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PHARMACY STUDENTS' OPINIONS OF USING MOCK QUESTIONS TO PREPARE FOR SUMMATIVE EXAMINATIONS

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ABSTRACT

Objective: Mock questions are thought to benefit to students through help with learning, revealing specific areas of learning difficulties, practice examination timing and aiding a higher mark in the examination. The literature suggests practice questions have a direct impact on students' academic performance and improving examination confidence.

The aim of the study was to gather opinions of pharmacy students on using mock examinations and practice questions to prepare for summative examinations.

Methods: Paper based questionnaires were distributed to all fourth year pharmacy students at the start of a university scheduled workshop session. The data was transcribed onto a Microsoft Excel™ spreadsheet and analysed.

Results: Out of all fourth year pharmacy students 73% completed the questionnaire of which 91% had received access to mock questions but only 92% of those who had access used them. Common themes were identified; the benefits of using mock questions were 'knowledge', 'examination style' and 'identification of weaknesses'. Furthermore, most participants chose 'Year 3 Calculations exam' (62%) as the most useful summative examination for which to use mock questions.

Conclusion: Mock questions have a place in improving the performance of pharmacy students in examinations. The study results showed that the majority of participants who used mock questions found them to be useful in promoting learning, revealing specific areas of learning difficulties, improving awareness of examination structure, practicing their ability to apply knowledge to questions under examination conditions and to motivate students to revise more using better strategies.

Keywords: Practice Questions, Mock Questions, Pharmacy Students, Examination Performance, Examination Confidence

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INTRODUCTION

Mock assessments and practice questions allow students the opportunity to receive feedback on their learning and self-identify their weaknesses, aiming to prepare them for the summative examination [1, 2]. According to Tofade *et al.* (2013) the use of questions in teaching is recognised as the cornerstone of education [3]. Roediger and Karpicke (2006) stated that testing can have direct and indirect effects on education. Improving information recall ability, is one of the direct benefits, also referred to as the '*testing effect*' [4]. Examples of the indirect effect include more time directed to study and improvement in revision skills.

Siddiqui *et al.* (2017) investigated the effectiveness of a mock Practical Assessment of Clinical Examination Skills (PACES) to test fifth-year medical students [5]. They showed that their students felt significantly more confident after the mock, and 90.6% of students agreed that the mock PACES were more useful than a lecture-based format, bedside teaching or small group teaching to prepare for the examination. Craft *et al.* (2017) found that practice through revision questions, promoted nursing students' confidence and in-depth understanding of bioscience subjects [6]. Powell *et al.* (2015) used mock practice to assess pharmacy students' confidence at interview; 51.5% 'Strongly agreed' or 'Agreed' that they felt confident in their ability to interview before they undertook the mock interview sessions, compared to 100% after the session [7]. An American study by Koenigsfeld *et al.* (2012) investigated the potential of "faculty-led mock-interview activity" in improving the students' preparation for their residency interview process. Forty-minute mock interview sessions were conducted with 28 doctor of pharmacy students. Students found the process helpful and felt well-prepared for their residency interviews.

Byron and James, (2004) demonstrated that mock questions improved dental students' examination performance compared to

students who did not use them [8]. The investigators developed a bank of trial examination questions; 50% of the questions were placed onto an online test site; the other half were incorporated into a written summative examination taken in a classroom. The results showed that students who took the online mock examination scored 8.8% and 5.5% higher grades in the summative examination (for semester 1 and semester 2 respectively) than those who did not take the practice examination. Griswold, Overson and Benassi (2017) stated that quizzing occupational therapy students on lecture content during the lecture was a good strategy to prepare students for clinical examinations [9]. In one module, the in-class questions focused on the condition taught in the current class. In a second module, students were asked to read statements listing the topics taught and the third module no questions were asked. Students' examination performance was better in the first module compared to modules two and three. Dotson, Sheldon and Sherman (2010) agreed with Griswold, (2017) that students showed improvement in their knowledge application in summative exams [10, 11].

Study rationale and aim

Although studies have been conducted on the impact mock examinations have on student achievement, no published studies were identified investigating pharmacy student opinions on the wider impact. This study investigated what fourth year pharmacy students at University of Wolverhampton think about mock questions for summative examination preparation, how many students use them and how and why they were used.

Ethics

Ethics approval was granted by the Pharmacy Ethics Review Board at University of Wolverhampton. Returned questionnaires were considered as the participants implied consent to participate in the study.

