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Table 5: Medical educators feedback to general aspects of the simulated labs.

No.	Item	Medical educator	Response
1	The Title of the instructional method highlight the contents	1	Excellent
		2	Very good
		3	Very good
		4	Very good
2	The structure of the instructional method is clearly stated	1	Excellent
		2	Satisfactory
		3	Satisfactory
		4	Very good
3	The aims and objectives are clearly stated	1	Very good
		2	Satisfactory
		3	Satisfactory
		4	Excellent
4	The contents are structured in a logical sequence	1	Very good
		2	Excellent
		3	Excellent
		4	Satisfactory
5	The study guide is users friendly	1	Very good
		2	Very good
		3	Very good
		4	Very good
6	The study guide is efficient and attractive	1	Excellent
		2	Very good
		3	Very good
		4	Satisfactory
7	The assessment is appropriate	1	Very good
		2	Satisfactory
		3	Satisfactory
		4	Satisfactory

8	This instructional method is appropriate for this subject	1	Very good
		2	Fair
		3	Fair
		4	Satisfactory
9	This instructional method is appropriate for this level	1	Very good
		2	Fair
		3	Fair
		4	Satisfactory

Table 5 adenddum note: 1 is a consultant of internal medicine, associate professor, and medical educator. 2 is a professor of pediatrics and medical educator. 3 is medical educator. 4 is a professor of medical education and consultant obstetrician and gynecologist.

Table 6: Medical educators responses to open end questions regarding the simulated labs.

No.	Item	Medical educator	Response
1	What is the greatest strength of this method?	1	It uses technology in student training
		2	That it teach an important subject with less requirements regarding resources
		3	It teach an important subject with less requirements regarding resources
		4	The Practical Handouts
2	This method can be improved by.....	1	Further structuring the objectives according to blooms
		2	Adding more teaching time
		3	Enabling relevant takehome tasks
		4	Illustrations and animations
3	Feel free to make additional comments, if any	1	Excellent, keep on the same good work

		2	I think it is good
		3	I cant agree more
		4	No, thanks

Table 6 adenddum note: 1 is a consultant of internal medicine, associate professor, and medical educator. 2 is a professor of pediatrics and medical educator. 3 is medical educator. 4 is a professor of medical education and consultant obstetrician and gynecologist.

1 is a consultant of internal medicine, associate professor, and medical educator. 2 is a professor of pediatrics and medical educator. 3 is medical educator. 4 is a professor of medical education and consultant obstetrician and gynecologist.

Table 7: Pharmacology experts feedback to general aspects of the simulated labs.

No.	Item	Pharmacology expert	Response
1	The aims and objectives of the instructional method are appropriate	I	Excellent
		II	Satisfactory
		III	Excellent
		IV	Excellent
		V	Excellent
		VI	Excellent
2	The contents are appropriate to the objectives	I	Very good
		II	Satisfactory
		III	Very good
		IV	Excellent
		V	Excellent
		VI	Very good
3	The contents are appropriate to medical students	I	Excellent
		II	Satisfactory
		III	Excellent
		IV	Excellent
		V	Satisfactory
		VI	Excellent
4	The contents are appropriate to the	I	Excellent

	level of the students	II	Satisfactory
		III	Very good
		IV	Excellent
		V	Fair
		VI	Excellent
5	The contents hangs together logically	I	Excellent
		II	Satisfactory
		III	Very good
		IV	Excellent
		V	Excellent
		VI	Very good
6	The references are appropriate to the materials	I	Poor
		II	Fair
		III	Very good
		IV	Excellent
		V	Excellent
		VI	Very good
7	The assessment is appropriate to the content	I	Very good
		II	Fair
		III	Very good
		IV	Excellent
		V	Excellent
		VI	Excellent
8	The use of this teaching approach is appropriate to the subject and students' level	I	Very good
		II	Fair
		III	Very good
		IV	Excellent
		V	Excellent
		VI	Excellent
9	The use of this teaching approach is appropriate for future practice	I	Very good
		II	Satisfactory
		III	Excellent
		IV	Satisfactory

		V	Very good
		VI	Very good

Table 7 adenddum note: *I and II are full professors of pharmacology. III and IV are associate professors of pharmacology. V and VI are assistant professors of pharmacology.*

Table 8: Pharmacology experts responses to open end questions regarding the simulated labs.

No.	Item	Pharmacology experts	Response
1	What do you think the greatest weakness/ strength of this teaching method?	I	- Weakness: lack of hand skills and performing actual experiments. - Strength: suitable for medicine students, less consumption of materials and animals.
		II	Use of many drugs at one part of experiment
		III	The student is able to comprehend the effect of drugs on isolated tissues.
		IV	No comment
		V	The weeknees of this approach usually the student think all matter are typical which is not correct so this approach is better to be followed by wet lab to compare between results
		VI	As all simulation software, the obtained results may differ from the real experimental laboratory

			work.
2	How would you improve this teaching method?	I	Do more practice and use different softwares and give more exercises.
		II	Use less number of drugs per step
		III	Coupling the simulation with videos/ demonstrations of real experiments
		IV	Increase no. of sessions
		V	The wet lab is important to compare between results. Take in consideration these activities should not affect the clinical practice of pharmacology in the hospital which is more important.
		VI	Is to overcome the aforementioned limitation, by implementing experimental pharmacology courses in the syllabus.
3	Feel free to make additional comments, if any	I	- Try to add the starting doses and concentration in the lab manual. - Students should do more practice to adjust the time interval in the dose cycle and also the addition of agonists and antagonists. - The references are not provided.

