

CASE BASED LEARNING AT AN INDIAN MEDICAL COLLEGE

MEDICAL STUDENTS AND FACULTY PERCEPTIONS TOWARDS A CASE-BASED
LEARNING INTERVENTION AT AN INDIAN MEDICAL COLLEGE

By: RAKSHA SULE, B.M.Sc.

A Thesis Submitted to the School of Graduate Studies in Partial Fulfilment of the Requirements
for the Degree Master of Science (Global Health)

McMaster University © Copyright by Raksha Sule, August 2016

McMaster University MCASTER OF SCIENCE (2016) Hamilton, Ontario (Global Health)

TITLE: Medical students and faculty perceptions towards the implementation of a case-based learning intervention at an Indian medical college.

AUTHOR: Raksha Sule, B.M.Sc. (Western University)

STUDENT NUMBER: 400047185

SUPERVISOR: Dr. Andrea Hunter

NUMBER OF PAGES: 144

ABSTRACT

Background: Current literature promotes a student-centred approach with an active learning design, as such curricula have demonstrated improvements in outcomes such as critical thinking and clinical competence. Current literature demonstrates success in North America and Europe. However, research in low-resource countries have highlighted resource- and satisfaction-related issues due to such shifts. This study implements a case-based learning (CBL) intervention at Kasturba Medical College Mangalore Campus (KMCMG), India. Faculty and undergraduate medical student perceptions are explored in order to understand the contextual factors that will lead to an effective, acceptable and feasible medical curriculum.

Methods: This cross-sectional, mixed-methods study employed a Likert scale questionnaire and semi-structured focus groups to 3rd year medical students (n=248), as well as semi-structured interviews with faculty (n=10) in the Department of Community Medicine. Cases were created through a co-development process with KMCMG faculty. Questionnaire data was analyzed by descriptive statistics and qualitative data was analyzed primarily by an inductive-iterative approach.

Results: Both faculty and students find CBL to be more valuable than the traditional lecture-based method, and find CBL meaningful for students as future physicians. Comments highlighted the importance of student preparedness and of trained facilitators in order to enhance the learning experience. A significantly larger proportion of Indian schooled students, versus those who studied abroad, felt that CBL helped acquire new information (p=0.016), enhanced their clinical approach (p=0.008), and believed the role of the facilitator was important (p=0.001).

Conclusion: Feedback towards CBL was found to be satisfactory in all aspects, and both students and faculty would like to see more CBL sessions in the future. Limitations such as faculty shortage and the inability to use informational technology at this time should be taken into consideration when moving forward. It is recommended that a resource-light version of CBL be considered, to provide robust orientations to faculty and students, and to further engage with faculty and students in order to enhance the CBL experience.

ACKNOWLEDGEMENTS

I would like to thank my very supportive supervisor, Dr. Andrea Hunter. Thank you for taking a big leap with me on this research project! I am grateful for your wisdom and patience in providing me endless guidance. I would also like to thank my supervisory committee members, Dr. David LaPierre (Dave) and Dr. Animesh Jain. Dave, thank you for helping me begin my journey years ago into the world of global health and medical education – your continued belief in me is always a blessing. Animesh, thank you for your unwavering support in India, for allowing me to take a leadership role in all research aspects, and for your generosity and hospitality. I would also like to extend my gratitude to Dr. Nitin Joseph, whose kindness and helpfulness made this research project a reality.

I would also like to thank Mr. Tom Haffie. Thank you for strengthening my passion in higher education, for sharing your insights with me, for your continuous faith in me, and for always being an inspiration.

I would like to express my thankfulness to all the wonderful friends I met in India. You opened your homes and hearts to me and made my trip to India even more beautiful than I could have ever imagined and hoped for. A special thank you to Akshita, Arjun and Nitish – you three are truly remarkable.

Finally, to my family. Mom and dad, I cannot express how thankful I am. I would not be where I am today without your sacrifices, encouragement and endless love. Thank you to Akshay, my brother, for being the voice of reason when I needed it the most. Lastly, thank you to my friends Anudeep and Gajan, for always helping me to believe in myself. I am lucky to consider you family.