MATERIALS AND METHODS

Methodology and design

This was designed as a questionnaire-based mixed-methods study. A questionnaire-based study was selected to maximise response rate within short period of time [12]. The anonymity of the paper-based questionnaires offers the respondents a safe environment to provide honest answers and feedback [13].

All 74 fourth-year pharmacy students were invited to participate in the study. This was because fourth year students have the most experience in the different type of examinations on the Master of Pharmacy (MPharm) course. Paper-based questionnaires (Appendix 1) and participant information sheets were handed out at the start of a university scheduled workshop session. Once the participants had finished, they were instructed to fold the questionnaire in half and return it into the lidded box to prevent any possible identification. Once collected, the data was entered onto a Microsoft Excel™ spreadsheet for analysis. Quantitative data was analysed by creating percentages and identifying trends. Qualitative data was analysed using thematic analysis, by looking at most common themes from participant’s responses to open ended questions [14]. The gender and age groups of all participants were used as variables to compare opinions.

RESULTS

Of the 74 fourth year pharmacy students on the MPharm course, 54 students completed the questionnaire (73%). There were 70% females (n=38) and 30% males (n=16) this is reflective of the overall

divide of females: males in the year group. The majority of the participants were 21-23 y (77.5%, 57.5% of females, 20% of males), 13% of participants were 24-26 y olds (7.5% of females, 5.5% of males), 7% were 27-30 y olds (5.5% of females, 2% of males) and 2% over 30 y (0% females, 2% of males).

Access to mock questions

Of all participants 91% (97% of females, 69% of males) had access to mock questions. Participants from all age groups had access to mock questions with only 9% (four of the 21-23 y olds and one of the 24-26 y olds groups) did not. Participants were then asked to indicate the source(s), where 43% indicated that the 'lecturers provided them', 22.5% said 'from Canvas' (The University of Wolverhampton online learning platform), 4% said 'from textbooks' and 4% said they received it from their 'peers'. There were 18.5% incorrect responses as participants gave examples of examinations, they used mock questions for instead of the source, and a further 9% participants did not answer the question.

Use of mock questions

Of all participants there were 91% (92% of all females, 69% of all males) used the mock questions they had accessed. Table 1 shows results by age.

Participants were then asked how they use the mock questions to prepare for their examinations. There were no explanations received from any male participants. Only seven females explained their responses (13%). Responses were thematised into three main themes (table 2).

Table 1: Number of participants who used the mock questions they had access to by age

Age range (years)	Number of participants		
	Yes	No	Total
21-23	36	4	40
24-26	5	0	5
27-30	4	0	4
Over 30	1	0	1
Did not disclose			4

Table 2: Themes identified for how mock questions were used

Theme	Comment	Participant number
Topic tested knowledge	"I tend to leave it towards the end of my exam preparation as I use these mock questions to test my knowledge to assess how much information I have retained"	13
	"I revise everything first and then go through mock questions to see my preparation for the exam"	25
	"I use mock questions to test what I know and what I don't know about topics that will be in the exam"	48
Guidance on Examination Questions Styles	"Understand the style of questions and how to properly answer them"	21
	"A guide to see what type of questions are asked"	24
Guidance on Examination Conditions	"I time myself as per maximum time allowed for the paper in real examination and do it under examination conditions"	5
	"I attempt the questions as I would in an examination"	43

Benefits of mock questions

Question 1: Participants were asked to select the response that best described how they feel about the statements relating to

benefits of mock questions. Overall, most strongly agreed or agreed with the first question statement (65%) and only one person disagreed (fig. 1).

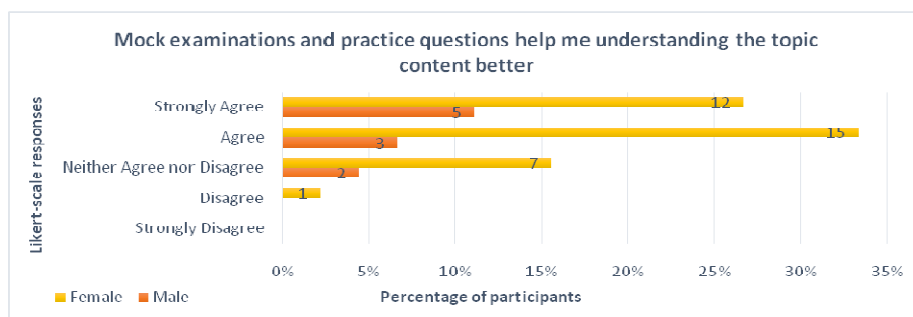


Fig. 1: Responses by gender on the effect of understanding the content better when mock questions are used

Table 3 shows the variation in responses in all age groups for the first question.

