Comparison of Conventional Fixed Learning Module with Computerised Fixed Learning Module in Teaching MD Phase II Students

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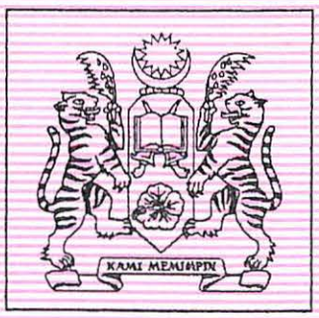

School of Medical Sciences
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Short term grant No. 304/PPSP/ 6131152

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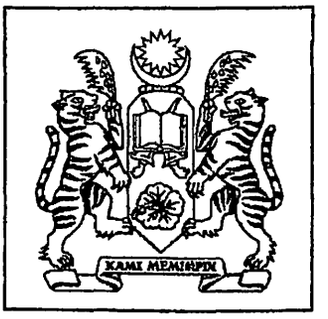

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Acknowledgement

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We also sincerely thank Dr. Herb Hagler, Ph.D. Professor in Pathology, Chief Informatics Officer for Pathology and Associate Course Director for Pathology, Apple Distinguished Educator Class of 2000, UT Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX for giving us permission to apply their 'javascript' (which is the back bone for this study) in this study.

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SUMMARY

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Introduction: Fixed Learning Module (FLM) is one of the important teaching methods for undergraduate medical students within the integrated system. The resource material of pathology is conventionally exhibited as potted specimens and charts. In this conventional FLM (conFLM), the students find difficulty in understanding pathology due to various reasons.

Aim: To create an alternate FLM- computerized FLM (comFLM)- material using a web based, interactive computer technology and to compare its effectiveness with the conFLM.

Materials & Methods: The conFLM materials were selected from the pathology museum. The comFLM (an HTML program) was prepared on female reproductive block (FRB) and musculoskeletal block (MSB) using digital photographs of potted specimens and java script and uploaded in the USM intranet. The phase II MD students were divided into two groups. Each group was exposed to only one type of FLM for each block with a cross over. At the end of each block, the students were given a questionnaire and also assessed by MCQ, computerized objective structured clinical examination (OSCE) and conventional OSCE examination. The data were collected and analysed by Mann Whitney test.

Result: Significant difference was observed only in MCQ marks in MSB and computerized OSCE marks in FRB. More than 60% of the students felt comFLM was more interesting, user friendly and they could attend more than once and could learn in their own pace. In contrast, majority (61%) of the students faced problem in conFLM and were unable to appreciate the pathological features seen in the specimen.

Conclusion: The computerized FLM had many advantages. However it might not replace the conventional FLM and indeed, both appear complementary to each other in effective learning of pathology FLM.

INTRODUCTION

INTRODUCTION

Fixed learning module (FLM) is one of the important teaching methods for undergraduate medical students within the integrated system, which is the basis of the Universiti Sains Malaysia (USM) curriculum. Input from the department of pathology is very high especially in the phase II of MD curriculum. Except for psychiatric block, pathology input is present in almost all weeks for every block.

The pathology input is predominantly in the form of exhibiting the potted specimens to impart knowledge of macroscopic pathological features. For each session, there are specimens ranging from eight to twenty five in number. Also provided are flow charts of pathophysiology, aetiology, pathological features, complications and photomicrographs.

During the FLM session, the gross features of the potted specimens were initially demonstrated to the group of students who assemble around the lecturer. When the quantity of students started increasing, this method became ineffective. So the gross pathology descriptions were printed and mounted on small cardboards and displayed along with the potted specimens. This method at least helped the students understand what to look for in the specimens. However the students found difficulty in appreciating the printed out gross features on the potted specimens. Hence in addition, the lecturers had to demonstrate those features to the students. Since the students' strength is high, they have to be divided into many groups and be demonstrated that many times. When the specimens are about twenty in number, the problems faced by the lecturer can easily be understood.

Later many closed circuit televisions (CCTV) were installed in the multi disciplinary lab (MDL). So the lecturers could demonstrate the gross features of the specimens at anyone time to the whole batch of students using the video camera and CCTV. However this method was not out of shortcomings. Many technical problems (like under lighting, glare) were encountered in this method of teaching. Furthermore every time the lecturers themselves have to manipulate the camera as well as give the commentary on gross description. During demonstration, as the camera would not be in the recording mode, it would automatically shut off every 10 minutes. Then the lecturers need to switch it on again. This evidently disturbs the flow of teaching. Moreover the three dimensional (3D) specimens were seen in two dimensions (2D) on the TV screen. Hence the gross pathological features could not be pointed out properly on the TV screen.

In the net result, the students were unable to understand well the gross pathology features. All those problems hold good for teaching the microscopic features also.

The aforementioned problems had necessitated improvising the teaching methodology. In this era of computer technology, a multimedia presentation - computerised FLM - with interactive features might be a suitable and an alternative or supplementary method of teaching the FLM materials. There are many interactive software to learn pathology is available in the internet and the proper software has to be selected depending upon the need[1, 2]. However this is not sufficient to gain knowledge of their own pathology gross specimens. Hence each medical school has to prepare their own interactive software (computerised FLM) utilizing their own pathology specimen.

The computerised FLM can be created in an attractive and user-friendly way. It can be uploaded in the local area network (LAN) or internet server, so that any number of students can make use of it. They can learn not only during the FLM session but also at their convenient times, as it will be interactive in nature and not require a resource person. Another important advantage would be that the students could learn at their own pace.

Before introducing the new methodology (Computerised FLM), it should be evaluated against the existing method with respect to its effectiveness, feasibility, advantages and disadvantages. Hence this study was undertaken to compare the computerised FLM with conventional FLM in teaching MD phase II students.

AIM

AIM

To create an alternate FLM material using a web based, interactive computer technology and to compare its effectiveness with conventional FLM.

MATERIALS & METHODS

MATERIALS & METHODS

The female reproductive block (FRB) and the musculoskeletal block (MSB) were selected for this study, as they contained a lot of specimens. There were fifty-nine potted specimens in the FRB and twenty-eight in MSB and were the resource material for the conFLM. The images of those specimens with 1 CM scale were recorded using Sony digital camera (Model: Mavica MVC FD – 75). Those images were edited using image editor software and saved in JPEG format. The macroscopic features were described and saved in the computer in doc format. Each macroscopic feature was highlighted on the digital image using the image editor software and saved as a separate image file again in the same JPEG format. Thus the number of images for each lesion would be a basic image plus the number of pathological features described for that specimen.

Using JavaScript, the macroscopic (text) features were linked with the corresponding images and a HTML file was created for each pathology specimen using Microsoft front page programme. Wherever necessary, the photomicrographs were taken using image analyser microscope. They were processed in the same way as that of gross specimens.

In addition, the pathophysiology and other relevant pathology of the various lesions were typed and saved as word format in the computer.

All the gross features, microscopic features, the respective images and pathophysiology were interlinked and web pages were created using Microsoft front page.

The resource material for conventional FLM of both blocks included potted specimens, photomicrographs and charts. They had been prepared already and available in the department of pathology. They were displayed in the MDL during the scheduled time.

The MD phase II students (2000/2001) were divided into two equal groups (A and B).

During the FRB teaching weeks, the group A students were instructed to attend only the conventional FLM in the MDL. A resource person (lecturer) was made available in the MDL. The web page for FRB was uploaded in the USM intranet and the URL address (http://notes.kck.usmnet/patologi/MyWeb/Fgt/index.htm)was given to the group B students. They were instructed to study only the computerised FLM. The venue allotted was CAI lab and the time allotted was during FLM session. No resource person was

made available in the CAI lab. The students could access the URL in other places like library too. It was made available all the 24 hours 7days a week, so that the students could access it even at any other convenient time.

At the end of the FRB, a questionnaire (Annex A) was given to both groups of students to get feed back. They were also assessed by MCQ and OSCE. The assessment was conducted in a big lecture hall with a proper seating arrangement so that no one could discuss with other. Each student was given a MCQ paper and asked to darken the appropriate circle. 50% of the OSCE questions were based on conventional specimens and the other 50% were based on the computerised specimens. All the specimens were photographed and projected on the screen and the students were asked to write the answers in the sheet provided. The filled up questionnaire and the answer sheets were collected and kept aside.

During the MSB teaching weeks, the student groups were crossed over. The web page for MSB was uploaded in the USM intranet and the URL address (http://notes.kck.usmnet/patologi/MyWeb/MSS/indexMSS.htm) given to the group A students. They were instructed to attend only the computerised FLM. The group B students were instructed to attend only the conventional FLM in the MDL.

At the end of the MSB, a similar questionnaire and an assessment with a new set of the questions pertaining to MSB were conducted.

The co- researcher who was blind to the study group corrected all the MCQ and OSCE answer scripts of both the blocks. The marks were entered in the PC using SPSS programme. The data obtained from the questionnaire were entered in the same file correspondingly.

Statistical analysis:

The marks obtained in conFLM and comFLM by both group of students were compared by Mann Whitney test. Univariate analysis was performed to find out whether the bio data influenced the marks obtained by the students.

RESULTS

Female reproductive Block

Preparation of computerised FLM material:

In the female reproductive block, 59 potted specimens were displayed for the conFLM group in the MDL (Fig1).