TABLE OF CONTENTS

ABSTRACT.....	iii
ACKNOWLEDGEMENTS.....	v
LIST OF FIGURES AND TABLES.....	viii
LIST OF ABBREVIATIONS.....	x
CHAPTER 1: INTRODUCTION.....	1
Study Purpose.....	2
Research Objectives.....	3
Research Collaborators.....	4
Organization of this Paper.....	5
CHAPTER 2: BACKGROUND LITERATURE REVIEW.....	6
Student-Centred Approach.....	6
What Is Case-based Learning.....	9
Medical Education in India.....	12
Summary.....	19
CHAPTER 3: METHODOLOGY.....	21
Introduction.....	21
Ethical Considerations.....	21
Conceptual Framework.....	23
Design of the Study.....	27
Operation of CBL Intervention.....	33
Data Collection.....	35
Data Analysis.....	36
Limitations of Methodology.....	37
Summary.....	38
CHAPTER 4: DATA FINDINGS.....	39
Introduction.....	39
Demographic Findings.....	39
Quantitative Findings.....	42

Content Analysis: Student Focus Groups.....	44
Methodological Triangulation: Student Focus Group and Questionnaire.....	50
Content Analysis: Faculty Interviews.....	55
Data Triangulation: Students Focus Groups and Faculty Interviews.....	61
Summary.....	66
CHAPTER 5: DISCUSSION.....	68
Introduction.....	68
Findings.....	68
Limitations.....	82
Recommendations.....	85
Future Strides for Medical Education in India.....	87
Summary.....	92
CHAPTER 6: CONCLUSION.....	94
REFERENCES.....	96
APPENDICES.....	103

LIST OF FIGURES AND TABLES

FIGURES

Figure 1. The four levels of inquiry in inquiry-based learning, and the information given to the student in each category (Banchi & Bell, 2008).....	8
Figure 2. Multi-theories model (Taylor & Hamdy, 2013).....	10
Figure 3. The conceptual framework used for this study.....	25
Figure 4. Discussion leading to cognitive skill development in medical students (Edmunds & Brown, 2010).....	72
Figure 5. The twelve roles of a medical educator (Harden & Crosby, 2000).....	75
Figure 6. Learner’s and teacher’s roles during the different phases of the “Multi-Theories Model” (Taylor & Hamdy, 2013).....	78
Figure 7. Miller’s pyramid. 7a. The four levels (Taylor & Hamdy, 2013); 7b. Learning methodologies mapped onto the pyramid. Revised from Miller (n.d.). 7c. Knowledge, skills and attitude mapped onto the pyramid (Koh & Dubrowski, 2016).....	91

TABLES

Table 1. Students participating in the acute diarrheal disease session randomly assigned to group.....	34
Table 2. Demographic data from the student questionnaire. Describes age, gender and majority of schooling before medical school (n=141).....	39

Table 3. Pearson Chi-squared association test ($\alpha = 0.05$) between demographic variables and overall perception characteristics towards case-based learning among medical students (n=141) (Q24 = question 24 from the questionnaire; Q25 = question 25 from the questionnaire).....**40**

LIST OF ABBREVIATIONS

ABE	Animal Bite Exposure
ADD	Acute Diarrheal Disease
CBL	Case-based Learning
IBL	Inquiry-based Learning
KMCMG	Kasturba Medical College Mangalore Campus
PBL	Problem-based Learning

DECLARATION OF ACADEMIC ACHIEVEMENT

The following is a declaration that the content of the research in this document has been completed by Raksha Sule and recognized the contributions of Dr. Andrea Hunter, Dr. David LaPierre, and Dr. Animesh Jain in both the research process and the completion of thesis.

CHAPTER 1: INTRODUCTION

The 1910 Flexner Report paved the path for medical education reform by fuelling the advancement of scientific discovery, which greatly improved patient life spans and health outcomes of the 20th century (Duffy, 2011; Frenk et al., 2010). However, the 21st century brings about a new set of challenges – the persistence of inequities, rapid transitions in demographic factors, and emerging health threats that may overwhelm health systems – that future physician graduates must face and effectively overcome. Current graduate physicians are often unable to meet these demands, largely due to an inadequate and outdated medical curricula (Frenk et al., 2010). There have been many calls for medical education to reconfigure itself in order to support the knowledge and skill development that is required to prepare the next generation of medical graduates (Cooke et al., 2006; Duffy, 2011). As such, there has been an increasing global trend in medical education that is shifting away from the traditional teacher-centred, didactic approach, towards a model that is student-centred and encompasses an active learning design (Jones et al., 2001).