Table 3: Number of participants by age on the effect of understanding the content better when mock questions are used

Age group (years)	Number of participants					Total
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
21-23	0	1	5	15	12	33
24-26	0	0	3	2	1	6
27-30	0	0	1	1	3	5
Over 30	0	0	0	0	1	1
Did not answer						9

Participants were also asked to briefly explain why they chose their responses. Only 11 participants justified their responses (20%).

Only one theme was identified in all male participants justifications and two themes identified in females' justifications (table 4).

Table 4: Themes identified for the effect of mock questions on the understanding the content better when mock questions are used

Theme	Comment	Participant number
Guidance on Examination Questions Styles	"They help me understand the style in which the content will be assessed"	6
Males Responses	"They help me to know the style of questions"	10
Guidance on Examination Questions Styles	"They help me to get an idea of what the examination questions will be like"	49
Females Responses	"The type of questions in mocks help me to get used to the way questions are worded in the actual examination"	18
	"Mocks helps me to understand the style of questions that will be asked"	43
	"Mocks give an indication on how questions will be asked"	48
Topic tested knowledge	"It tests my knowledge and also gives me an indication if I have a good understanding of the content"	13
Females Responses	"Mocks give an indication as to what I know from revision"	17
	"Mocks give an indication as to what I need to learn"	25
	"Mocks helped to identify my weak areas"	35
	"Mock questions help me to realise which topics I may need to go over"	47

Question 2: Overall, most participants selected 'Neither Agree nor Disagree' for the second question (47%) (fig. 2).

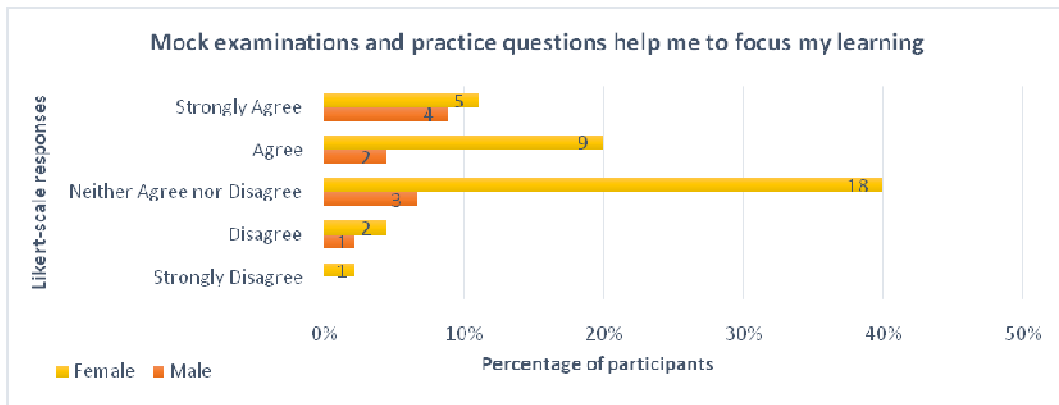


Fig. 2: Responses by gender on the effect on learning focus when mock questions are used

Table 5 shows the variation in responses in all age groups for the second question.

Table 5: Participant responses by age on the effect of focus when using mock questions

Age group (y)	Number of participants					Total
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
21-23	1	3	18	6	6	34
24-26	0	0	1	4	1	6
27-30	0	0	2	1	1	4
Over 30	0	0	0	0	1	1
Did not answer						9

Participants were then asked the briefly explain their response, only six (11%) responses were received with new theme of 'no effect' emerging (table 6).

Table 6: Themes identified for the effect of mock questions on learning focus

Theme	Comment	Participant number
Guidance on Examination	<i>"By knowing the style of questions so I can apply knowledge"</i>	10
Questions Styles	<i>"They give me a sense of the type of question to expect in examination"</i>	19
Males Responses	<i>"Mock questions help to give a feel for how the questions are structured"</i>	26
No effect	<i>"with or without mock questions I would still be focussed on the exam"</i>	23
Females Responses	<i>"they have no effect in concentration"</i>	25
	<i>"does not impact my focus in exams"</i>	44

Question 3: Overall, most participants chose 'strongly agree' and 'agree' (70%) for the third question (fig. 3).

