

STUDENT - ORIENTED TEACHING METHOD IN LEARNING OF HISTOLOGY, POWERED BY VIRTUAL MICROSCOPY - A STUDY TO UNDERSTAND THE PERCEPTION AND ATTITUDE OF 1ST YEAR UNDERGRADUATE MBBS STUDENTS OF ESIPGIMS, JOKA.

Medical Education

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ABSTRACT

Background, Histology, is an integral element of basic science education within today's medical curricula and the practice of teaching is based on theoretical didactic strategies along with practical training, through optical microscopy. However, in the last decade of the 20th century, the concept of virtual slides that perfectly emulate a traditional microscope and glass slides emerged, making it possible to examine histological sections at different magnifications without any loss of quality, which took a faster pace during the trying times of pandemic. As such, this study was directed in understanding the perception and attitude of the students towards online teaching using virtual microscopy. **Study design :** It is a descriptive - quantitative study. **Materials and methods :** The present study involved 125 1st phase MBBS students of 2020-21 batch of ESI Medical College, Joka who attended offline histology classes during pre-coronavirus era, shifting to online mode during covid pandemic. Students were provided with questionnaire. Responses were analyzed using Likert's scale. These results were compared with studies done previously. **Results :** 87-89 % of students were of the view that there should be blending of virtual and optical microscopic studies in histology. Flexibility and accessibility were other factors which had a positive impact on majority of students. P value was found to be significant at $p < .05$. **Conclusions :** Though conventional microscope is still an integral part of histological studies, advent of visual microscopy in itself brought into forefront the advantages such as better retention, enhancement, time flexibility and accessibility in medical curriculum.

KEYWORDS

Virtual microscopy, Traditional microscopy, Learning experience

INTRODUCTION :

Histology has been a well-established, fundamental part of many biomedical curricula. Student perceptions are important because they provide their vision regarding the factors that impede learning as beginner in clinical training and their suggestion for improvement¹. Histology relies heavily on technology to allow visualisation of biological tissue microstructure. Teaching microscopic anatomy has shifted in the last few decades from conventional microscopy using light microscope and glass slides to virtual microscopy using computers and virtual slides. Advances in technology have revolutionized the methods and tools used in medical education; many medical schools to adopt VM either exclusively or with a blended approach. Digital pathology innovation and application in medical education have paved the path for a significant shift in the advancement of the medical curriculum. The current trend is to validate electronic learning methods in a control environment that eliminates bias and infatuation; the current trend also entails an ongoing validation of simulation-based education². The adoption of new technology provides an opportunity for the users and developers to reanalyze and reshape teaching practice³. Teachers as designers hold the potential to initiate sustainable and large-scale improvements in teaching and learning in higher education⁴. In spite of some shortcomings, the blended approach has economical and pedagogical advantages. This study was aimed on understanding the views and attitudes of students towards virtual microscopic study in context to optical microscopy which they are accustomed.

Aims And Objectives

- 1) To understand students' attitude towards virtual microscopic teaching.
- 2) To get a feedback regarding their views on teaching histology virtually versus optical microscopy.

MATERIALS AND METHODS

Study Design : It's a descriptive-quantitative study.

Study Sample : The study population comprised of 114 1st phase medical students of ESI Medical College, Joka, who attended sessions on histology in phases, using light microscope and virtually too.

Inclusion criteria : Students who voluntarily participated and have attended sessions using optical microscope and virtually too.

Data analysis and statistics : Data analysis was carried out using SPSS package. Statistical significance was set at $p < .05$. Quantitative data analysis done using students' responses as a 5-point Likert scale questionnaire of 13 questions. Kolmogorov-Smirnov calculator test for normality was done. One-way analysis of variance (ANOVA) used, to find out the level of agreement among the students in regards to

the views on virtual microscopy.

RESULTS AND FINDINGS :

87.2% students from 1st phase MBBS batch (2020-2021) participated voluntarily following sensitization regarding the study conducted. Students who failed to complete the questionnaire given, were excluded from the study. A sudden shift to online teaching in histology during the surge of covid, which was a complete new concept for the students, who were always adapted to the traditional method of using optical microscope were taken into account, so as to understand their insight regarding virtual microscopy versus the traditional method. Response to the Questionnaire comprising of 13 statements, were measured using the 5 point Likert scale (Strongly agree, Agree, Neutral, Disagree, Strongly disagree). Likert scale range was taken for each category of acceptance (Table 1). Kolmogorov-Smirnov calculator test for normality was done for each level of agreements and the data does not differ significantly from that which is normally distributed. Students strongly agreed that it helps in better understanding of the correlation between histological diagrams and the slides. They strongly supported the concept of integrating virtual microscopy with traditional teaching of histology (Fig 1&2).

