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An evaluation of the 'CRAMPS' pedagogy in Pharmacology: Perspectives of medical students at the University of Namibia

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Abstract

Background: The variation in pharmacology teaching approaches influences the intrinsic student learning behaviours and impacts on acquisition of desired competencies, particularly in the setting of the new Schools of Medicine and Pharmacy at the University of Namibia. Though the SOAP and PHARM notes have been used effectively in clinical pharmacy teaching, systematic approaches to strengthen the teaching of pharmacology have been limited.

Objective: To determine the usefulness of the CRAMPS (Class, Rationale, Adverse reaction, Mechanism, Pharmacokinetics and Special considerations) approach as a teaching tool in pharmacology from the students' perspective.

Methods: A cross-sectional survey was conducted among pharmacy and medicine students who had completed a 16-week pharmacology module between July and November 2012. Data on perceived effectiveness of teaching approaches were collected using an adjusted Likert scale based questionnaire. Data were entered into Epidata® v.3.1 and exported to SPSS® v.19 software for descriptive analysis.

Results: Of the 86 (99%) students, the majority were female 58(67.4%); with males had a higher mean age than females (p<0.001). One fifth of students did not complete 90% of learning encounters. The majority of students perceived didactic audiovisual lectures using CRAMPS approach as very effective (p<0.001). Some students perceived the incoherence and dynamics among students in a home group as a deterrent factor to learning pharmacology.

Conclusion: An audiovisual CRAMPS approach is considered as an effective and systematic tool in teaching-learning of pharmacology. However, poor group dynamics within home groups may negatively impact on learning pharmacology and may not be ideal approach for all students.

Keywords: *effectiveness, pharmacology, teaching-learning, perceptions, Namibia*

Introduction

Medical students perceive pharmacology as an intellectually challenging discipline and thus its delivery in new medical education settings has potential for content overload and inappropriate outcome alignment (Garg *et al*., 2004). Though the World Health Organisation (WHO) recognises the strengthening pre-service training in pharmacotherapy as one of the ten strategies to improving the rational use of medicines, innovative effective and systematic pedagogic tools for pharmacology are limited (Anruradha & Mayank, 2010). Systematic teaching approaches such as the SOAP (Subjective, Objective, Assessment and Plan) approaches in clinical pharmacy have been shown to impart indispensable life-long skills for making objective therapeutic decisions and promote rational use of medicines. Innovations in the effective delivery of pharmacology in new undergraduate medical programs in the sub-Saharan African countries such as Namibia that are poorly resourced remains unknown (Tisonova *et al*., 2005; Wilson *et al*., 2005; Australian Learning and Teaching Council, 2010). In new health education settings such as that of the University of Namibia (UNAM), the inadequacy of skilled human and infrastructural resources upon untested curricula may impact negatively on the realisation of the learning outcomes (Biggs *et al*., 1999; Michel *et al*., 2002; Gitanjali *et al*., 2006; Eiad *et al*., 2008). Medical students and/or lecturers are often stereotyped towards this core discipline and resort to short term learning-teaching methods that encourage 'cramming' of facts rather than conceptualisation (Dee Fink, 2003; Australian Learning and Teaching Council, 2010). Innovative pedagogic approaches to foster the effective delivery of pharmacology tailored to students learning styles and needs in the context of new medical education settings in the sub-Saharan Africa remain

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critical (Garg *et al*., 2004; Shallcoss & Harrison, 2007; Badyal *et al*., 2010). However though the learning environment is rapidly changing with educational institutions more willing to share resources, for example, the Strathclyde University virtual pharmacology simulations and the SABER initiative (Sharing and Building Educational Resources) – a web based, free access resource platform (webpage) – training of pharmacology in most African countries has remained unchallenged (Mayer *et al*., 1992).

Objective

We evaluated the perceived effectiveness of the CRAMPS and home group novel pharmacology teaching and learning methods from the undergraduate students' perspective.

Methods

Study design and setting

A cross-sectional interventional survey using a self-administered questionnaire was conducted among first year pharmacy and second year medicine students the UNAM after completing an introductory 16 week module on pharmacology during the July – November 2012 semester. An adjusted Likert-scale response format was used to evaluate the perceived effectiveness of the CRAMPS and other teaching-learning methods employed in the module against item statements in the questionnaire. The study was conducted at the School of Medicine Campus.