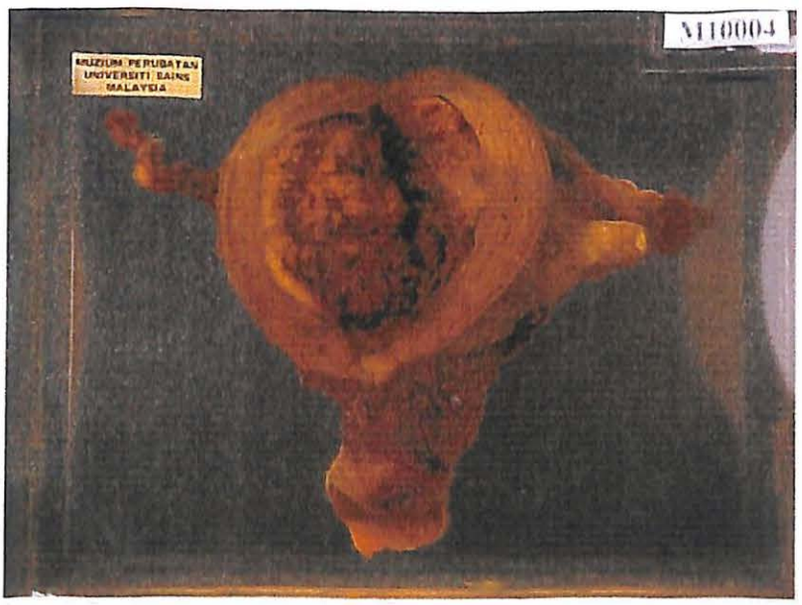


Fig.1 – Potted specimen of an endometrial carcinoma

The images of those 59 specimens were processed in the image editing software. Using JavaScript, the macroscopic (text) features were linked with the corresponding images and a HTML file was created for each pathology specimen using Microsoft front-page programme (Fig.2, 3, 4, 5and 6). The pathophysiology, microscopic features and other relevant pathological features were also prepared in HTML format.

The web page for FRB was uploaded in the USM intranet

http://notes.kck.usmnet/patologi/MyWeb/Fgt/index.htm

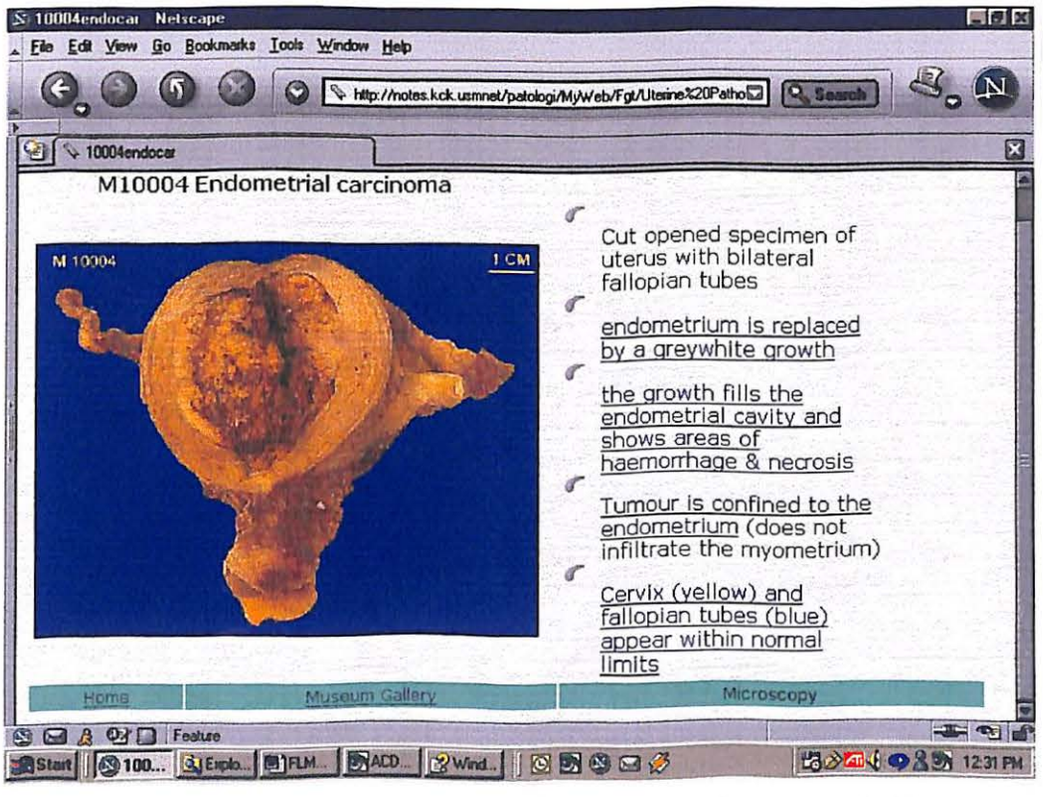


Fig. 2 – The same specimen depicted in Fig. 1 has been edited and uploaded in intranet.

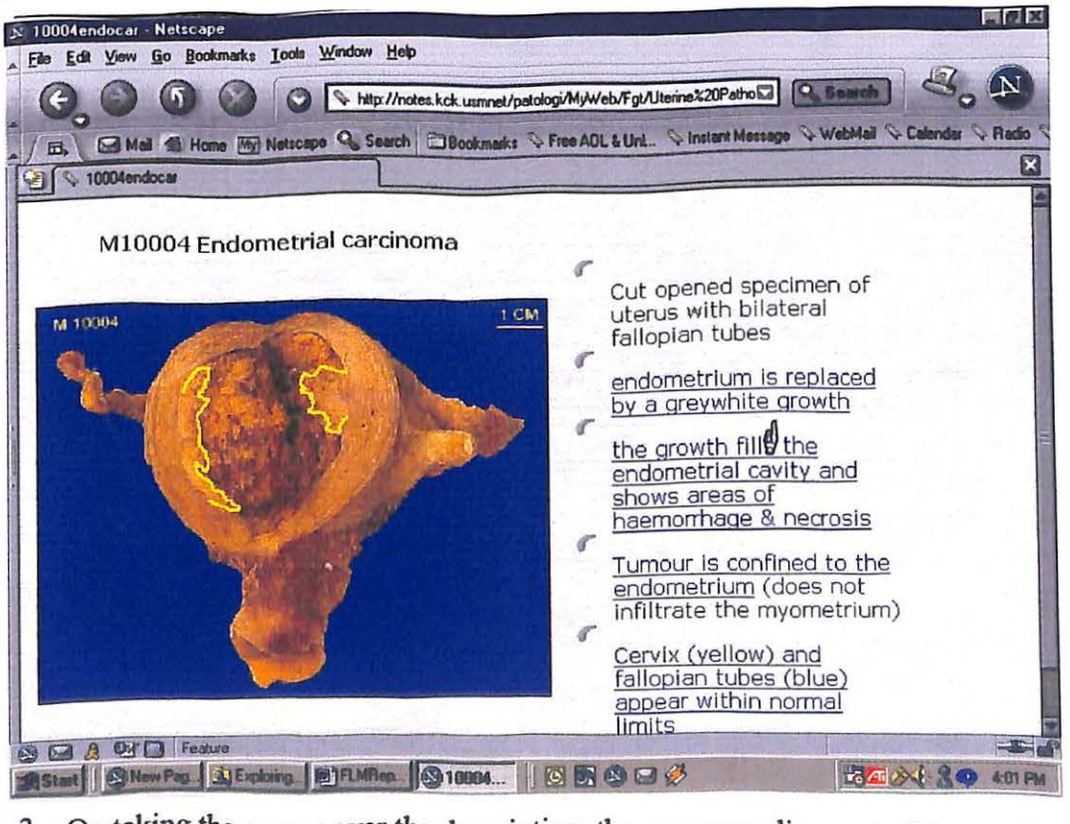


Fig. 3 – On taking the cursor over the description, the corresponding part of the specimen is displayed.

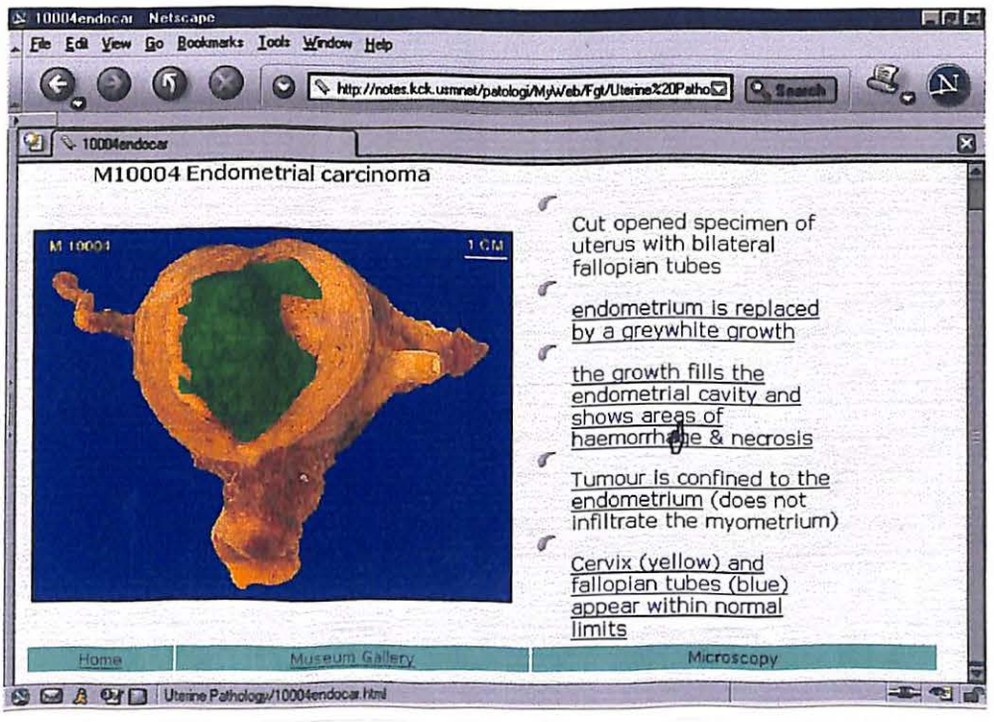


Fig. 4 – On moving the cursor over the next description, the corresponding part of the specimen is displayed