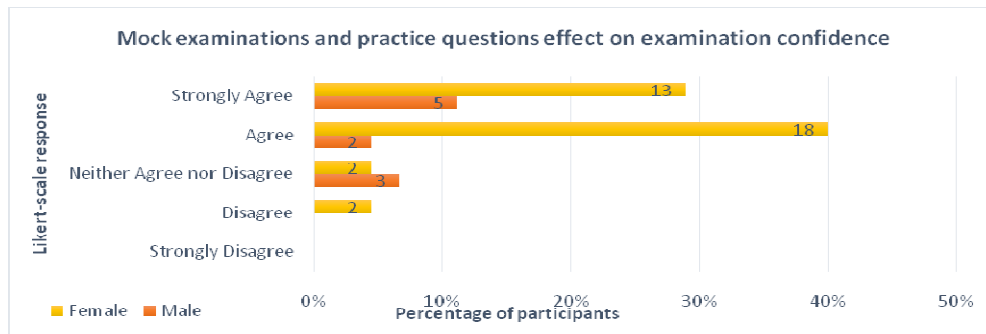


Fig. 3: Responses by gender on the effect on examination confidence when using mock questions

Table 7 shows the variation in responses in all age groups for third question.

Table 7: Participant responses by age on the effect of confidence when using mock questions

Age group (y)	Number of participants					Total
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
21-23	0	1	2	16	13	34
24-26	0	0	3	1	2	6
27-30	0	1	0	2	1	4
Over 30	0	0	0	0	1	1
Did not answer						9

There were no male participants and only eight (15%) female participants commented on their options choices for this question (table 8).

Table 8: Themes identified for the effect of mock questions on examination confidence

Theme	Comment	Participant number
Academic Performance	<i>"Mocks help me to understand which parts I need to improve"</i>	3
Improvement	<i>"Mocks help me to find areas of improvement"</i>	7
	<i>"Practicing mock questions allows me to get better in answering questions"</i>	16
	<i>"Mocks give me an idea of what to expect in exam"</i>	45
	<i>"Mocks allow me to prepare for examinations to maximise marks"</i>	49
	<i>"Mocks help me to understand how the exam will be like"</i>	54
Topic tested knowledge	<i>"Mocks allow me to acknowledge my strengths and weaknesses"</i>	31
	<i>"Mocks help me to build my knowledge in each section"</i>	32

Question 4: Overall, most participants chose 'strongly agree' and 'agree' (65%) for the fourth question (fig. 4).

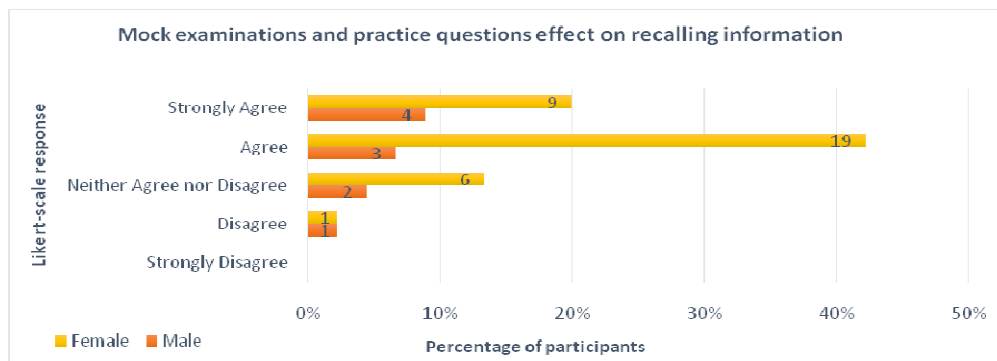


Fig. 4: Participants responses by gender on the effect of recalling information when using mock questions

Table 9 shows the variation in responses in all age groups for fourth question.

Table 9: Participants responses by age on the effect of recalling information when using mock questions

Age group (y)	Number of participants					Total
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
21-23	0	1	5	18	10	34
24-26	0	0	1	3	2	6
27-30	0	1	1	1	1	4
Over 30	0	0	1	0	0	1
Did not answer						9

Participants were then asked to give a brief explanation for their chosen response, there were eight (15%) participants commented on their options choices for this question (table 10).