Study population and sample

The study population included all registered pharmacy and medical students who were undertaking the 'Introduction to the Pharmacology' module, a co-taught module. Only students who had completed at least 50% of learning activities according to the attendance register were included in the study. A total of 87 out of 88 students were eligible for the study including 29 and 58 pharmacy and medical students respectively.

Delivery methods that were evaluated

Novel pedagogic approaches including the CRAMPS model and use of home groups for teaching pharmacology were evaluated on their perceived impact on students' learning. To facilitate understanding of the most important concepts on medicines, a CRAMPS model was adopted, with special emphasis given to classes of medicines included in the Namibia Essential Medicine List (NEMLIST: MoHSS, 2008), and/or the Namibia Standard Treatment Guidelines (MoHSS, 2011). During the face-to-face contact sessions, a prototype medicine from each class was used to systematically describe the pharmacology using the CRAMPS model. The CRAMPS model emphasised a systematic, organised and logical approach to the teaching and learning of pharmacology. In order to make PowerPoint® presentations interactive, learning outcomes, quiz questions, case studies and audiovisual illustrations were incorporated that emphasised the application of the CRAMPS model. Electronic lecture notes were made available to students at the end of each session. To foster inter-professional education, each student was assigned to a home group from which they derived learning support from the multi-professional student group members. Each home group consisted of five students with at least two students of pharmacy or medicine. Students were randomly selected for inclusion into the home group according to the register. Each student had at least one opportunity to chair and direct learning within the home group for a week. Every week, members of each home group peer evaluated one another on the skills, knowledge and attitude attained. To ensure uniformity in learning amongst the home groups and students, case-based seminars were conducted through use of debates that stimulated competition among the home groups. Due to lack of a functional laboratory, most practical sessions were clinically-oriented pharmacology practicals and computer simulations were done using free software. A wide range of practicals covering pharmacokinetics, pharmacodynamics and therapeutics were completed.

Data collection

All students were informed about this evaluation at the beginning and throughout the duration of the module. The questionnaire was pre-tested for face-validity amongst three staff members at the then Department of Pharmacy. At the end of the 16 week module, students were informed about the study design and teaching learning method (TLM) to be evaluated. Students were asked to grade 31 statements on a four-point Likert scale (Strongly disagree – Strongly agree: Appendix A). The questionnaire also gave students the opportunity to express qualitatively their perception and preferences on the effectiveness of CRAMPS and the TLM that were used in the pharmacology module. Other variables elucidated were demographic information, prior knowledge gained in pharmacology and student preferred learning styles.

Data management and analysis

The self-administered questionnaires were double-checked for completeness by the researcher. Quantitative data was double entered into Epi-data® (version 3.1) software for data cleaning and management and then exported to SPSS® (version 19) for comparative and descriptive analyses using students t-test and chi-square test for continuous and categorical variables respectively. Variation in preferences for teaching methods among the home groups was compared using one-way ANOVA. Qualitative data collected from certain question items were manually coded and categorised into themes for thematic analysis.

Ethics

As part of the evaluation feedback system of the University of Namibia to improve teaching and learning, approval from the then Head of the Department of Pharmacy and the Associate Dean and Chair of Ethics and Research Committee of the School of Medicine. Students were required to give informed consent prior to completing the questionnaires. Students were not required to disclose their names or individual identifiers such as date of birth rather codes were used to delink respondents from the information given. All students gave written an informed consent prior to being included in the study. Participation was voluntary.

Results

Socio-demographic characteristics

Out of the 87 eligible students, 86 (99%) completed the survey questionnaire (Table I). The majority of respondents were female 58 (67.4%). Male respondents were significantly older than the females ($p<0.001$), and the majority of students (95%) were taking pharmacology module for the first time ($p=0.003$). There were no significant differences in distribution of students by gender and highest qualification or degree program undertaken ($p>0.05$; Table I).

Table I: Social demographic characteristics of respondents (n=86)

Characteristic	Gender		Total (%)	*p*-value
	Male (M)	Female (F)		
Mean Age (years ± SD)	23.04 ±4.43	20.55 ±2.04	21.35 ±3.23	*0.001*ǂ
Degree Program (n=79)	19 (36)	34 (64)	53 (67.1)	
MBChB II	8 (30)	18 (70)	26 (32.9)	*0.655**
B.Pharmacy I				
Highest Education (n=80)				
Grade 12	14 (29)	34 (71)	48 (60)	
BSc	7 (54)	6 (46)	13 (16.3)	
Medical degree	-	3 (100)	3 (3.8)	
Premed/ 1st year BSc	6 (38)	10 (62)	16 (20)	*0.219**
First time Pharmacology training (n=86)				
Yes	24 (29)	58 (71)	82 (95.3)	
No	4 (100)	-	4 (4.6)	*0.003**