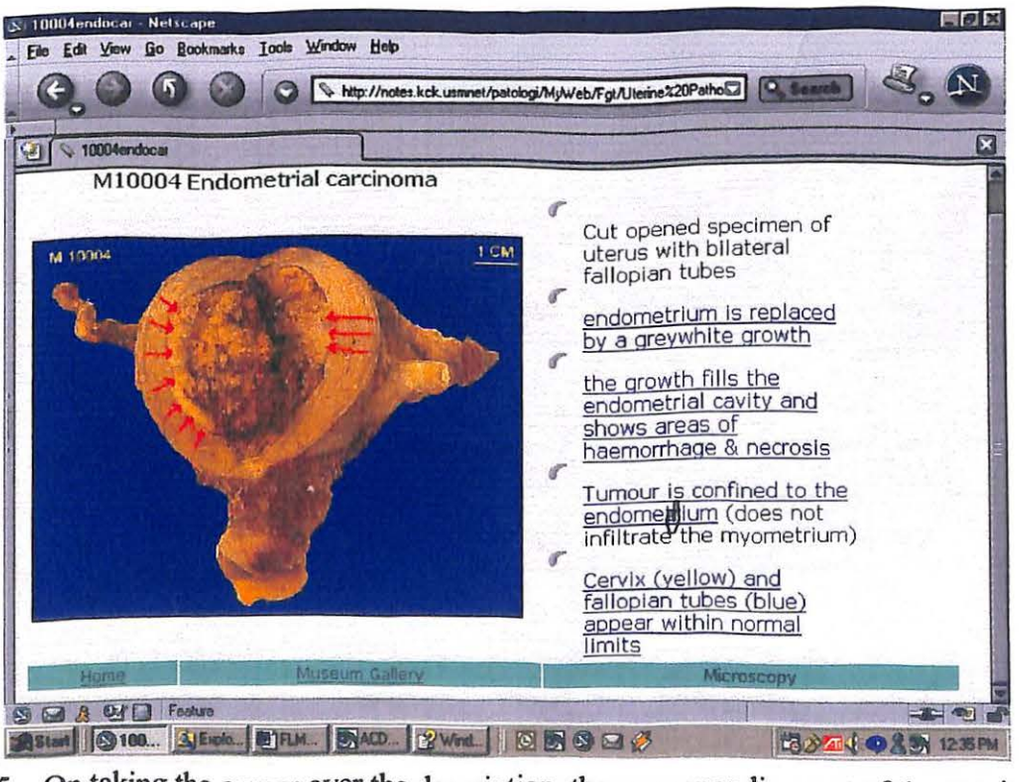


Fig. 5 – On taking the cursor over the description, the corresponding part of the specimen is displayed.

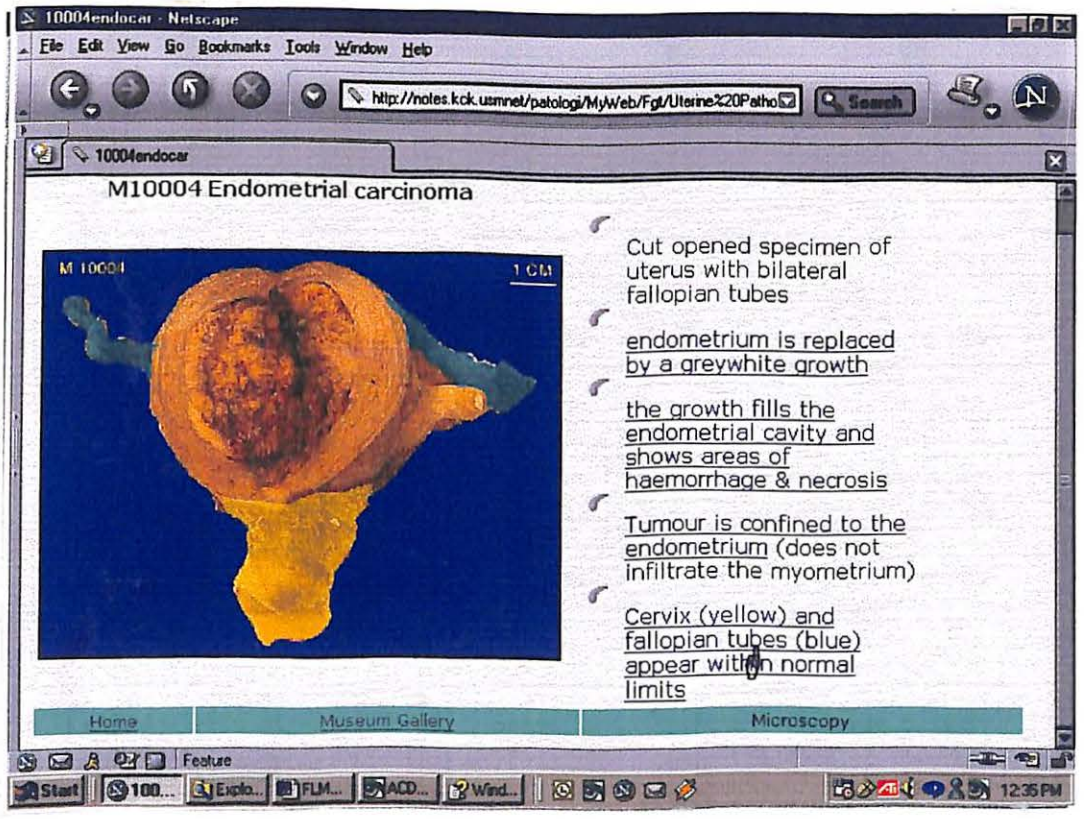


Fig. 6 – On taking the cursor over the description, the corresponding part of the specimen is displayed.

Assessment of students:

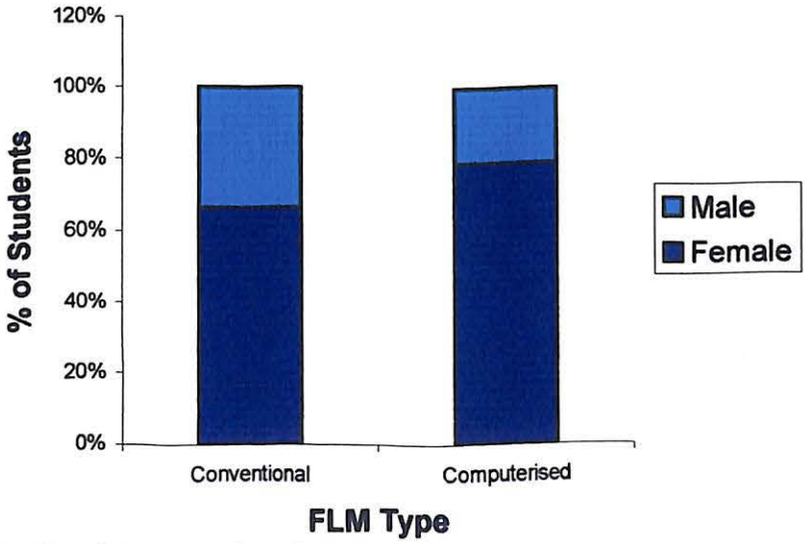
One hundred and sixty three students were participated in the assessment at the end of FRB. 87 students underwent conventional FLM (conFLM) and the remaining 76 students underwent computerised FLM (comFLM). 10 students were excluded from this study, as they attended both type of FLM. Hence the questionnaire and the assessment were evaluated by statistical analysis only for 153 students.