Table 10: Themes identified for the effect of mock questions on recalling information

Theme	Comment	Participant number
Questions Similarity between Mocks and Summative Examination	"Some questions from mock are repeated in the examination"	24
	"Some of the mock questions came up in the exam"	36
Males Responses		
Questions Similarity between Mocks and Summative Examination	"Prepared for similar questions enable me to rehearse information"	1
	"Some questions that appeared in the mock closely resembled some questions in the examination"	12
Females Responses		
Improve Memorising Topic Content	"When questions are similar, they are helpful"	42
	"writing and answering questions helps me remember more information"	16
	"remember things better when I get tested on them"	23
	"helps to improve my memory as it allows to answer questions more specifically"	32

Question 5: Fig. 5 shows participants responses by gender for the fifth question with 70% of all respondents selected 'strongly agree' and 'agree'.

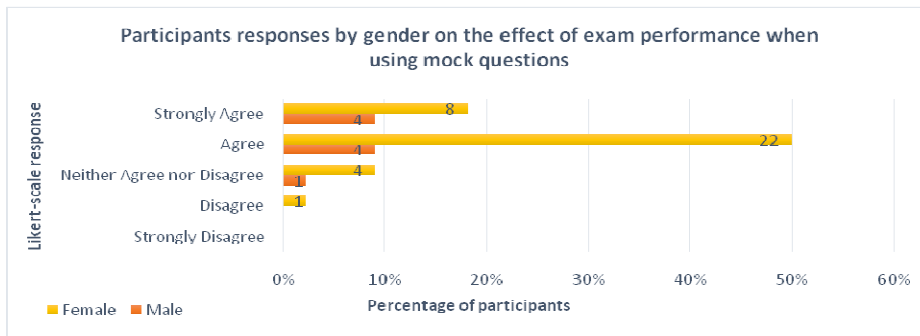


Fig. 5: Participants responses by gender on the effect of exam performance when using mock questions

Table 11 shows the variation in responses in all age groups for fifth question.

Table 11: Participants responses by age on the effect of exam performance

Age group (y)	Number of participants					Total
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	
21-23	0	0	3	22	9	34
24-26	0	0	2	2	1	5
27-30	0	1	0	2	1	4
Over 30	0	0	0	0	1	1
Did not answer						9

No explanations from male participants were received, however seven (13%) responses were returned by female respondents (table 12).

Table 12: Themes identified for the effect of mock questions on examination performance

Theme	Comment	Participant number
Examination Structure	"Helps me with my writing technique"	21
	"Helps to structure answers to questions in the exam"	33
	"I feel more familiar with the layout and the level of detail I should include"	50
Questions Similarity between Mocks and Summative Examination	"Very helpful when similar questions appear in the exam"	1
	"Some of questions in the mocks are the same, so practicing them result in better performance"	39
Knowledge Application and Practice	"Effective source of practice"	7
	"It gave me the opportunity to practice answering exam questions"	12

The effect of revision when using mock questions

Participants were asked to tick 'yes' or 'no' if they felt they need to do more revision after completing a mock paper, with 81% of all

participants answered 'yes' (only one female said no and 10 people did not respond). Participants were then asked for an explanation for their response, eight (15%) responses were received (table 13).

Table 13: Themes identified for the effect of mock questions on revision

Theme	Comment	Participant number
Identifying Tested Knowledge Weaknesses	"highlighted my weaknesses"	5
Males Responses	"sometimes find the questions difficult which means I need to revise more"	24
	"There will be a few questions in the mock paper that I wouldn't have got right in actual examination which makes me revise more"	48
	"highlighted my weaknesses"	5
Identifying Tested Knowledge Weaknesses	"I studied but I did not know everything on the mock paper or how to answer the questions"	21
Females Responses	"Highlights gaps in my knowledge"	32
	"Points areas that require more revision"	6
	"Allows me to understand what topics I need to improve on"	29
	"Allows me to fill in any gaps that have been identified"	31

Revision strategy

Participants were then asked to select 'yes' or 'no' if they feel they need to change their revision strategy after completing a mock

paper. Only 43% of participants selected yes. More females (37%) than males (6%) said 'yes' for this question. Table 14 shows the trend by age.