Active learning combines engagement and observation (in real or simulated contexts) with critical reflection experiences (Chickering & Gamson, 1987; Graffam et al, 2007). Prominent examples of active learning methods include case-based learning (CBL) and problem-based learning (PBL). Such a paradigm shift has been justified by studies demonstrating a multitude of improvements in outcomes including: critical thinking, communication, team-based dynamics and clinical competence (Desmarchais, 1993; Hunt et al, 2003).

Recently, medical schools in resource-limited countries have also begun to introduce these changes into their curricula. However, a wide range of studies have highlighted the barriers that

they have faced when doing so. One study showcased that medical schools in Asia are not designed to effectively implement CBL because of faculty limitations and a lack of teaching guides (Chan, Hsu & Hong, 2008). Additionally, a study that introduced PBL in an Argentinian medical school described issues that included a shortage of full-time teachers, and the inability to finance appropriately equipped spaces for tutorial groups (Carrera, Tellez & D'Ottavio, 2003). Furthermore, studies in India have showcased challenges with PBL such as: increased time needed, lack of confidence and/or maturity in students, poor motivation from students, and an unclear role of tutors (Joseph et al., 2015; Nanda & Manjunatha, 2013).

Study Purpose

Literature to date currently focuses on the success that medical schools in North America and Europe have achieved when implementing such changes in their medical curricula (Baum & Axtell, 2004; Anderson, 2000). However, given the above discussion, it is important to understand how complex factors at play in low-resource countries would affect such a shift to an active learning method. Moreover, it is important to have a contextual understanding of a specific country, region and/or institution, in order to create an effective, acceptable and feasible medical curricula that meet both faculty and student expectations and satisfaction.

As such, to better understand systemic limitations and constraints, faculty perceptions must be explored. Conjointly, and ultimately, it is essential to utilize an approach to teaching that contextually best suits the students' learning experience and outcomes (Papanna et al., 2013). Therefore, further research is needed to understand the perceptions of medical students in order to ensure the delivery of a medical curriculum that is acceptable and effective. The resultant understanding would lead to better student learning achievements, and consequently, improvements in the health of patients, communities and populations.

This study will implement a CBL intervention at an Indian medical college, and take an in-depth look into the perceptions of the medical students and faculty in order to gain an understanding of the overall impact of CBL.

Research Question

The objective of this study is to understand the perceived benefits and challenges of a CBL intervention by evaluating the perceptions of medical students and faculty at Kasturba Medical College Mangalore Campus (KMCMG), India. This study aims to answer the following question:

Through a mixed-methods approach, what are the perceptions of medical students and faculty towards a CBL intervention at Kasturba Medical College Mangalore Campus, India?

Study Objectives

Along with the core research question, the following research objectives will be addressed:

1. Describe the perceived benefits of CBL.
2. Describe the perceived challenges of CBL.
3. Explore the relationship between the perceptions of KMCMG's faculty and students towards CBL.
4. Understand, from the participants' perspectives, potential areas of improvement and future considerations in regards to implementing a CBL curriculum.

Research Collaborators

SharinginHealth

In order to effectively create a CBL intervention, it was pivotal for the researcher to partner with a third-party organization that could provide critical direction and expertise in creating validated and high-quality CBL training resources.

SharinginHealth (SiH) is a Canadian not-for-profit organization with a mission to train primary care health professionals in rural and low-resource communities. As an open-access platform, SiH develops high-quality educational training resources and partners with local institutions to integrate and/or disseminate the information into their current curriculum. There are four main program components to the unique SiH pedagogical model: the flipped-classroom approach, CBL, simulations, and formative assessments. In this way, the model supports a student-centred approach and an active learning methodology to ultimately help develop clinical competence and related skills (SharinginHealth, n.d.).

Kasturba Medical College, Mangalore Campus

In 1953, Dr. T.M.A Pai founded India's first private medical school, Kasturba Medical College, in Manipal, Karnataka. Prior to 1969, students would complete their pre-clinical terms at Manipal, and their clinical training in Mangalore, Karnataka, about 65km south. However, in 1969, with the establishment of Kasturba Hospital in Mangalore, the Mangalore training area became a separate constituent college, Kasturba Medical College Mangalore Campus (KMCMG). It is at the Mangalore campus that this research study takes place.