Students' demography:

Sex:

In the conFLM, 66.7% were female and 33.3% were male, while in comFLM 78.9% were female. (Fig.7)

Fig. 7: Sex incidence of Students

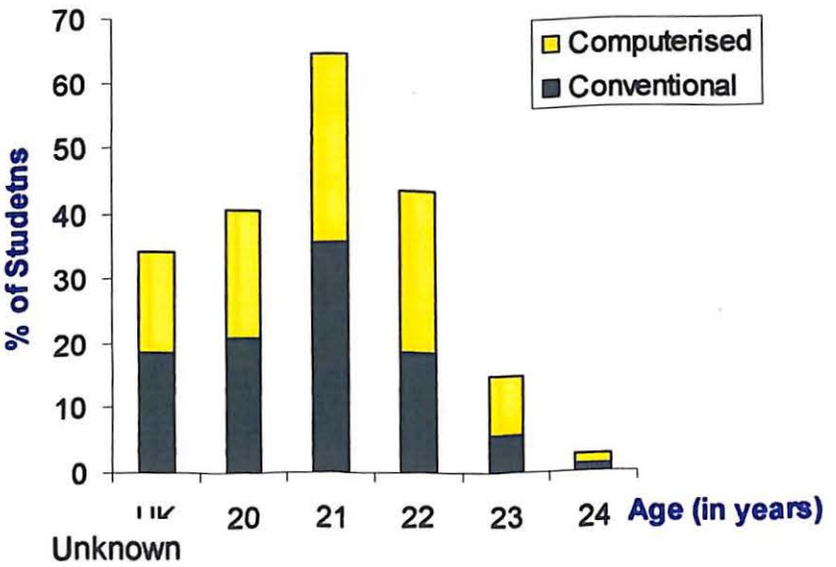


Age:

In conFLM, majority (35.6%) were 21 years old, 20.7% were 20 years, 18.4% were 22 years. 5.7% were 23 years old and one student was 24 years old. Age factor was not available in 18.4%

In comFLM also majority of students (28.9%) were 21 years old, 25% were 22 years, 19.7% were 20 years, 9.2% were 23 years old. 1 student was 24 years old and in 15.8% it was not known. (Fig. 8)

Fig. 8: Age incidence of students

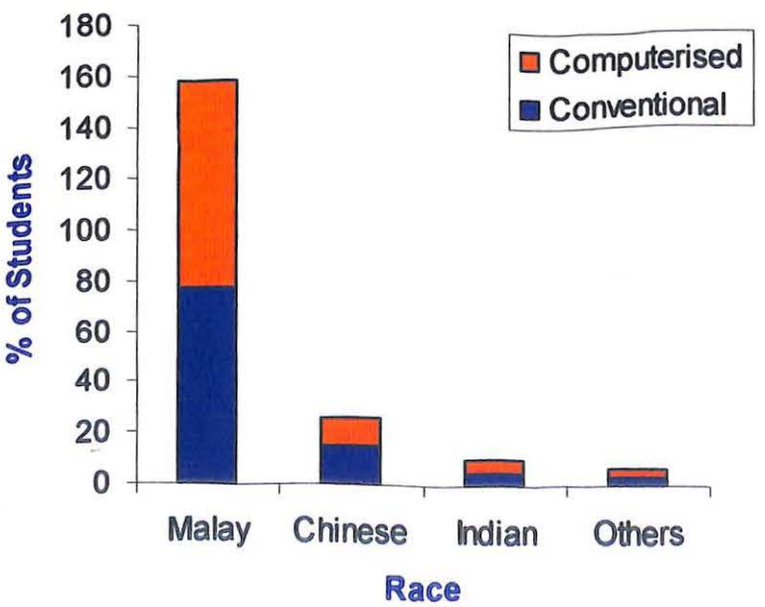


Race:

In conFLM, majority (77%) were Malays. 14.9% were Chinese, 4.6% were Indians and 3.4% were of other races.

In comFLM too, majority (81.6%) were Malays. 10.5% were Chinese and 5.3% were Indians. 2.6% were of other races. (Fig. 9)

Fig 9. Incidence of race of Students

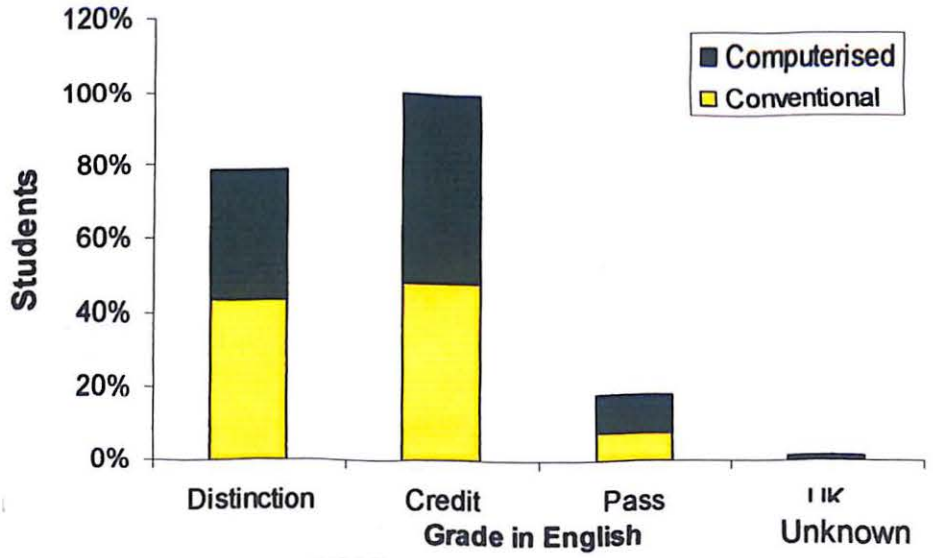


Grade in English in SPM / Matriculation:

In conFLM, 43.7% had got distinction, 48.3% got credit and the remaining 8% had just passed.

In comFLM, 35.5% had got distinction, 52.6% got credit and the remaining 10.5% had just passed. This data was not available in 1.3%. (Fig. 10)

Fig 10. Grade in English obtained by students

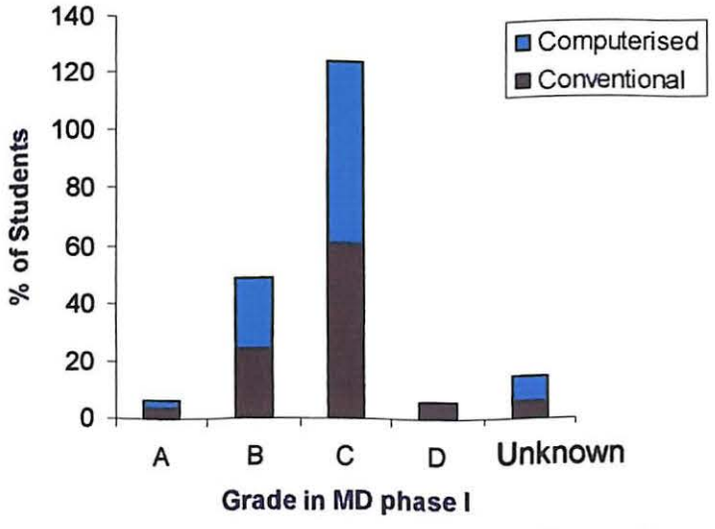


Grade in MD phase I professional examination:

In conFLM, majority (60.9%) had obtained grade 'C', followed by grade 'B' (24.1%). 5.7% of students got grade 'D'. 3.4% had got grade 'A' and the information was not available in 5.7% of the sample.

In comFLM, majority (63.2%) had obtained grade 'C', followed by grade 'B' (25%). 2.6% had got grade 'A' and the information was not available in 9.2% of the sample. (Fig. 11)

Fig. 11:Grade in MD Phase I obtained by students



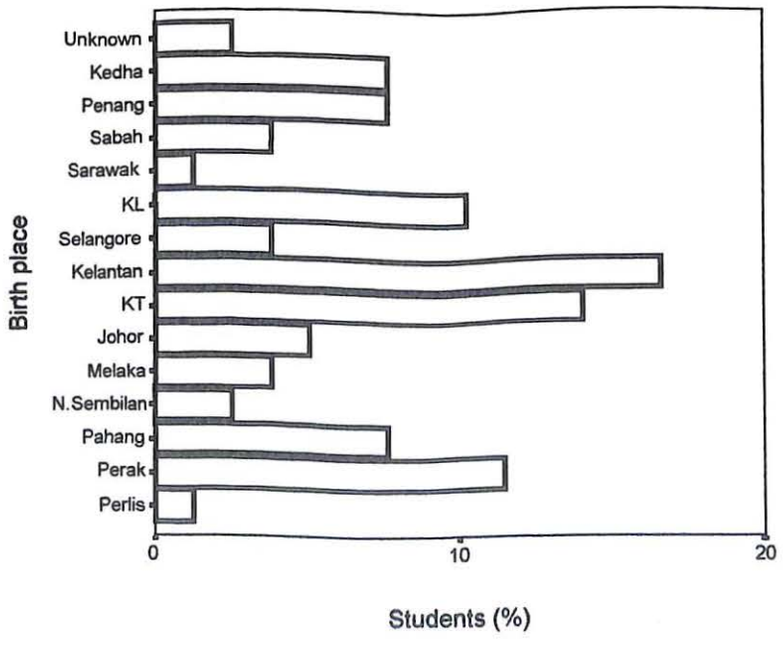
Owning a personal computer (PC):

In conFLM, 34.5% owned a PC and in comFLM 38.2% owned one.