Table 14: Participants responses by age on revision strategy

Age group (y)	Number of participants		
	Yes	No	Total
21-23	17	17	34
24-26	3	3	6
27-30	3	1	4
Over 30	1	0	1
Did not answer			9

Usefulness of mock questions

Participants were asked to select the mock question topics they practiced, then they were asked to select in the second column if they felt mock questions were useful. Only 45 (83%) participants answered this question. The results of participant's responses by gender are shown in table 15. Overall, there was a variation in the number of participants who used mock questions for the different examinations and those who found them useful. The

results show that Year 1 and Year 2 calculations had the highest number of participants who used mock questions (83%) and 81% found them useful. For male participants, the most common examination that mock questions were used for were Year 1 and Year 2 calculations (18.5%) of which all 10 participants found them useful. This was the same for females as the most common examination that mock questions were used for were also Year 1 and Year 2 calculations (85%) of which all 35 participants found them useful.

Table 15: Participants responses by gender on the mock questions were used and found most useful

Examination	Used mock questions to prepare for examination			Found mock questions useful for this examination)		
	Male	Female	Total	Male	Female	Total
Calculations 1	10	35	45	10	34	44
Calculations 2	10	35	45	10	34	44
Calculations 3	9	34	43	9	34	43
Pharmacists, Patients and Medicines (PPM)	9	20	29	9	19	28
Introduction to Drugs and Medicines (IDM)	8	30	38	7	28	35
Molecules, Cells and Systems (MCS)	9	27	36	7	27	34
Medicines in Development and Use 1 (MDU)	9	29	38	7	28	35
MDU part 2	10	18	28	9	18	28
Therapeutic Management of Patients (TMP) 1	9	21	30	8	18	26
TMP 2	8	17	25	7	17	24
Law and Ethics	7	25	32	7	22	29

The results show a few differences in the most common examinations that mock questions were used for in all the age groups. For 21-23 y olds, the most common examinations mock questions used were year 1 and year 2 calculations and all of them found them useful. For 24-26 y olds, the most common examinations were year 1 and year 2 calculations and Medicines in Development and Use (MDU) part 1 examination (a written examination focusing

on the pharmacology, chemistry and pharmaceuticals of medications as they relate to pharmacy practice). For 27-30 y olds it was Year 1, year 2 and year 3 calculations, Therapeutic Management of Patients (TMP) part 1 examination (a written examination focusing on clinical pharmacy) and Law and Ethics examination. For the over 30 y old participant, all examinations mock questions were used except for the Law and Ethics examination (table 16).

Table 16: Participants responses by age on the mock questions were used and found most useful

Examination	Used mock questions to prepare for this examination				Total	Found mock questions useful for this examination				Total
	21-23	24-26	27-30	Over 30		21-23	24-26	27-30	Over 30	
Calculations 1	34	6	4	1	45	34	6	3	1	44
Calculations 2	34	6	4	1	45	34	6	3	1	44
Calculations 3	33	5	4	1	43	33	5	4	1	43
PPM	20	5	3	1	29	19	5	3	1	28
IDM	29	5	3	1	38	29	4	2	0	35
MCS	27	5	3	1	36	26	5	3	0	34
MDU1	28	6	3	1	38	27	4	3	1	35
MDU 2	19	5	3	1	28	19	5	3	1	28
TMP 1	20	5	4	1	30	18	4	3	1	26
TMP 2	17	5	2	1	25	18	3	2	1	24
Law and Ethics	24	4	4	0	32	22	3	4	0	29

Participants were then asked to tick one summative examination that mock questions were most useful for. There were only 29 (54%) participants answered this question (table 17).

Table 17: Participants responses by gender on the summative examination mock questions were most useful

Examination	Summative examination participants found mock questions most useful for (number of participants)		
	Male	Female	Total
Calculations 1	0	0	0
Calculations 2	0	0	0
Calculations 3	5	13	18
PPM	0	0	0
IDM	0	0	0
MCS	0	2	2
MDU 1	0	2	2
MDU 2	0	0	0
TMP 1	4	1	5
TMP2	0	2	2
Law and Ethics exam	0	2	0

Table 18: Participants responses by age on the summative mock questions were most useful for