KMC has been widely known to engage in and welcome medical education innovations. For example, most recently in May 2016, the Manipal campus hosted the International Symposium

on “Transforming health professions education and health care delivery through Interprofessional Education and Practice”, bringing medical education scholar Dr. William Burdick and other prominent international figures together (A. Jain, personal communication, May 3, 2016). Although both KMC campuses have engaged in implementing and evaluating PBL interventions in the past (Joseph et al., 2015; Nanda & Manjunatha, 2013; Ciraj, Vinod & Ramnarayan, 2010), a CBL intervention had not been initiated at KMCMG, prior to this reasearch study.

Organization of this Paper

This paper begins by providing a brief background literature review on the educational concepts related to CBL, and the current position of medical education in India. Next, the study methodology will be described in detail. Following this, key results are presented, conjointly with the analytical triangulation of the data. The discussion will serve to reinforce the findings, provide insight onto the limitations, as well as recommend future directions for the Department of Community Medicine at KMCMG. Within the broader context of India, potential recommendations will be made about the feasibility and effectiveness of medical education reform, and the dissertation will conclude with final thoughts.

CHAPTER 2: BACKGROUND LITERATURE REVIEW

In this chapter, the summary of the literature that is relevant to the study and operationalization of the CBL intervention will be described. It provides the appropriate background for understanding the purpose of the study and will serve as the basis for understanding the design of this research work as outlined in Chapter 3.

Student-Centred Approach

Medical education is constantly evolving to meet the needs of the society and environment of the 21st century (Anderson, 2000). Therefore, the shift from the teacher-centred approach towards the student-centred approach has resulted in a much needed change in the way that students learn. Where the teacher-centred approach promotes a top-down trickle of knowledge, the student-centred approach promotes knowledge creation through the dynamic exchange of dialogue between student-and-teacher and student-and-student. In this way, students are engaged in constructive, self-directed, collaborative and contextual learning (Setia et al., 2011; Jones et al., 2001). The student-centred approach focuses on active learning methodologies, rather than methodologies that avail the passive acquisition of knowledge. This has been shown to improve a range of outcomes, such as increased student motivation, improved communication and team-based skills, professionalism, critical thinking and clinical competence (Graffam, 2007; DesMarchais, 1993; Frenk et al., 2010; Hunt et al., 2003).

Active Learning

Bonwell & Eison define active learning as “anything that involves students in doing things and thinking about things they are doing” (1991). In other words, active learning permits students to engage in and observe an experience (real or simulated), while simultaneously critically

reflecting on the experience (Chikering & Gamson, 2987; Graffam, 2007). In this iterative way, active learning presupposes that students construct knowledge based on their experiences. Alternatively, passive learning assumes the transmission of knowledge, rather than the exploration and development of knowledge (Bonwell & Eison, 1991).

When designing active learning educational interventions, educators must find:

“...ways to activate the learners’ experiences so their previous world comes into direct contact with the new world being explored. This juxtaposition, when followed by significant reflection, builds frameworks upon which new learning functions. Learning situations are designed so students grapple with ill-structured problems or evaluate a discipline's inquiry patterns” (Graffam, 2007).

Active learning methods are also often complemented by the use of information technology and computer-assisted learning, which have the added benefit of being able to support limited teaching staff (Jones et al., 2001; McCoy et al., 2015).

Types of active learning methodologies include the umbrella-domain of “inquiry-based learning,” which houses the prominent and popular educational methodologies of “problem-based learning” and “case-based learning.” Inquiry-based learning (IBL) highlights the constructivist view to learning, combined with the use of group processes (Thistlethwaite et al., 2012). That is, IBL promotes asking questions, fosters inter- and intra-student engagement during the learning process, and provides ways for students to reflect on their own experiences to knowledge creation. Banchi & Bell (2008) suggest that there are four levels of IBL: confirmation, structured, guided and open (Figure 1). This continuum focuses on how much information is given to the student, as well as how much support is provided by the educator. As one moves up the inquiry levels, the learner shifts from surface learning to deep learning (Thistlethwaite et al., 2012), which fosters the

learning process from acquiring and reproducing knowledge to constructing meaning through the application of knowledge. (Marton & Säljö, 1997; Entwistle 2009).