Table 1

Statements	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree	Likert Range
1. Virtual microscopic display of slides is better than display under optical microscope	14.95 (16)	41.12 (44)	16.82 (18)	18.69 (20)	8.4 (9)	2.04
2. It helps in better understanding of the correlation between histological diagrams and slides	28 (30)	59.81 (64)	9.34 (10)	2.80 (3)	0	1.75
3. It provides better platform for discussion with your fellow mates	21.49 (23)	49.53 (53)	19.62 (21)	9.34 (10)	0.9 (1)	2.07
4. The concept regarding different areas of a slide specimen becomes clearer using virtual microscopy	32.71 (35)	46.72 (50)	11.2 (12)	9.34 (10)	0	1.85
5. It enables better interaction between teacher and the students	25.23 (27)	41.12 (44)	20.56 (22)	11.21 (12)	2.8 (3)	2.14

6. It is more productive than the conventional method of teaching	19.62 (21)	38.39 (41)	20.56 (22)	17.75 (19)	1.8(2)	2.23
7. It is easy to apply the information that was obtained in classroom lectures	25.23 (27)	45.71 (49)	18.69 (20)	4.67 (5)	1.8(2)	1.72
8. Can be viewed according to your time and convenience	51.40 (55)	36.44 (39)	7.47 (8)	0.91 (1)	1.8(2)	1.5
9. Do you think, virtual microscopy should be integrated with traditional teaching in histology ?	42.05 (45)	46.72 (50)	9.34 (10)	0.91 (1)	1.8(2)	1.65
10. Scope of magnification of image helps in identifying the microscopic structures better	37.38 (40)	43.92 (47)	16.82 (18)	1.82 (0)		1.71
11. Virtual microscopy along with power point presentation will enhance your knowledge in histology?	42.99 (46)	42.05 (45)	18.69 (20)	2.83 (0)		1.82
12. Retention of microscopic structure viewed, is better in virtual microscopy	24.29 (26)	40.18 (43)	21.49 (23)	13.08 (14)	2.8(3)	2.21
13. It helps in team based learning, thus improving retention	23.36 (25)	45.79 (49)	22.42 (24)	9.34 (10)	9(1)	2.1

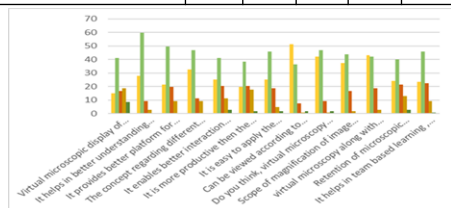


Figure 1 Student feedback for each statement

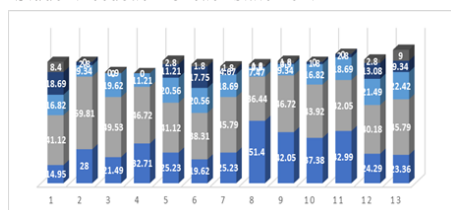


Figure 2 Percentage of students for each level of agreement

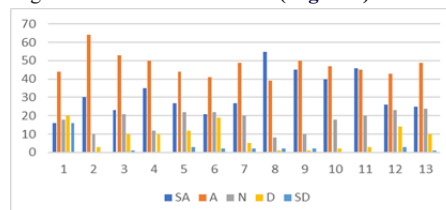
41.12% students were of the opinion that virtual display of slides was much better than display of slides under the microscope, whereas only 18.69% students disagreed in this matter. Students strongly agreed, that the histological slides and the theoretical basis can be correlated better through virtual display of slides. More than 40% of students agreed that virtual display of slides provide them the convenience of discussing and studying with their friends and helps them to understand and identify a particular point in a slide (Fig 1&2). Only a small percentage of students disagreed, a mere 9 to 17 percentage of students. 66.45% of students were of the view that it helps in better interaction between the students and teachers. Students were in agreement that virtual display was much more productive than the conventional mode of teaching and they strongly agreed that it is easier to correlate with the teaching that has been imparted in the classroom. Flexibility of timing and the convenience of viewing, as and when required was supported by 87.44% of students. 89% of the students strongly supported the concept of integrating virtual microscopic studies with the traditional mode of teaching histology and were of the view that collaboration of virtual microscopy and power point presentation will provide the scope to enhance their knowledge in a productive way (Fig.1). 64.47% of the students gave their opinion that retention capacity of slides seen is much better when viewed virtually. Only about 21.49% of students were not sure whether it makes much of a difference. 64.47% of students shared that retention of the microscopic structures observed through virtual microscopy can be retained easily and identified better, then through the traditional

approach of observing through optical microscope (Fig.2&3). The One way Anova was calculated taking into consideration the different observations and the feedback. The result is significant at $p < .05$. (Table 2)