Birthplace:

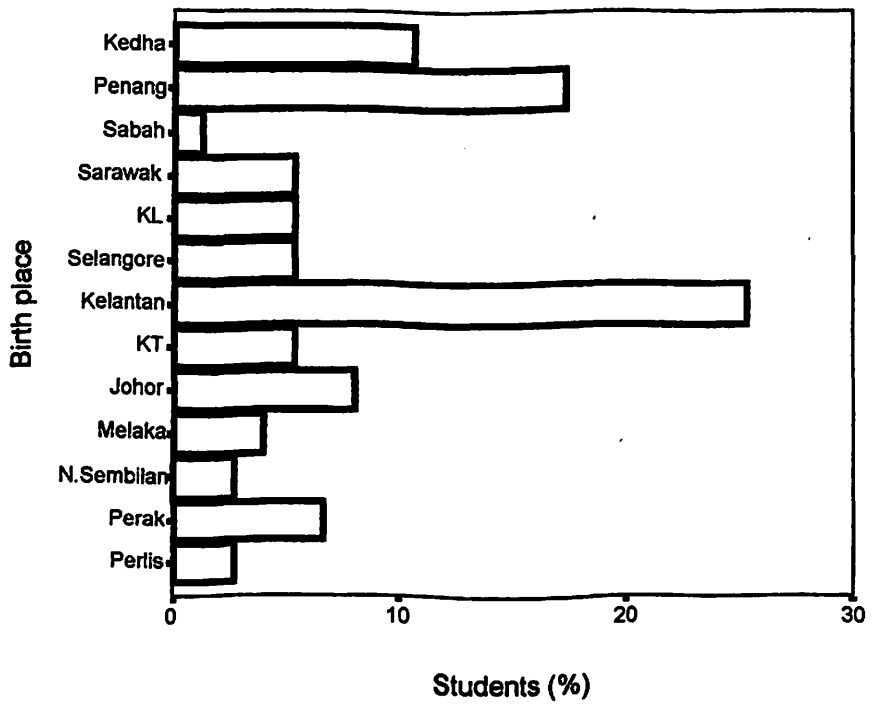
In conFLM, majority of the students (17.2%) birthplace was Kelantan followed by Kuala Terrangannu (12.6%). 10.3% of the students had Perak as birthplace while another 10.3% had Kuala Lumpur. Input from other states ranged from 1.1% to 9.2%. (Fig. 12)

Fig. 12:Birth Place of students – in conFLM



In comFLM also, majority (25%) were from Kelantan, however followed by Penang (17.1%). 10.5% students had come from Keda. The input from other states ranged from 1.3% to 7.9% (Fig. 13).

Fig. 13: Birth Place of students – in comFLM group



Practicing aspects of FLM:

Place of exposure to FLM:

In conFLM, apart from MDL, 10.3% utilized the CAI lab & other places. They were excluded from the study.

In comFLM, apart from CAI lab, 22.4% utilized the library & other places where PC was available.

Number of times exposed to FLM:

In conFLM, only 4.6% students attended FLM more than once. However in comFLM, 31.6% of students attended 2 times, 6.6% for 3 times, 3.9% for 4 times and 1.3% attended for 5 times.

Duration spent in FLM:

In conFLM, 70.1% spent less than 1 hour and 33.3% spent more than 1 hour. The data was not available in 9.2%.

In comFLM, 57.9% spent less than 1 hour while 64.5% spent more than 1 hour.

Attending session:

In conFLM, apart from FLM session, 31% attended during self-study session.

In comFLM, apart from FLM session 55.3% attended during self-study session and 18.4% after hours.

Problems faced:

In conFLM, 93.1 faced some problems while in comFLM, 85.5% faced some problems (Fig. 14).

Non-availability of resource person was the problem faced by 42.5% and 52.6% of students in conFLM and comFLM respectively.

60.9% of conFLM students found resource material was not clear while only 30.3% of comFLM students felt so.

51.3% found CAI lab was not freely accessible in comFLM, while only 25.3% felt so with MDL in conFLM.

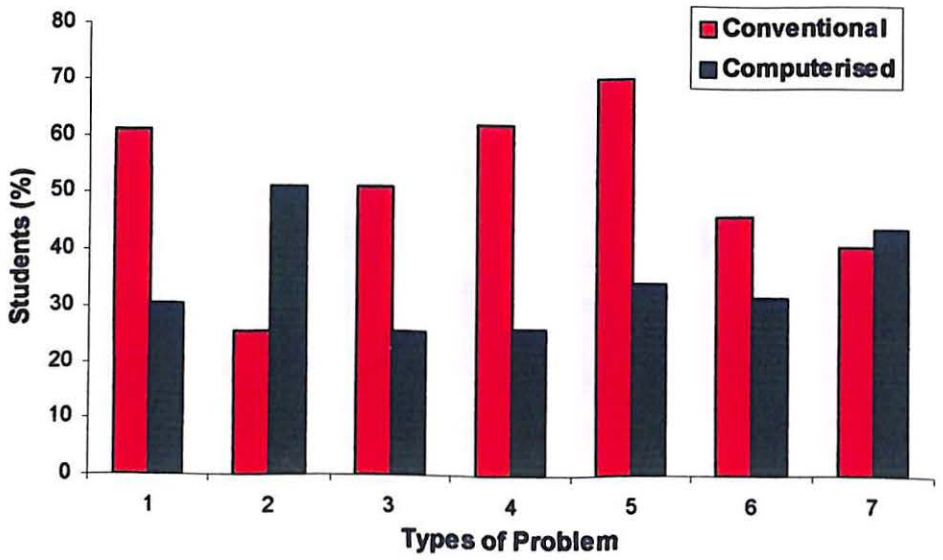
The difficulty in understanding the gross features, microscopic features and pathophysiology was very high (62.1%, 70.1% and 46% respectively) in conFLM on comparing with comFLM (26.1%, 34.2% and 31.6% respectively).

43.7% students found inhibition to interact with the resource person and almost equal number (40.8%) found inability to interact with PC.

In conFLM, 27 out of 78 students faced some problems other than mentioned in the questionnaire. Majority (37%) felt that the MDL was over crowded. 22.2% of the students felt the need for a written description for the gross specimens. 18.5% of the students found difficulty in understanding certain lecturer's accent. 11.1% of the students found problems in audiovisual system while another 11.1% of the students felt the MDL should be kept open even after office hours.

In comFLM, 42 out of 75 students faced some problems other than mentioned in the questionnaire. Majority of the students (33.3%) felt the PC kept in CAI were not sufficient. Some of them (21.4%) could not open some of the files. 14.3% of the students felt difficulty in learning sitting in front of the PC and 12% felt the need of a lecturer. 7.1% of the students felt that they could not copy the files and also could not access the web page in the cyber cafe. Another 7.1% of the students were not satisfied with seeing the 2D pictures, indeed they preferred to see the 3D specimens.

Fig. 14:Types of problem faced in FRB



1– Resource person, 2 – Learning material, 3 – Place of FLM, 4 – Difficulty in gross, 5 – Difficulty in microscopy, 6 – Difficulty in pathophysiology, 7 – Inhibition

Comparison of marks obtained by both groups:

MCQ Marks: (Tab. 1)

In conFLM, the marks scored by the students ranged from 3 to 17 out of 20, with a mean of 10. 46.2% students scored more than 50%.

In comFLM, the marks ranged from 4 to 16 with mean of 10. Forty eight percent of the students scored more than 50%. There was no statistical significant difference between the groups ($p = 0.464$).

Conventional OSCE Marks: (Tab. 1)

In conFLM, the scored marks ranged from 2 to12 out of 12. The mean was 8.2 and 78.2% of the students got more than 50% marks.

In comFLM, the scored marks ranged from 0 to12 out of 12. The mean was 7.5 and 70.7% of the students got more than 50% marks. However it was not statistically significant ($p = 0.078$)

Computerised OSCE Marks: (Tab. 1)

In conFLM group, the scored marks ranged from 0 to12 out of 12. The mean was 6.1 and 41% of the students got more than 50% marks.

In comFLM, the scored marks ranged from 0 to10 out of 12. However the mean was 4.9 and only 32% of the students got more than 50% marks. The difference was statistically significant (p = 0.014).

Tab. 1: Mann – Whitney test comparing the marks obtained in female reproductive block

	MCQMARKS	CONVENTIONAL OSCE MARKS	COMPUTERISED OSCE MARKS
Mann-Whitney U	2725.500	2444.000	2254.500
Wilcoxon W	5806.500	5294.000	5104.500
Z	-.733	-1.760	-2.454
Asymp. Sig. (2-tailed)	.464	.078	.014

Musculoskeletal Block

Preparation of computerised FLM material:

In the musculoskeletal block, images of 28 specimens were processed in the image editing software. Using JavaScript, the macroscopic (text) features were linked with the corresponding images and a HTML file was created for each pathology specimen using Microsoft front page programme. The pathophysiology, microscopic features and other relevant pathological features were also prepared in HTML format. The web page for MSB was uploaded in the USM intranet http://notes.kck.usmnet/patologi/MyWeb/MSS/indexMSS.htm

Assessment of students:

One hundred and one students participated in the assessment at the end of MSB. 54 students underwent conFLM and the remaining 47 students underwent comFLM. Twenty-nine students were excluded from this study, as they attended both types of FLM. Hence the questionnaire and assessment were evaluated for statistical analysis for only 72 students.

Practicing aspects of FLM:

Place of exposure to FLM:

In conFLM, apart from MDL, 31.5% utilized the CAI lab & library. They were excluded from the study.

In comFLM, apart from CAI lab, 19.2% utilized the library & other places where PC was available. As 25.5% of the students utilized the MDL, they were excluded from this study.

Times exposed to FLM:

In conFLM, only 11.1% of students attended FLM twice and 5.6% attended three times. However, in comFLM 34% of students attended twice, and 4.3 % for 4 times.

Duration spent in FLM:

In conFLM, 55.6% spent less than 1 hour and the remaining students spent more than 1 hour.

In comFLM, 76.6% spent less than 1 hour while 23.4% spent more than 1 hour in CAI lab.

Attending session:

In conFLM, apart from FLM session, 29.6% attended during self-study session.

In comFLM, apart from FLM session 34% attended during self-study session and 14.9% after hours.

Problems faced:

In conFLM, 68.5 faced some problems while in comFLM only 42.6% faced it (Fig. 15).

Non-availability of resource person was the problem faced by 20.4% and 17% of students in conFLM and comFLM respectively.

37% of conFLM students found resource material was not clear while only 17% of comFLM students felt so.