Inquiry Level	Question	Procedure	Solution
1—Confirmation Inquiry <i>Students confirm a principle through an activity when the results are known in advance.</i>	✓	✓	✓
2—Structured Inquiry <i>Students investigate a teacher-presented question through a prescribed procedure.</i>	✓	✓	
3—Guided Inquiry <i>Students investigate a teacher-presented question using student designed/selected procedures.</i>	✓		
4—Open Inquiry <i>Students investigate questions that are student formulated through student designed/selected procedures.</i>			

Figure 1. The four levels of inquiry in inquiry-based learning, and the information given to the student in each category (Banchi & Bell, 2008).

Problem-Based Learning versus Case-Based Learning

Medical education curricula have greatly delved into the use of problem-based learning (PBL) and case-based learning (CBL). However, often there is confusion in how these methods take up their own unique space in the spectrum of active learning (Thistlethwaite et al., 2012). Although CBL will be explored in further detail in the next section, it is critical to outline some of the key similarities and differences between PBL and CBL in order to ensure a general understanding of what this study aims to implement.

Similarities between PBL and CBL include: being student-centred and interactive, engaging students in discussions of clinical problems that often mimic real-life situations, having students work in teams to solve the problem, and ensuring the instructor’s role is a facilitator rather a lecturer (Thistlethwaite et al., 2012). One major difference includes their place on the inquiry spectrum. While CBL may be placed between structured and guided inquiry, PBL may be placed between guided and open inquiry (Thistlethwaite et al., 2012). Additionally, in regards to guidance

by facilitators, CBL promotes facilitators to correct any misinterpretations of the information, whereas PBL does not necessitate this (Dupuis & Persky, 2008). CBL may also require more advanced preparation by faculty, whereas PBL may take up more time and resources per session (Srinivasan et al., 2007). Finally, in PBL, the “problem drives the learning” to solve medical problems, whereas in CBL, learning is acquired through the recollection of previously known knowledge to solve clinical cases (Garvey, O’Sullivan & Blake, 2000; Thistlethwaite et al., 2012).

What is Case Based Learning?

There is no international consensus on what CBL encompasses. However, Thistlethwaite & colleagues (2012) engaged in a rigorous systematic review in order to elucidate the key components of CBL. Their methodology consisted of reviewing 104 papers globally, whereby 23 were deemed as higher quality for further review. Of these 23 papers, six were from Europe, fourteen from North America, and three from Australia. The following are their generalized results:

Definition: “CBL is a learning and teaching approach that aims to prepare students for clinical practice, through the use of authentic clinical cases. These cases link theory to practice, through the application of knowledge to the cases, and encourage the use of inquiry-based learning methods” (pg 45).

Methods of CBL: “The most common method of case delivery [is] by small group or large group discussion, usually with a facilitator” (pg 24).

Learning Outcomes: CBL sessions usually “include learning outcomes, either specific outcomes relating to topic/subject goals, or to more generic learning outcomes/goals.” An inference cannot be made on whether or not defined outcomes were known to faculty only, or known to students as well (pg 25).

How CBL is effective and how CBL promotes learning: “CBL promotes learning through the application of knowledge to clinical cases by students, enhancing the relevance of their learning and promoting their understanding of concepts” (pg 46).

In reviewing the literature, Thistlethwaite & colleagues (2012), recommend the following quote as a good summary to describe CBL:

“The [learning] group focuses on creative problem solving with some advance preparation, discovery is encouraged in a format in which both students and facilitators share responsibility for coming to closure on cardinal learning points (i.e. on the continuum between structured and guided). Learners are presented with a clinical problem and have time to struggle, define and resolve the problem. However when learners begin to explore tangents, the facilitators use guiding questions to bring them back to the main learning objective. Students may ask questions of local experts during the session” (Srinivasan et al 2007, p74).

CBL and Adult-Learning Theories

The components of CBL align well with many adult-learning theories that are relevant to medical education. As such, the process of CBL can be described by the “Multi-Theories Model” by Taylor & Hamdy (2013), which is a five-stage model that encapsulates several theories in describing the learner experience (Figure 2).