One Way Anova Test For Levels Of Agreement (Table 2)

READINGS	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	TOTAL
MEAN	32	47.5385	17.5385	8.4615	1.9231	21.492
STANDARD DEVIATION	11.4164	6.3589	5.562	6.5779	2.3966	17.9636

Level Of Agreement For The Statements (Figure 3)



SA(Strongly agree), A(Agree), N(Neutral), D(Disagree), SD(Strongly disagree)

DISCUSSION

More than 87% of students regarded the quality of virtual slides to be equal to or better than glass slides. A total of 87.7% of respondents estimated their learning success to be equal or better with virtual microscopy compared to traditional light microscopy. Only 12.3% had concerns about learning less than with light microscopy. Most students (61.3%) recommended the use of both modalities in equal proportions⁵. In this study too, 89% of students supported the concept of integration of both modalities of teaching. Students reported that the main advantage of this modern teaching technique was the ability to view slides at any time and from any location. Teaching histology to medical students with traditional microscopes and glass slides and teaching with digitized slides, reported a generally positive response from students and highlighted various perceived advantages of virtual microscopy over traditional microscopy, including image clarity, accessibility, collaborative learning, and efficient time use^{6,7}. Contributions to learning from peers was an important factor in the benefits of team-based learning in pathology⁸. There was no marked difference in base knowledge between students who had undertaken practical teaching using either virtual microscopy or microscopes and glass slides, indicating that each can be effective. The interactivity between the student and the specimen is high, as recommended by experts⁹.

Apart from this more than 65% of students have depicted better understanding of slides if its virtual, in this study too. The integration of state-of-the-art educational technology into a real world setting does not occur over night, but requires time¹⁰. This autonomy, which allows students to self-learn, allows them to work at home by adapting to their pace of learning. For students, VM make it possible to reduce the hours of face-to-face lessons for teaching histology, without compromising the quality of the study¹¹.

Virtual microscopy has not only been reported to improve the student learning process, but it has also been shown to improve their cooperation skills, communication abilities and self-confidence¹². Virtual and optical microscopy classes, were compared for teaching histology to medical students and found virtual microscopic labs were a viable addition, if not a replacement, for traditional microscopy¹³. The teaching challenges brought about by the COVID-19 crisis, particularly the necessity of an abrupt switch to remote teaching, have highlighted the important role of VM in imparting practical skills in medical histology and pathology education^{14,15}. However, more than 93% of students who experienced the face- to-face course and 72.4% of those who took the lockdown-adapted course believed that VM cannot completely replace the use of the OM. 100% of the lockdown cohort of students expressed the opinion that a combination of VM and OM was a good teaching method for learning histology. In this study, 87% of students wanted a combination of VM and OM in histological studies. Several studies have shown that students obtained better learning outcomes when they were able to use VM rather than just OM

[16,17]. This technology allows for unrestricted access to the material—slides are available for examination anytime, and from anywhere—which gives students the ability to better organize their study time [18]. 72% of respondents' preferred (agreed and strongly agreed) using VM. Students recorded the easy image access at any time and place as the most distinctive feature of VM [19]. Students compared the two viewing approaches and rated the virtual slides and virtual microscope highly. Overall, they preferred the virtual microscope laboratory [20]. A major percentage of students in this study shared the same view regarding accessibility to slides.

Students in blended settings perceived the integration of the VM in their courses as being more enjoyable than online students. In this study, it has been observed that more than 80% of students wanted the collaboration between virtual and traditional way of teaching in histology and supported the fact that it provides them with flexible timing for studying. Apart from this it is perceived that virtual microscopy helps them in better retention of the slides than that observed using traditional microscope.

CONCLUSION

For histology learning objectives, and assessments, the virtual microscopy is a proven reliable and valid pedagogy method. Virtual microscopy has many advantages over conventional microscopy and it complements conventional microscopic evaluation of slides. Although merits of conventional microscopy cannot be overruled, the virtual microscopy finds important niche in various tools of teaching and learning methods. The use of virtual microscopy has the potential to enhance student learning, as found through the feedback of the students in the present educational research. Apart from this it leads to better interaction between the teacher and the learner. The need of the hour is to imbibe virtual study in histology by setting up virtual lab in colleges, which will enhance the learning and grasping capacity of the students.

Conflict Of Interest : There is no conflict of interest

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