6.4% found CAI lab was not freely accessible while only 14.8% felt so with MDL.

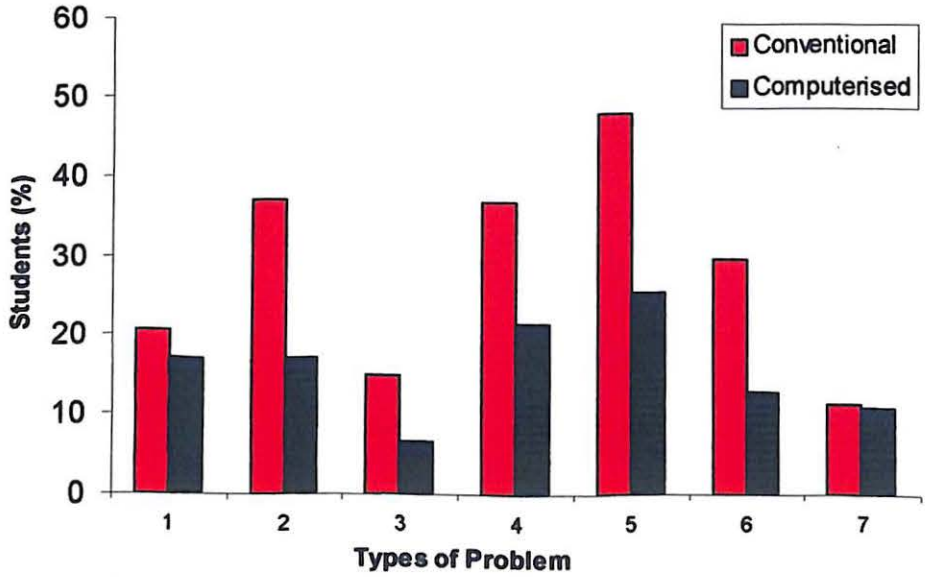
The difficulty in understanding the gross features, microscopic features and pathophysiology was very high (37%, 48.1% and 29.6% respectively) in conFLM on comparing comFLM (21.3%, 25.5% and 12.8% respectively).

11.1% students found inhibition to interact with the resource person and almost equal number (10.6%) found inability to interact with PC.

On comparing the FRB, in this MSBlock only five students faced some problems other than mentioned in the questionnaire. In comFLM, only one student felt that it was boring and there was lot of interruptions and not adequate PCs. In conFLM also only one

student got easily bored and another felt there was not enough time. Two students complained that it was too crowded.

Fig. 15:Types of problem faced in MSB



1– Resource person, 2– Learning material, 3 – Place of FLM, 4 – Difficulty in gross, 5 – Difficulty in microscopy, 6 – Difficulty in pathophysiology, 7 – Inhibition

Comparison of marks obtained by both groups:

MCQ Marks: (Tab. 2)

In conFLM, the marks scored by the students ranged from 2 to18 out of 20, with a mean of 12. 81.1% of the students scored more than 50%.

In comFLM, the marks ranged from 7 to 20 with a mean of 14. 88.6% of the students scored more than 50%. There was a significant difference ($p = 0.025$) was noted between those groups.

Conventional OSCE Marks: (Tab. 2)

In both conFLM and comFLM, the scored marks ranged from 0 to12 out of 12 and the mean was 7. 67.6% of the conFLM students and 45.7% of the comFLM students got more than 50% marks. However there was no statistically significant difference ($p = 0.755$)

Computerised OSCE Marks: (Tab. 2)

In both conFLM and comFLM the marks ranged from 0 to 12 out of 12 with a mean of 8. Seventy three percent of the conFLM and 74.3% of the comFLM students got

more than 50% marks. However there was no statistically significant difference (p = 0.670)

Tab. 2: Mann – Whitney test comparing the marks obtained in musculoskeletal block

	MCQMARKS	CONVENTIONAL OSCE MARK	COMPUTERISED OSCE MARK
Mann-Whitney U	450.000	620.000	610.000
Wilcoxon W	1153.000	1250.000	1313.000
Z	-2.244	-.312	-.426
Asymp. Sig. (2-tailed)	.025	.755	.670

Compassion between computerised FLM and conventional FLM: (Fig. 16)

Total students participated in this questionnaire were one hundred and one. Nine important factors were compared. They included interest, user friendly, requirement of a resource person, easy understanding, interaction, usefulness and the preference.

Interesting:

60.4% of the students felt that comFLM was more interesting than conFLM while only15.8% felt the conFLM was more interesting than comFLM. 23.8% of the students found both types of FLM were equally interesting.

Users friendly:

64.4% of the students felt that comFLM was more users friendly than conFLM while only 20.8% felt the conFLM was more users friendly than comFLM. 14.8% of the students found both types of FLM were equally users friendly.

Requirement of a resource person during FLM session:

Majority (60.1%) of the students felt the need of a resource person in both the type of FLM. While 38.6% felt the need of a resource person only in conFLM, one percent required the resource person only in comFLM.

Better understanding:

34.7%, 6.9% and 24.8% of the students understood the macroscopic feature, microscopic feature and pathophysiology respectively better in conFLM than in comFLM.

46.5%, 82.2% and 43.6% of the students understood the macroscopic feature, microscopic feature and pathophysiology respectively better in comFLM than in conFLM.

18.8%, 10.9% and 31.7% of the students found no difference between the two types of FLM in understanding the macroscopic feature, microscopic feature and pathophysiology respectively.

Interaction:

71.2% of the students felt the interaction was better in conFLM while only 13.9% felt it was better in comFLM. 14.9% of the students felt there was no difference between the two types of FLM.

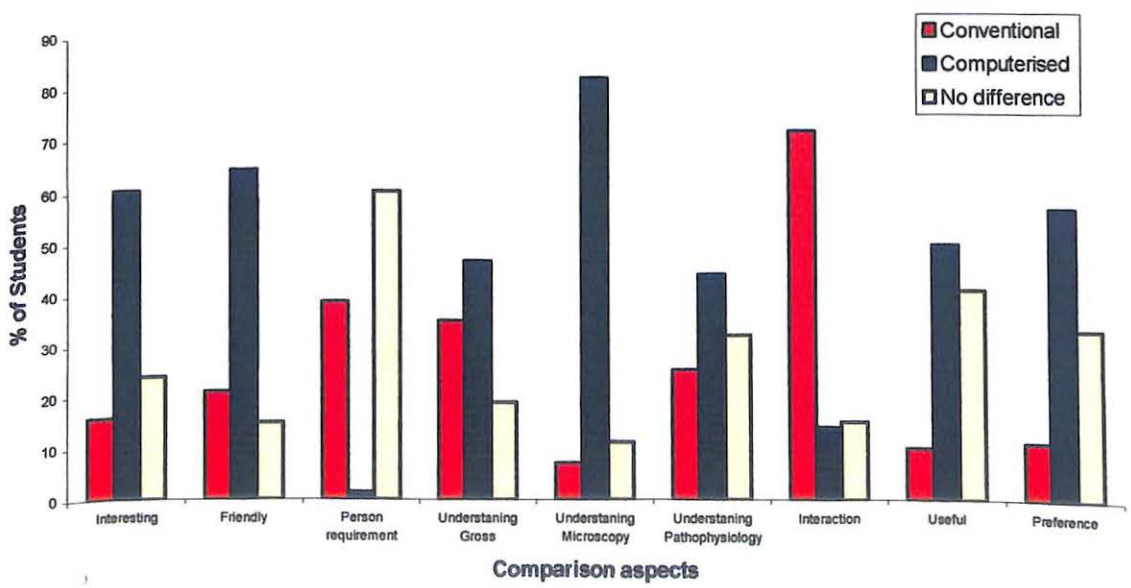
Usefulness:

49.5% of the students found comFLM was more useful than conFLM, while only 9.9% found conFLM was more useful than comFLM. 40.6% of the students found both the type of FLMs were equally useful.

Preference:

56.4% of the students preferred comFLM while only 10.9% preferred conFLM. 32.7% of the students had no preference.

Fig. 16:Comparison of comFLM & conFLM



Free Remarks:

As both the batches of students had been exposed to both the types of FLM, all the students were included for this variable. Out of 72 students, 53 of them gave their free comments and suggestion. Majority (79.2%) preferred both the types of FLM should be there in practice. They wanted to inspect the real three-dimensional specimens and listen to the necessary explanation given by the pathologist to get the first hand information. However the comFLM pictures were so clear and self-explanatory and would be immensely helpful in the revision. 9.4% of the students went to the extent of saying comFLM itself would be enough. Another 3.8% of the students recommended lecturers to be there in comFLM. 5.7% of the students suggested creating a self-assessment in the comFLM. 3.8% of the students suggested burning the whole FLM material on the CD for sales so that they could view it in the hostel also.

DISCUSSION

DISCUSSION

In this study two methods – computerized and conventional method for teaching fixed-learning module for phase II MD students were compared. Originally FRB and genitourinary block (GUB) were included in this study because both the blocks contained a quite a number of specimens. During the study week of FRB, the conventional FLM was displayed in the multidisciplinary lab (MDL). The comFLM was prepared by the primary researcher (M. Madhavan) and was uploaded in the USM intranet. It took about four months to complete. The usmnet could be assessed in the CAI lab, library and all other PCs which were connected by Ethernet card. The phase II students were divided into two groups. One group (A) was exposed to conFLM and the other group (B) was exposed to comFLM in FRB.