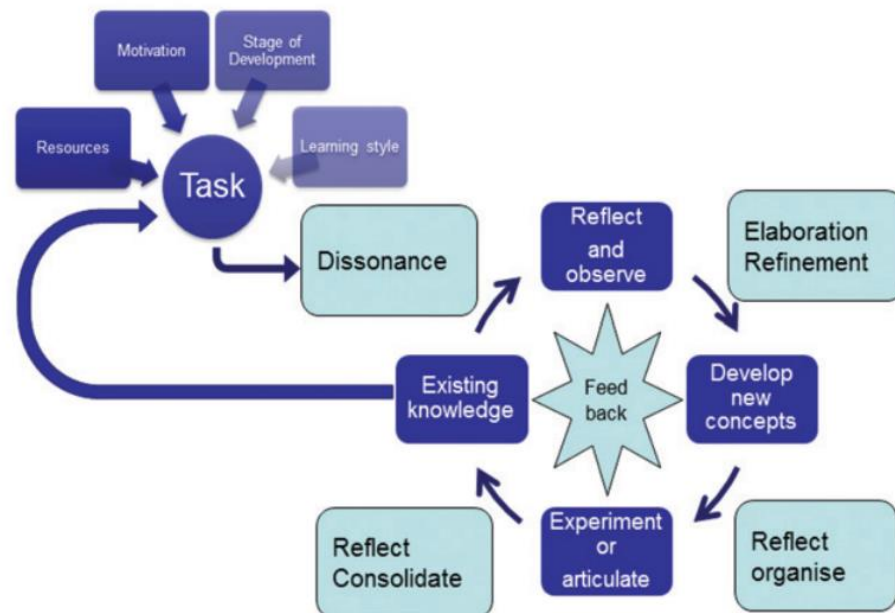


Figure 2. Multi-theories model (Taylor & Hamdy, 2013).

Taylor & Hamdy's (2013) model starts with the learner being given a task. At this time, the learner is heavily influenced by his/her existing knowledge. During the *dissonance* stage, the existing knowledge is challenged and/or found to be incomplete. In the case of CBL, the learner brings his/her knowledge to the clinical case problem at hand, only to realize that not enough information is given and that the learner will have to seek out (new) explanations and solutions. Therefore, during the *elaboration and refinement* stage, the learner begins to construct new information in an active way. In CBL, participants at this stage will be critically engaged in active discussion with other group members in order to explore various concepts and ideas that will lead to likely solutions. During the *reflecting and organizing* phase, the learner will bring together known knowledge and new knowledge in order to articulate a possible solution. At this stage, the facilitator prominently acts to support critical thinking in the development of any idea. In CBL, the role of the tutor is exactly that – to guide the students in critically thinking about the pathway in which they reach their answers. Next is the *feedback* stage. This stage allows the learner and facilitator to engage in a deeper discussion about the possible solutions. The facilitator can provide feedback in which they guide students: into thinking about the correct solutions, in critically questioning and recognizing incorrect solutions, and to reflect on how they arrived to the solution. This stage includes group members posing questions to each other and the facilitator to seek clarifications. As well, this stage permits a higher-level of awareness in regards to students articulating how they felt the learning process worked. In CBL, this co-construction of knowledge permits the facilitator to clarify any misconceptions and ensure that the final learning outcomes will be met. The facilitator at this time can also begin to start the debrief/reflection process in which students may share how they learned, what went well, and what did not go so well. Finally, during the *consolidation* phase, the learner has an opportunity to reflect on the new concepts that

have been gained and to make sense of how this may fit with previous knowledge. The learner will also further reflect on the group processes. In CBL, this last stage can be seen as a reflection and debrief period, during which time the facilitator may encourage the learners to reflect further, may mention strengths and weaknesses of the group process, and also summarize the learning outcomes.

Medical Education in India

There are many comprehensive and notable studies that have explored medical education trends regarding curricular reform in the Western hemisphere, all of which suggest that a shift towards active learning strategies is a positive endeavour (Baum & Axtell, 2004; Anderson, 2000). However, as previously mentioned, many medical schools in low-resource countries have encountered a range of barriers when attempting to deliver such curricula (Jones, 2011).

Therefore, the following section will engage in a discussion about medical education in India in order to better contextually frame this research study. This section will begin with an overall perspective on what has occurred at the national level, followed by specific institutional examples that highlight important results from PBL and CBL interventions.

The Origins

Medicine in India dates back to around 3000 BC, when paintings in the Indus Valley cave were found to describe anatomic knowledge. This was known as the “pre-Vedic” period. Transitioning to around 1500 BC, or the Vedic period, marked writings were found that described anatomy and the uses and applications of medicinal herbs and plants. Following this, the post-Vedic period (880 BC to 1000 AD), the philosophy of Ayurveda, known as “the harmony between

the spirit, senses and the mind”, was the prominent medical ideology of India (Supe & Burdick, 2006).