**p-value was determined by student t-test*ǂ *and Pearson chi-squared test*

Effectiveness of face-to-face PowerPoint® presentation approaches

Most students positively perceived the use of PowerPoint® lectures, learning support systems with audiovisual aids, mnemonics and the organised approach of CRAMPS, the lecturing style based on logic or common sense approach, use of home groups and electronic communication as important for their learning (Table II: $p<0.001$). However some students were less in favour of home groups as ideal for pharmacology learning compared to other modalities. Some students reported that the inclusion of session learning outcomes during the PowerPoint® presentations as not important and 21% of students did not attend more than 90% of face-face contact sessions (Table II).

Table II: Students perception on effectives of common LBM approaches (n=86)

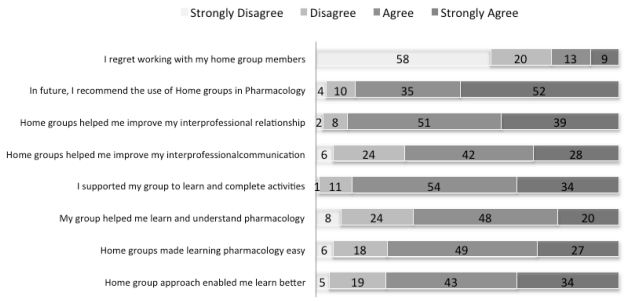
Approach used to teach	Strongly Disagree (%)	Disagree (%)	Agree (%)	Strongly Agree (%)	**p*-value
Power point face-face lectures make pharmacology easy to learn	-	1 (1.2)	21 (24.4)	64 (74.4)	*0.001*
I attended more than (90%) of the face-face lecture sessions	-	18 (21)	21 (24)	47 (56)	*0.001*
Face-face power point lectures are were easy to understand	-	2 (2.3)	25 (29.1)	59 (68.6)	*0.001*
Use of pictures & animations made pharmacology easy to learn	-	1 (1.2)	16 (18.6)	69 (80.2)	*0.001*
Use of learning outcomes made learning pharmacology easy	1 (1.2)	4 (4.7)	34 (39.5)	46 (53.5)	*0.001*
Use of mnemonics like "PAINS" made learning easy	-	-	6 (7)	80 (93)	*0.001*
Use of CRAMPS model made me focus my reading & learning	-	5 (5.8)	19 (22.1)	62 (72.1)	*0.001*
Lecturer's style of teaching made learning pharmacology easy	-	2 (2.3)	14 (16.3)	69 (80.2)	*0.001*
The use of home group seminars enabled me learn better	4 (4.7)	16 (18.6)	37 (43)	29 (33.7)	*0.001*
E-mail access to class notes made learning and revision easy	-	1 (1.2)	10 (11.6)	75 (87.2)	*0.001*

**p-value obtained by Pearson chi-square test*

Effectiveness of home group sessions in teaching and learning pharmacology

The majority of students perceived the home group-based approach helpful in improving their inter-professional communication and relation skills as well as learning pharmacology with 87% recommending the use of the method in training pharmacology (Figure 1).

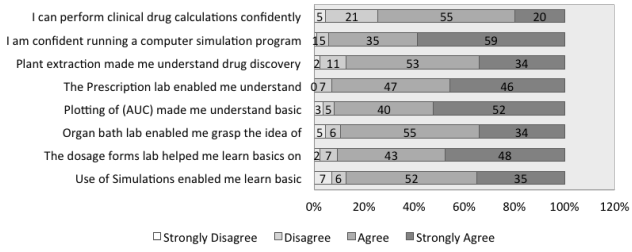
Figure 1: Students perception of effectiveness of the home group based approach



TLM approaches in pharmacology practicals

The majority of students reported that incorporation of practice-related practicals such as interpretation of prescriptions, dosage forms, plant extraction, pharmacokinetic absorption curves and clinical dosage calculations enhanced their learning of basic concepts of pharmacology. Though the majority of students were confident in the running of computer simulation and performing dosage calculations, 6% and 26% of students respectively reported otherwise.

Figure 2: Students perception of effectiveness of TLM used in pharmacology practicals



Student-preferred learning and lecturing styles

What helped students learn pharmacology (n=77)

Twenty-nine students (38%) reported that the use of well organised Power Point® lectures and lecture attendance, 21 (27%) the consistent student direct learning using lecture notes, text books, internet surfing and past papers, and 27 (35%) the use of learning support systems during teaching such as mnemonics, CRAMPS model, logical approaches, seminars and emphasis of the concept were useful in their learning of pharmacology.

