that the module was too difficult to carry in just one IPC session.

16.5% of students commented that the material of teaching should be improved, the major comments were; (1)"put the atlas near the microscope", and (2) "additional teaching method was needed". Meanwhile, 16.07% of students complaining about tutor. The majority comments of students were (1) "need more tutor", and (2) "please provide one tutor for one group"

Overall, the qualitative comments in questionnaire were supporting the IPC ideas, but the students think that lack of time, facility and tutor constrained

Table 7. The average post-test score from the students with different method of teaching.

	nIPC	IPC
Scores collected (n)	1990	1952
Average post-test score	79.35±16.5	73.7±18.4
Number of students with score <55	134	263
Number of students with score ≥55	1856	1689
Percentage of students failed the post-test	6.73%	13.5%

the IPC process.Thus, with the current situation of time, facility and tutor, they prefer nIPC method.

Short-term retention. The student's post-test scores were collected from archive covering both nIPC and IPC method. There were 3942 student's scores used in this study; i.e. 1990 of

n-IPC scores and 1952 of IPC scores. Mean score for each group were 79.35±16.5 and 73.7±18.4, respectively. Percentages of students with score ≥55 were 93.3% and 86.5%. There were significant differences between groups (P<0.001)

Discussion and Conclusion

This study was conducted to evaluate the student's perception of Histology IPC and nIPC in FMUI. By analyzing the opinions given by participants, we covered the quality and effectiveness of (1) pre-practical lecture and (2) the glass slides provided (facility); We also covered the student's opinion regarding IPC and compared the post-test scores between two different methods. Generally, the survey result about student's opinion regarding IPC that has been implemented in FMUI were positive.

The student's satisfaction of preliminary lecture were excellent (Table 2). The students thought that the lecture given before the practical class was clear and correlated with running modules. The lecture given helped them understand the practical session better. Previous study reported that the interactive lecture before and during the histology practical class helped improving the student's learning outcomes[7]. By given the preliminary lecture, we refreshed their knowledge about the material taught in laboratory. Additionally, an adequate number of staff were present to answer their question during the activity of active learning process in FMUI (4-6 tutors for 60 students).

Although some students think that FMUI need to upgrade their facility to accommodate better learning in histology, the student's satisfaction of glass slides provided in class were good (Table 3). Better glass slides provided are needed to increase the satisfaction and effectiveness of the learning process. Some students also noted that they need additional learning materials to help them understand the microscopic structure, i.e. atlas or another additional teaching method.

The development of technology nowadays is forcing some medical schools to replace the traditional teaching of microscope-usedof histology with another alternative. Medical schools with better funding and technology believed that implementing virtual microscope aided the students in better learning of histology [8].Additionally, another learning method should be administered to help students in practical class. Providing the atlases of micrographs slides with labeled information right beside the actual microscope slide may help students identify the exact structure with little or no help from the instructor [9]. Alternatively, the used of other approaches such as audiovisual, photomicrographs and videotape in practical classes of histology were believed to assist learning process in undergraduate medical students [10]. These approaches are faster and cheaper alternatives to virtual microscope that can be arranged.

Regarding students' opinion about IPC, the majority of students think that by comparing the basic, normal and abnormal microscopic structures of the tissues and organsencourage them to think critically about the structures they observe, thus, it motivated them to understand the pathophysiological process of disease. Comparing the different structures allowed the students to visualize the changes in tissues and organs from normal to pathology and optimized their time in learning process.

In fact, The University of New South Wales employed scenario-based learning by integrating the practical histology and histopathology and the result showed that by relating the histology with relevant histopathology, students clearly perceived the benefit and can relate the histological features of tissue with its clinical manifestations[11]. Integrating the practical class was indeed preparing the students to understand basic sciences in clinical environment and allowing the students to see the things together in one big picture [1,3].

Unfortunately, students 'agreement to implement IPC in FMUI were poor, only 37.4% of students agreed to IPC method in simple 3-scales question (Table 5). The result from accumulated post-practical test scores also showed that the scores from modules taught in nIPC wereslightly better, with higher average score and lower percentage of failed students (Table 7). This result contradicted with students' perspectives about IPC (Table 4) but supported the students' preferences of nIPC (Table 5).

Although only (5.8%) of students answering the open-ended question totally rejecting the idea of IPC, the causes of this contradictory result should be further evaluated. The majority of students noted that IPC was actually a good idea to be implemented, but lack of time was the major factor to inhibit the effectiveness of IPC.

Although there is no current report about ideal time for practical activity, we suggest that some modules with lot of material, such as reproduction system or gastrointestinal system should be implemented in more rounds to increase the effectiveness of this

method.Moreover, many studies reported that the students trained within an integrated curriculum made more accurate diagnoses than did students trained in a conventional curriculum [12]. The integration will stimulate the students in better understanding of biomedical principles of basic science with its clinical appearances [13].

Adding the time amount for learning histology or changing the new approaches in teaching histology might be a better solution to improve the effectiveness of histology teaching in FMUI. In fact, equipped the laboratory with advanced techniques enable the learning process more efficient and interactive.

Ethical Approval: This study design was approved by the Ethics Committee of Universitas Indonesia.

Conflict of interest: **Nil**

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