Examination	Summative examination participants found mock questions most useful for (number of participants)				Total
	21-23	24-26	27-30	Over 30	
Calculations 1	0	0	0	0	0
Calculations 2	0	0	0	0	0
Calculations 3	15	1	1	1	18
PPM	0	0	0	0	0
IDM	0	0	0	0	0
MCS	1	1	0	0	2
MDU 1	2	0	0	0	2
MDU 2	0	0	0	0	0
TMP 1	4	1	0	0	5
TMP 2	2	0	0	0	2
Law and Ethics exam	0	0	0	0	0
Did not respond					25

Overall, most of participants chose Year 3 calculations as the most useful examination to use mock questions for (33% of all participants), 9% of participants chose TMP part 1 examinations, 7% chose Molecules, Cells and Systems (MCS), MDU part 1 and TMP part 2 exam. The majority of males (56%) and females (59%) chose Year 3 calculations as the most useful examination to use mock questions.

Table 18 shows that the responses within the age groups were similar. The majority of participants chose Year 3 calculations (33%), however, 11 (20%) participants selected other examinations.

DISCUSSION

The results suggest that mock questions are considered useful tools among pharmacy students in assisting their preparation for summative examinations. The data shows that the majority of participants used the mock questions available to prepare for summative examinations and found them beneficial (92%). Participants' statements suggest that mock questions are used as

part of different learning strategies by the students; to assess and evaluate their 'knowledge', as a 'guide' or as a tool to 'develop knowledge'. According to most responses, mock questions helped in assessing the level of knowledge a student has gained. This helps them focus on important content. However, some thought that memorising the answers for these questions is the intended benefit whilst in fact this is the opposite of what is intended by the teaching staff, where understanding the content and being able to apply knowledge are the main intention.

Furthermore, those using mock questions, recognised them as essential to understand the structure or pattern of the examination. The majority of students considered mock questions as an essential tool to evaluate their understanding the syllabus content and to identify areas of the topic they need to focus on and develop. The findings of this study align with Dotson *et al.* (2010) who used mock short essay questions to prepare students for the summative examination. They reported that students who used the mock questions, found them useful as the mock questions helped in

developing application-based understanding of course material and developing deeper understanding of the topic.

Participants of the study were asked their opinions about whether mock questions help them to improve their examination confidence. The results suggest that mock questions helped students in information recall, but unexpectedly students reported that this was mostly because they had memorised the answers. They perceived this would benefit them if mock questions were repeated or closely adapted in the summative examination, improving their grade. This is not the teaching staffs' intention.

These results also agree with Powell *et al.* (2015) who reported improvement in confidence amongst students who took part in mock interview sessions. The students found the practice helpful and they felt well-prepared with increased confidence for the interviews. Students indicated that understanding the examination structure facilitated their examination performance resulting in better grades. Byron and James (2004) who wrote mock questions for dental students and those who used them achieved better grades in the summative examinations.

In this study participants indicated that even after completing the mock questions, there was still a requirement to revise the content in the conventional way. Since mock questions indicate the areas of weaknesses and knowledge gaps, they do not finalise the preparation. Rather, they make it easy for students to further prepare, concentrating on areas where improvement is most needed. Students reported that mock questions motivated them to revise content and to change their revision strategy.

The findings of this study suggest that mock questions are not often used by students for all summative examination preparation but rather for some examinations they perceive to be more challenging. The most common examinations these pharmacy students nominated were calculations examinations. This could be because the examination questions share great similarity between the mock questions and summative examination. Fewer participants indicated usefulness of mock questions for the summative examination preparation of MCS, MDU, TMP and Law and Ethics examinations, which may suggest that mock questions were not helpful to prepare students for all examinations.

LIMITATIONS

A limitation of the study was the small sample (n=54 participants) from only one institution and future studies will need to consider larger sample from different institutions. The questions require revision as some participants' answers did not make sense, which suggests ambiguity. These limitations might have affected the research outcome which can be improved in future studies.

CONCLUSION

In conclusion, mock assessments and practice questions have a place in improving the performance of pharmacy students in examinations. The study results showed that majority of participants used mock questions for the correct reason and found them to be useful in promoting learning, revealing specific areas of learning difficulties, improving awareness of the examination structure and motivating them to revise more using better strategies. However, some students used mock examination to test their ability to memorise answers for question which may be repeated in the summative examination, which is not the intended purpose. However, the finding from this study may not be applicable to all pharmacy students, future studies conducted from multiple institutions and using a larger sample is needed to confirm these findings.

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Nil

AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICTS OF INTERESTS

The authors declare no conflict of interest.

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