What made learning pharmacology difficult (n=74)

Students perceived the following as obstacles to learning pharmacology: memorising and conceptualising facts related to medicines including drug classes, drug names, calculations and failing to grasp the concept in a lecture (49%); information over load and long lectures (22%); students not putting in enough effort (12%) and did not report anything that made learning difficult (9.5%); absconding from face-face lectures and learning experiences (2.7%); lack of feedback and hard assessments (5.4%).

What students enjoy about home groups (n=71)

Most students (90%) enjoyed learning through interacting, cooperating and discussing with classmates while carrying out an activity.

What students dislike about home groups (n=68)

Just over half of the students highlighted the lack of cooperation among some members (51%), difficulty in distributing tasks among group members and poor time management (27%), lack of extra tutorial classes (1.5%), and not being able to choose their own groups (2.9%).

Student preferred teaching and learning styles (n=72)

Regarding teaching styles, most students preferred the lecture-based method using a PowerPoint® presentation and the use of visual aids (83%), home groups (14%), tutorials or seminars (17%).

Students preferred learning style (n=65)

Preferred learning approaches reported on favourably included the use of lecture notes (45%), developing own notes (4.4%), self-directed learning (through textbooks, Google®, reading before and after lectures: 35%), use of practice questions (7.7%), studying alone (4.4%), and group discussions (8.8%).

Discussion

In this study most students perceived the use of a variety of methods important in learning pharmacology. The majority of students also perceived a lecturer-centred method by use of PowerPoint® presentation more effective rather the student centred approaches. Similar studies (Marhur *et al*., 2004; Badyal *et al*., 2010; Seth *et al*., 2010; Thirunavukkarasu *et al*. 2011) showed that interactive lecture methods increased comprehension of pharmacology compared to small group and tutorial approaches. However, Tisonova *et al*., 2004 emphasised the use of lecture-based methods alongside a student-based approach to foster application and communication of the facts. The home group approach used in the current study was perceived as not an effective approach for pharmacology training by some students. Barakzai (2004) and Tisonova *et al*. (2005) reported that student-centred teaching approaches in pharmacology is associated with challenges of bonding acceptance among group members. A survey of student preferences of teaching methods of pharmacology in Australia's Universities showed that 44 – 77% of students would prefer group based methods (Australian Learning & Teaching Council, 2010). The use of a systematic and organised approaches was perceived effective in the current study; the students also perceived

the use of audiovisual powered PowerPoint® presentations, with clear learning outcomes are perceived to enhance learning. A similar study by Garg *et al*. (2004) showed that students were interested in clear learning outcomes that have therapeutic application. Tutorials and seminars are a vital feedback learning support system in pharmacology.

In the current study students perceived the uncertainty of the scope of facts to memorize about medicines as the major obstacle towards learning pharmacology. A study by Tisonova *et al.* (2004) showed that over 83.3% of medical students struggled to comprehend and apply the details on medicines taught in pharmacology. The use of the CRAMPS pedagogy approach that details prototype medicines outlined in the Namibia Essential Medicine List (Nemlist) made learning pharmacology more focused concepts relevant to practice. Anruradha and Trivedi (2010) reported the importance of teaching critical aspects to the practice of pharmacology to facilitate the assimilation of information and prevent stigma towards a core medical discipline. The use of mnemonics alongside the CRAMPS approach was also perceived as a systematic memorising support tool to help conceptualise pharmacology concepts.

The current study showed that some students were less motivated to initiate self-directed learning or actively participate in completing activities assigned to home groups. The uses of self-reflection and peer evaluation sessions were perceived to enhance student accountability. Brown *et al.* (1988) showed that successful small group teaching depended on the individual's dynamics of the group chair and the students.

Though home groups enhance inter-professional learning and communication, poor group dynamics among members reportedly negatively impact on learning among some student groups. Home groups may offer opportunities for students to exploit others knowledge and understanding during completion of tasks. We propose that groups should be an appropriate size and membership changed throughout the module or sessions. Clinically oriented practicals appeared to enhance learning of pharmacology concepts.