After the FRB was over, the comFLM was prepared on GUB. The comFLM material was prepared only by the primary researcher. However it could not be completed before that block got started. Hence that block was not included in the assessment.

Then comFLM material was prepared on MSB which took nearly three months and was uploaded in the usmnet. At this time, the students group were crossed over so that the group A was exposed to comFLM while the group B was exposed to conFLM.

At the end of each block, the students were assessed by examination on MCQs, conOSCE and comOSCE. The students' demography, practicing aspects of FLM, the problems faced during learning FLM and the comparison of two types of FLM were also assessed by questionnaire. All the assessments were conducted in the lecture hall. During the assessment the Group A and B were well separated from each other. The student seats were also spaced enough and the students were invigilated carefully to prevent any discussion among them.

Marks obtained:

In FRB, there was no significant difference between the mean marks obtained in MCQ by the two groups (p value is 0.464). This reflects the theoretical knowledge was not influenced by the method of FLM. Even in conOSCE, there was no significant difference (p=0.078). On contrary, the conFLM group acquired more mean marks (6.1) in comOSCE than by comFLM group (4.9). Also only 32% of comFLM students got more than 50% of marks while 41% of conFLM students got more than 50% (p value = 0.014). This showed that computerised FLM alone was not sufficient to recognize the

pathological features in a potted specimen, because they were not so clear in the potted specimen. Moreover, there was no resource person in comFLM and it might have stalled their learning process. Indeed, the features were very clear in the comFLM, so that the group who had seen the conventional specimens could easily recognize them in the digital photographs. A pathologist conducted the conFLM and he might have emphasized the important features of the specimen. This emphasize that a resource person is certainly needed during FLM.

In MSB, the comFLM group scored better than conFLM group in MCQ assessment and was statistically significant ($p = 0.025$). However, in FRB, there was no statistical difference in MCQ marks. So it is not apparent whether the comFLM imparts more theory knowledge or not. This study has to be extended to many more blocks to verify this finding.

In both comOSCE as well as conOSCE of MSB, there was no statistical difference noted between the groups A and B. But in FRB, the conFLM group acquired more mean marks (6.1) in comOSCE than by comFLM group (4.9). Again it appears difficult to draw a line between two types of FLM. Moreover it appears that the nature of specimens and the type of pathological lesions present in the specimens might influence learning process.

Univariate analysis was done to find out whether the bio data influenced their marks obtained in the assessment. But, no factors were found to influence it except the race of the student.

Thus no one type of FLM appears superior than the other. However the comFLM appears to have more advantages.

The students could spend more time in comFLM on comparing with conFLM. Since each student was provided with an individual personal computer (PC) in the CAI lab, they could learn it in their own pace. In other words, they could utilize the comFLM at their maximum. This also reflected by their attendance (more than 55%) during the self study session by comFLM group.

Spending more time in FLM and attending more than once might suggest that the comFLM would be more difficult to understand and require more time than the conFLM. But it was not true. Almost 61% of conFLM students in FRB and 37% of conFLM students in MSB found the resource material was not clear. A very high percentage of students felt that they could not understand the macroscopic features, microscopic

features and pathophysiology exhibited in conFLM. So it appears that the students lost their hope in attending conFLM more than once and felt no point in spending more time on it.

After both the students groups were exposed to both the types of FLM, they were asked to compare the FLMs with respect to interest generated, user friendliness, requirement of a resource person, understanding, usefulness and the preference.

More than 60% of the students felt comFLM was more interesting and user friendly than conFLM, while only 15% felt vice versa.

46.5%, 82.2% and 43.6% of the students understood the macroscopic features, microscopic features and pathophysiology respectively better in comFLM than in conFLM, whereas only 34.7%, 6.9% and 24.8% of the students understood the macroscopic feature, microscopic feature and pathophysiology respectively better in conFLM than in comFLM.

49.5% of the students found comFLM was more useful than conFLM, while only 9.9% found conFLM was more useful than comFLM. Hence 56.4% of the students preferred comFLM while only 10.9% preferred conFLM if there were choice of only one type of FLM. However majority (60.1%) of the students felt the need for a resource person in both types of FLM.

Majority of the students felt that both types of FLM should be in practice. They want to inspect the real three-dimensional specimens and listen to the necessary explanation given by the pathologist during conFLM and to revise comFLM pictures during revision as they are so clear and self explanatory. The researchers also felt similar way.

CONCLUSION

CONCLSUION

Computerised FLM material has got more advantages than conventional FLM. Once it got uploaded in the web, the students could view at any time, any place and any number of times and learn in their own pace. However it would not replace the conventional FLM because the students still need to get proper explanation from the resource person (pathologist). However, it would be certainly more useful during revision.

Thus, computerised FLM and conventional FLM appear complementing each other in effective learning of FLM by phase II, MD students.

REFERENCES

REFERENCES

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2. Susan Toohey & Eilean Watson, (2001) "Twelve tips on choosing web teaching software", Medical Teacher, Vol. **23**, No. 6

APPENDIX

APPENDIX

Assessment of Fixed Learning Module – (Female reproductive block)

***** (Please darken the circle wherever applicable) *****

Bio-data:

1. **Sex:** O Male O Female

2. **Age:** years

3. **Race** O Malay O Chinese O Indian O Others

4. **Grade in English in SPM / Matriculation**
   O Distinction O Credit O Pass O Fail

5. **Grade in Professional I, MD**
   O A O B O C O D

6. **Do you own a personal computer?** O Yes O No

7. **Please state your birth place (Name of the state)** .....

Practicing aspects

8. **Where did you get exposed to FLM material** (you can choose more than one)?
   O MDL O CAI Lab O Library O Others

9. **How many times did you attend computerised FLM each week?**
   O 1 O 2 O 3 O 4 O 5 or more

10. **The duration that you spent for each visit**
    (Please darken the duration & circle the number of times; You can choose more than one)
    O < 30 min. X 1 / 2 / 3 / 4 times
    O 31 to 60 min X 1 / 2 / 3 / 4 times
    O 61 to 90 min X 1 / 2 / 3 / 4 times
    O > 91 minutes X 1 / 2 / 3 / 4 times

11. **When did you attend the FLM (computerised or conventional)?**
    (Please darken the circle; you can choose more than one answer)
    O Self-study session O FLM session O CAI session O After hours

12. **Did you face any problem during learning, using the FLM (computerised or conventional)?**
    O Yes O No

13. **If 'Yes', what type of problem?** (You can choose more than one answer)
    O Non-availability of resource person
    O Resource person / resource material is not clear
    O Resource place (MDL / CAI lab) was not freely accessible
    O Could not understand the gross pathological features exhibited
    O Could not understand the microscopic features exhibited
    O Could not understand the pathophysiological mechanism exhibited
    O Inhibition to interact with the resource person / Inability to interact with the PC
    O Others. (Specify)

    .....

MCQ

		T	F
1	In hydatidiform mole - complete type, both the chromosomes are maternal origin	O	O
2	Gestational choriocarcinoma can be preceded by endometrial hyperplasia	O	O
3	Acute salpingitis is the commonest cause for tubal pregnancy	O	O
4	Choriocarcinoma histologically shows oedematous chorionic villi	O	O
5	Increased incidence of endometrial carcinoma is noted in granulosa cell tumour	O	O
6	Mucinous tumours of the ovary develop from the surface epithelium	O	O
7	Brenner tumour develops from the surface epithelium	O	O
8	Yolk sac tumour develops from the sex cord stroma	O	O
9	Dysgerminoma develops from germ cell	O	O
10	Thecoma is microscopically characterised by Call-Exner bodies	O	O
11	Mature teratomas are typically solid	O	O
12	Endometriosis of ovary is a precancerous lesion	O	O
13	Fertilization of an empty ovum is an important cause for the ectopic pregnancy	O	O
14	Choriocarcinoma characteristically metastasise by haematogenous route	O	O
15	Krukenberg tumour is usually bilateral	O	O
16	Serum beta HCG will be raised in endodermal sinus tumour	O	O
17	Invasive mole is characterised by the penetration of the endometrium	O	O
18	Hydatidiform mole is characterised by the proliferation of trophoblasts	O	O
19	Serous cystadenoma is usually multilocular	O	O
20	Choriocarcinoma characteristically confined to the uterine body	O	O