Western medicine was introduced to India by the Portuguese and British around the 1830s and 1840s. Up until this era, university-affiliated medical education was not the norm. However, at the time of the British departure in 1947, there were 23 medical colleges that offered the undergraduate medicine degree, Bachelor of Medicine and Bachelor of Surgery (MBBS) (Supe & Burdick, 2006; Naik, 2014).

Medical School Timeline

The timeline of an average Indian student pursuing medical college begins with seeking admission after twelve years of school. During that time, prerequisite courses in biology, chemistry and physics must be completed. Admission into medical college is based upon a multiple choice question-format entrance test.

The undergraduate medical education degree totals to 5.5 years. During the first 4.5 years, the majority of medical colleges have students engage in a didactic, traditional-based curriculum. This is followed by a one year internship, in which students rotate through various specialties. Graduates can then register with the Medical Council of India to be eligible for independent practice. Most graduates then aim to pursue post-graduate specialty programs (Sood, 2008).

National Bodies

The regulatory body for medical education in India is the Medical Council of India (MCI), a government agency under the Indian Medical Council Act of 1933. The act has been modified multiple times, most recently in 2001, to ensure a more rigorous procedure for maintenance of universal standards of medical education. However, although the MCI provides broad guidelines,

specific details of the teaching and learning programs are primarily decided by the individual institution. As such, there is currently no uniformity between medical colleges and thereupon, the medical student graduates (Sood, 2008; Solanki & Kashyap, 2016).

As an autonomous body, the National Assessment and Accreditation Council (NAAC) was created in 1994 to uphold the quality of higher education in India. Through internal and external evaluations, its mission is to offer institutions an opportunity for accreditation, to be supportive of institutional strengths, and to shed light onto weaknesses and opportunities. In particular, the NAAC encourages institutions to adopt innovative pedagogical methods, and provides information on the quality of education offered by institutions. However, since this accreditation and evaluation process is voluntary, many institutions disregard it (Sood, 2008).

Taking the pitfalls of the MCI and NAAC together, the number of medical colleges engaging in medical education innovations is very low (Sood, 2008).

Current Challenges & Future Directions

In the last two decades, there has been a rapid expansion in the number of medical colleges in India, now totalling 381 (Solanki & Kashyap, 2016). Although this has improved the doctor-to-patient ratio from 1:3800 in 2001 to 1:1953 in 2011 (Planning Commission, 2011), the standards and quality of health care remain unchanged and varied between regions (Solanki & Kashyap, 2016). The factors responsible for this “static quality” of education have been attributed to many issues, such as resource misallocation, poor faculty development, neglect in research initiatives, ineffective assessment systems, and outdated curricula (Deswal & Singhal, 2010; Solanki & Kashyap, 2016).

Many calls for curriculum change have been made in the last 30 years, however significant reforms have only been made to a limited number of medical colleges (Supe & Burdick, 2006). As such, in 2011, the MCI proposed a *Vision 2015* document that outlines goals for medical education reform. As suggested by the MCI, India's goal by 2030 is to achieve a doctor-to-population ratio of 1:1000. Given that the current medical education standards in India do not meet high-quality levels for content or competency (MCI, 2011), the council went through a process of critical analysis to find areas for improvement in the curriculum. Some recommendations include: improving learning skills and communication, bridging the gap between theory and practice, and using CBL as an introduction to early clinical exposure. Specific modifications include a greater emphasis on self-directed learning and encouragement of student-centred approaches. With the inclusion of these recommendations relating to new teaching-learning methodologies, it is hoped that this will “lead to a new generation of medical graduates of global standards” (MCI, 2011).

Medical Education Interventions in India

This section will look at a few key medical education interventions at medical colleges in India. The scope of this section will be limited to: primary data collection experiments, PBL and CBL interventions, and a study population specifically targeted to undergraduate medical students in India. Studies that were excluded from this brief review included those that: integrated various active learning methods within one class session, created a “program” that integrated components of various active learning methods, modified the general structure of PBL and/or CBL, research in progress experiments, and those without full articles available. Papers were found on the MEDLINE database. Relevant articles from the bibliography list of the found papers were also included. The search was limited to the years of 2000 – 2016, and restricted to the English language. Search terms (and related variants) included: “case-based learning”, “problem-based

learning”, “India”, “medical student”, and “medical education”. The papers referenced in this discussion are not exhaustive, but have met the saturation level for new findings, thereby serving as an appropriate summarization of results in the Indian context.