Conclusions And Recommendations

We conclude that PowerPoint®-based lectures were the preferred TLM in pharmacology, with seminar and tutorials as an essential component of the training. Home groups were not the ideal TLM for some students. The study therefore recommends:

- The use of PowerPoint® lecture method as main teaching and learning approach in pharmacology with seminars and tutorials and home groups as supportive methods.
- The use small group based methods should be run with caution and only in well balanced groups where members self- and peer-evaluate each other.
- The essential medicine list based prototype CRAMPS model as a learning support system should be used together with mnemonics.
- Emphasis of the concept towards understanding the pharmacology of a drug should be stressed rather than the content.
- Assess individual students learning needs at the start of the module and provide feedback to students promptly and accurately
- Individualise some practical activities rather than giving group assessments

Limitations

The 'gold standard' approach of evaluating experimental methodology would have been through the use of a randomised controlled trial. However, it was not possible to randomise students according to the learning methods due to the ethical issues related to the approach and this remains a reasonable limitation of the study. The self-reporting method of data collection has various limitations; however this study sought students' perspectives thus self-reporting may have been ideal as students were encouraged to be as honest while giving responses.

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Appendix A: Consent form and survey questionnaire

Effectiveness of Pharmacology Teaching-Learning Methods at the University of Namibia: Students' Perceptions and Preferences

I am Dan Kibuule, Lecturer School of Medicine – seeking your perceptions on the most appropriate teaching-learning methods for the pharmacology module. The information given will be treated with highest confidentiality for improving pharmacology teaching. I kindly request you to complete this short questionnaire that will not take you more than 5 minutes. Please be as honest as possible will giving your responses. I accept

Sign:_____

date: _____

A. Demographic characteristics	Serial #: _____
101. Sex: (1) Male ▫ (2) Female ▫ **102**. Age(years): _____ **103**. Is it your First time to undertake Pharmacology: (1) YES ▫ (2) NO ▫	**104. Program**: (1) MBChB ▫ (2) B.Pharmacy ▫ 105. **Highest qualification:** (1) Grade 12 ▫ (2) Science degree ▫ (3) Medical Degree ▫ (4) Premed/ 1 year science

B. Face to face Power point Lectures	Strongly Disagree	Disagree	Agree	Strongly Agree
106. Power point face-face lectures make pharmacology easy to learn	01	02	03	04
107. I attended more than (90%) of the face-face lecture sessions	01	02	03	04
108. Face-face power point lectures are were easy to understand	01	02	03	04
109. Use of pictures & animations made pharmacology easy to learn	01	02	03	04
110. Use of learning outcomes made learning pharmacology easy	01	02	03	04
111. Use of mnemonics like "PAINS" made learning easy	01	02	03	04
112. Use of CRAMPS model made me focus my reading & learning	01	02	03	04
113. The lecturers style of teaching made learning pharmacology easy	01	02	03	04
114. The use of home group seminars enabled me learn better	01	02	03	04
115. E-mail access to class notes made learning and revision easy	01	02	03	04
116. In my opinion, the best way that helped me to learn pharmacology is to:				
117. In my opinion, what made learning pharmacology difficult was :				

C. Home group Approach in Pharmacology	Strongly Disagree	Disagree	Agree	Strongly Agree
118. Home groups made learning pharmacology easy	01	02	03	04
119. My group helped me learn and understand pharmacology	01	02	03	04

120. I helped my group to learn pharmacology & complete activities	01	02	03	04
121. My communication was improved by the home groups	01	02	03	04
122. My relationship with classmates improved with groups	01	02	03	04
123. In future, I recommend the use of Home groups in Pharmacology	01	02	03	04
124. I regret working with my home group members	01	02	03	04

125. What I enjoyed MOST about my Home group approach in Pharmacology was:

126. What I disliked about the home group approach in pharmacology was:

D. Pharmacology Practical Sessions	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly Agree**
127. Use of Simulations enabled me learn basic pharmacology concepts	01	02	03	04
128. The dosage forms lab helped me learn basics on medicines better	01	02	03	04
129. Organ bath lab enabled me grasp the idea of experimental pharmacology	01	02	03	04
130. Plotting of (AUC) made me understand basic Pharmacokinetics better	01	02	03	04
131. The Prescription lab enabled me understand prescriptions better	01	02	03	04
132. Plant extraction made me understand drug discovery concepts	01	02	03	04
133. I am confident running a computer simulation program on my own	01	02	03	04
134. I can perform clinical drug calculations confidently	01	02	03	04

135. In my opinion, these are my preferences in learning pharmacology:

a) My preferred teaching style:.....

b) My preferred Reading style:.....

THANK YOU, DANKIE NE', TANGI UNENE,