		II	Information in the trace should be clear and complete
		III	This simulation program is suitable for the purpose of distance learning.
		IV	Excellent assessment
		V	By the end of any pharmacology module the student should be able to know the position of any drug in hospital. It is highly essential to fill the gap between what the book says and what the practice in the hospital needs. The student should know the drug dosage forms, regulation for dispensing, device(s) of administration (if any), devices to measure the drug effects and investigation(s) to monitor drug side effects..etc.
		VI	There is no additional comments, thanks.

Table 8 adenddum note: *I and II are full professors of pharmacology, III and IV are associate professors of pharmacology, V and VI are assistant professors of pharmacology.*

Table 9: Qualitative perspectives from students regarding simulation-based learning (SBL) in conducting pharmacology practicals.

No .	Item	Male Response, n = 147 (Freq/%)	Female Response, n = 59 (Freq/%)	p-value
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		Complicated	Simple	I don't Know	Complicated	Simple	I don't Know	0.000
1	Ease of application of the SBL software	79(53.7)	60(40.8)	8(5.4)	50(84.7)	7(11.9)	2(3.4)	
2	Quality of the learning experience	Bad 27(18.4)	Good 87(59.2)	Excellent 33(22.4)	Bad 36(61)	Good 21(35.6)	Excellent 2(3.4)	0.000
3	Having a previous experience with SBL	Yes 42(28.6)	I don't Know 3(2)	No 102(69.4)	Yes 36(61)	I don't Know 5(8.5)	No 18(30.5)	0.000
4	Time-effectiveness of the SBL	Long 33(22.4)	Intermediate 51(34.7)	Short 63(42.9)	Long 3(5.1)	Intermediate 36(61)	Short 20(33.9)	0.001
5	Scientific content of the SBL	Bad 31(21.1)	Good 88(59.9)	Excellent 27(18.4)	Bad 22(37.3)	Good 21(35.6)	Excellent 16(27.1)	0.005
6	Ability of the SBL to communicate the feelings of pharmacology practical	Yes 58((39.5)	I don't Know 24(16.3)	No 65(44.2)	Yes 16(27.1)	I don't Know 12(20.3)	No 31(52.5)	0.247
7	SBL utility for other medical disciplines	Yes 54(36.7)	I don't Know 23(15.6)	No 70(47.6)	Yes 21(35.6)	I don't Know 6(10.2)	No 32(54.2)	0.526
8	Preference for simulated versus traditional "wet lab" environments	No 56(38.1)	I don't Know 13(8.8)	Yes 78(53.1)	No 2(3.4)	I don't Know 16(27.1)	Yes 41(69.5)	0.000
9	The Lab contents achieves the ILOs	Bad 23(15.6)	Good 86(58.5)	Excellent 38(25.9)	Bad 1(1.7)	Good 24(40.7)	Excellent 34(57.6)	0.000
10	Generation of realistic data to estimate the required parameters	No 42(28.6)	I don't Know 45(30.6)	Yes 60(40.8)	No 5(8.5)	I don't Know 21(35.6)	Yes 33(55.9)	0.007
11	SBL potential to facilitate experimental design and hypothesis testing	No 54(36.7)	I don't Know 23(15.6)	Yes 70(47.6)	No 5(8.5)	I don't Know 14(23.7)	Yes 40(67.8)	0.000

12	SBL capacity to help understanding theoretical knowledge	Bad	Good	Excellent	Bad	Good	Excellent	0.000
		32(21.8)	73(49.7)	42(28.6)	2(3.4)	22(37.3)	35(59.3)	
		15(10.2)	27(18.4)	6(4.1)	3(5.1)	6(10.2)	1(1.7)	

Table 9 adenddum note: Chi-squire test was used to calculate the level of significance between the two sections. Significant gender-based differences in SBL perception were observed in the areas of software application ease and overall experience quality ($p < 0.05$).

Table 10: Medical students scores in pharmacology OSPE stations after being instructed using simulated pharmacology labs. (Total score is 10 Marks)

Module Component	Patch 1 Males (n= 56)	Patch 1 Females (n= 43)	Patch 2 Males (n= 54)	Patch 2 Females (n= 45)	Patch 3 Males (n= 50)	Patch 3 Females (n= 60)	p-value
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Principles of Disease I	7.7 ± 0.5	8 ± 1.2	7.9 ± 0.3	7.4 ± 0.7	7.6 ± 0.9	7.1 ± 1.0	<0.05*
Principles of Disease II	9 ± 0.3	9 ± 0.7	8.8 ± 0.2	9 ± 0.6	7.7 ± 1	7.9 ± 1.3	
Gastrointestinal System	8.1 ± 0.4	8.3 ± 0.6	7.9 ± 0.3	8.1 ± 0.6	7.4 ± 0.9	8.7 ± 0.1	
Nervous System & Special Senses	6.6 ± 1.5	6.9 ± 1.1	6.8 ± 1.7	6.9 ± 1.9	6.5 ± 1.2	6.7 ± 1.8	