OSCE - Conventional

OSCE 1: M 575/89

1. State the probable diagnosis

2. List two features to support your diagnosis
   a. ...
   b. ...

OSCE 2 M 924/92

1. State the probable diagnosis

2. List four features to support your diagnosis
   a. ...
   b. ...
   c. ....
   d. ....

OSCE: 3 M 425/86 A pelvic organ removed from a woman is displayed

1. State the probable diagnosis

2. List two features to support your diagnosis
   a. ...
   b. ...

OSCE 4: M 801/90 A pelvic organ removed from a woman is displayed

1. State the probable diagnosis

2. List two features to support your diagnosis
   a...
   b...

OSCE – Computerised

OSCE 1: 311/85

1. State the probable diagnosis

2. List two features to support your diagnosis
   a. ...
   b. ...

OSCE 2: No number. A pelvic organ from a woman is displayed

1. State the probable diagnosis

2. List two features to support your diagnosis
   a. ...
   b. ...

OSCE 3: 1147/98

1. State the probable diagnosis

2. List four features to support your diagnosis
   a. ...
   b. ...
   c. ...
   d. ...

OSCE 4: Photomicrograph of endometrial curettage is displayed

1. State the probable diagnosis

2. List two features to support your diagnosis
   a. ...
   b. ...

Answer Sheet

MCQ

		T	F
1	In hydatidiform mole - complete type, both the chromosomes are maternal origin	○	■
2	Gestational choriocarcinoma can be preceded by endometrial hyperplasia	○	■
3	Acute salpingitis is the commonest cause for tubal pregnancy	○	■
4	Choriocarcinoma histologically shows oedematous chorionic villi	○	■
5	Increased incidence of endometrial carcinoma is noted in granulosa cell tumour	■	○
6	Mucinous tumours of the ovary develop from the surface epithelium	■	○
7	Brenner tumour develops from the surface epithelium	■	○
8	Yolk sac tumour develops from the sex cord stroma	○	■
9	Dysgerminoma develops from germ cell	■	○
10	Thecoma is microscopically characterised by Call-Exner bodies	○	■
11	Mature teratomas are typically solid	○	■
12	Endometriosis of ovary is a precancerous lesion	○	■
13	Fertilization of an empty ovum is an important cause for the ectopic pregnancy	○	■
14	Choriocarcinoma characteristically metastasise by haematogenous route	■	○
15	Krukenberg tumour is usually bilateral	■	○
16	Serum beta HCG will be raised in endodermal sinus tumour	○	■
17	Invasive mole is characterised by the penetration of the endometrium	○	■
18	Hydatidiform mole is characterised by the proliferation of trophoblasts	■	○
19	Serous cystadenoma is usually multilocular	○	■
20	Choriocarcinoma characteristically confined to the uterine body	○	■

Key for OSCE:
M 575/89 – Tubal Pregnancy
M 924 / 92 – Adenomyosis with endometriosis
M 425/86 –
M 801/90 – Teratoma ovary

311/85 – Choriocarcinoma
No Number – Serous cystadenoma
1147/98 – Granulosa cell Tumour
Micrograph – Hydatidiform mole

Assessment of Fixed Learning Module – (Musculoskeletal block)

***** (Please darken the circle wherever applicable) *****

Bio-data:

1. **Sex:** O Male O Female

2. **Age:** years

3. **Race** O Malay O Chinese O Indian O Others

4. Grade in English in SPM / Matriculation
   O Distinction O Credit O Pass O Fail

5. **Grade in Professional I, MD**
   O A O B O C O D

6. **Do you own a personal computer?** O Yes O No

7. **Please state your birth place (Name of the state)** .....

Practicing aspects

8. **Where did you get exposed to FLM material** (you can choose more than one)?
   O MDL O CAI Lab O Library O Others

9. **How many times did you attend computerised FLM each week?**
   O 1 O 2 O 3 O 4 O 5 or more

10. **The duration that you spent for each visit**
    (Please darken the duration & circle the number of times; You can choose more than one)
    O < 30 min. X 1 / 2 / 3 / 4 times
    O 31 to 60 min X 1 / 2 / 3 / 4 times
    O 61 to 90 min X 1 / 2 / 3 / 4 times
    O > 91 minutes X 1 / 2 / 3 / 4 times

11. **When did you attend the FLM (computerised or conventional)?**
    (Please darken the circle; you can choose more than one answer)
    O Self-study session O FLM session O CAI session O After hours

12. **Did you face any problem during learning, using the FLM (computerised or conventional)?**
    O Yes O No

13. **If 'Yes', what type of problem?** (You can choose more than one answer)
    O Non-availability of resource person
    O Resource person / resource material is not clear
    O Resource place (MDL / CAI lab) was not freely accessible
    O Could not understand the gross pathological features exhibited
    O Could not understand the microscopic features exhibited
    O Could not understand the pathophysiological mechanism exhibited
    O Inhibition to interact with the resource person / Inability to interact with the PC
    O Others. (Specify)
    .....
    .....
    .....

14. **Which FLM was more interesting?**
- O Computerised FLM
- O Conventional FLM
- O No difference

15. **Which FLM was more users friendly**
- O Computerised FLM
- O Conventional FLM
- O No difference

16. A resource person is required in
- O Computerised FLM only
- O Conventional FLM only
- O Both FLMs

17. **Macroscopic features were better understood in**
- O Computerised FLM
- O Conventional FLM
- O No difference

18. **Microscopic features were better understood in**
- O Computerised FLM
- O Conventional FLM
- O No difference

19. **Pathophysiological features were better understood in**
- O Computerised FLM
- O Conventional FLM
- O No difference

20. **Interactions were better in**
- O Computerised FLM
- O Conventional FLM
- O No difference

21. **Which FLM was more useful?**
- O Computerised FLM
- O Conventional FLM
- O No difference

22. **Which type of FLM do you prefer?**
- O Computerised FLM
- O Conventional FLM
- O No difference

Any other suggestions / remarks/ comments:

.....
.....
.....
.....
.....
.....
.....
.....
.....

Assessment of Fixed Learning Module – Musculoskeletal block

MCQ

		T	F
1	Giant cell tumour typically arises in the epiphysis	O	O
2	Plain X-ray of giant cell tumour shows **'onion-skin'** appearance	O	O
3	Osteosarcoma characteristically affects the elderly	O	O
4	Osteosarcoma characteristically involves the diaphysis	O	O
5	Plain X-ray of osteosarcoma shows Codman's triangle	O	O
6	Osteosarcoma characteristically shows osteoid production by tumour cells	O	O
7	Giant cell tumour is known to arise from Paget's disease of bone	O	O
8	Peak incidence of chondrosarcoma occurs between 30 to 60 years of age	O	O
9	Pelvis is a common site for chondrosarcoma	O	O
10	Chondrosarcoma is known to develop from multiple enchondromatosis	O	O
11	Haemangioma is a well encapsulated tumour	O	O
12	Cavernous haemangioma is known to occur in liver	O	O
13	Microscopically lipoma resembles mature adipose tissue	O	O
14	Characteristic feature of liposarcoma is the 'Lipoblast'	O	O
15	Rhabdomyosarcoma is common below the age of 15 years	O	O
16	Presence of 'Rhabdomyoblast' is the characteristic feature of rhabdomyosarcoma	O	O
17	Schwannoma often transforms into malignant Schwannoma	O	O
18	Osteosarcoma commonly affects the lower end of femur	O	O
19	Giant cell tumour often erodes the cortical bone and infiltrates the soft tissue	O	O
20	In giant cell tumour, the giant cells are the tumour cells	O	O

OSCE - Computerised

OSCE 1: M 855/91A Cutaneous swelling removed from a middle aged man

1. State the probable diagnosis

2. List two features to support your diagnosis
   a) ...
   b) ...

OSCE 2 M1181/99A Specimen removed from a 30 years old man

1. State the probable diagnosis

2. List four features to support your diagnosis
   a.
   b.

OSCE: 3 M817/91 Soft tissue swelling removed from 60 years old female

1. State the probable diagnosis

2. List two features to support your diagnosis
   a) ...
   b) ...

OSCE 4: M1186/99A

1. State the probable diagnosis

2. List two features to support your diagnosis
   a...
   b...

OSCE – Conventional

OSCE 1: M804/90

1. State the probable diagnosis

2. List two features to support your diagnosis
   a. ...

   b. ...

OSCE 2: M1165/99A. A long bone removed from a 35 yr. old woman is displayed

1. State the probable diagnosis

2. List two features to support your diagnosis
   a. ...

   b. ...

OSCE 3: M1102/94

1. State the probable diagnosis

2. List two features to support your diagnosis
   a. ...

   b. ...

OSCE 4: M 652/89 Soft tissue swelling removed from thigh of a 58 year old male

1. State the probable diagnosis

2. List two features to support your diagnosis
   a) ...

   b) ...

		T	F
1	Giant cell tumour typically arises in the epiphysis	■	○
2	Plain X-ray of giant cell tumour shows **'onion-skin'** appearance	○	■
3	Osteosarcoma characteristically affects the elderly	○	■
4	Osteosarcoma characteristically involves the diaphysis	○	■
5	Plain X-ray of osteosarcoma shows Codman's triangle	■	○
6	Osteosarcoma characteristically shows osteoid production by tumour cells	■	○
7	Giant cell tumour is known to arise from Paget's disease of bone	○	■
8	Peak incidence of chondrosarcoma occurs between 30 to 60 years of age	■	○
9	Pelvis is a common site for chondrosarcoma	■	○
10	Chondrosarcoma is known to develop from multiple enchondromatosis	■	○
11	Haemangioma is a well encapsulated tumour	○	■
12	Cavernous haemangioma is known to occur in liver	■	○
13	Microscopically lipoma resembles mature adipose tissue	■	○
14	Characteristic feature of liposarcoma is the 'Lipoblast'	■	○
15	Rhabdomyosarcoma is common below the age of 15 years	■	○
16	Presence of 'Rhabdomyoblast' is the characteristic feature of rhabdomyosarcoma	■	○
17	Schwannoma often transforms into malignant Schwannoma	○	■
18	Osteosarcoma commonly affects the lower end of femur	■	○
19	Giant cell tumour often erodes the cortical bone and infiltrates the soft tissue	○	■
20	In giant cell tumour, the giant cells are the tumour cells	○	■

Key:
Conventional FLM OSCE:
804/90 – Lipoma
1165/99A – Osteosarcoma
1102/94 – haemangioma
652/89 – Liposarcoma

Computerised FLM:
855/91A – Neurofibroma
1181/99A – Giant cell tumour
817/91 – Malignant Schwannoma
1186/99A – Osteosarcoma / NHL