Case-Based Learning

Student Experience: At the academic performance level, all studies reviewed with an academic evaluation component demonstrated a significant increase in CBL post-test scores in comparison to didactic post-test scores (Nair et al., 2013; Tathe & Singh, 2014; Joshi, Nilwar & Thorat, 2014; Kireeti & Reddy, 2015; Motagi, N & Patil, 2015). When assessing positive perceptions for CBL, the majority of students believed in an: improvement of knowledge retention, improvement of reasoning and problem-solving skills and soft skills (e.g. teamwork, communication, interpersonal), improvement of student-teacher interactions, and increased motivation and interest in topic (Gade & Chari, 2013; Jamkar et al., 2007; Nair et al., 2013; Joshi, Nilwar & Thorat, 2014). In regards to concerns, one study found that CBL was perceived to be time-consuming, that it may not help with traditional examinations, and that a downfall was clinical skills not being taught (Jamkar et al., 2007).

Important to note, is that most of the research done evaluated student academic performance on summative assessments. Additionally, all of these studies used only the quantitative method of scaled questionnaires in order to assess the students’ perceptions.

Faculty Experience: Of all the papers found that fit the inclusion criteria, only three papers assessed faculty perceptions. Faculty perceived CBL to be beneficial for students in regards to the following reasons: promotes self-study and problem-solving abilities of students, improves communication and promotes healthy teacher-student relationship (Gade & Chari, 2013; Ciraj,

Vinod & Ramnarayan, 2010). Concerns from these studies included: resource limitations (time, faculty members and infrastructure), the challenge of involving shy and less interested students, and the belief that CBL does not impart factual knowledge to the students. Some faculty in one paper also suggested that a challenge would be to change the mindset of senior faculty and staff members to cooperate and try a new method (Gade & Chari, 2013). It was suggested in this regard to train teachers regularly, and importantly, to help faculty understand that implementing such teaching approaches will promote higher order thinking, and ultimately better clinical outcomes (Gade & Chari, 2013). Contrarily, faculty from another paper were “proud to be a part of [the] new modality” (Jamkar et al., 2007), perhaps, as the authors note, because faculty were involved in every stage of the CBL design and implementation process. However, the faculty in this study did suggest that it is difficult to evaluate student perceptions when the study period is short.

Problem-Based Learning

There were two studies found in regards to PBL in India that were focused at the undergraduate medical education level. Both were limited to student perceptions.

The first study (Nanda & Manjunatha, 2013) assessed a total of 773 first year medical students’ perceptions in regards to PBL versus the traditional-based method with both quantitative and qualitative methods. Pertaining to benefits (found to be statistically significant, $p < 0.001$), students believed that: PBL was more enjoyable, more motivating, stimulates interest in the topic, and develops interpersonal skills to a higher degree, better promotes teamwork, and develops reasoning, curiosity and independent thinking to a higher degree. Qualitatively, students also indicated that PBL would help them become better clinicians. In regards to concerns, qualitatively, students expressed: not all group members participated equally which hindered their learning

process, that PBL would not be helpful in preparing for exams, and that the tutor was too strict. Students mainly suggested that the PBL process should be formally assessed and that this assessment should play a vital role in the final grade, and that tutors need more effective training prior to conducting PBL. Additionally, there were no significant differences based on where students had their primary education (in India or abroad), and no advantage (statistically) between traditional and PBL methods in regards to learning efficiency and student-teacher relationships. The researchers of this paper conclude that in their institution's contextual needs, a hybrid PBL and traditional curricula should be implemented, and that in order to successfully implement a PBL curriculum, there is need for strong support from administration, and effective training of both faculty and students. They also note that India is a country of “many cultures”, and as such, the results and findings of one study cannot necessarily be transferrable to another institution, region and/or country.

The second study (Joseph et al., 2015) demonstrates that students are strongly satisfied with PBL. In this study, PBL was introduced to final year medical students, and perceptions were measured using a questionnaire. In regards to benefits, PBL was found to: improve productivity within a group setting, and enhance their critical thinking, team work, interest in the topic and leadership skills. One of the major concerns was that students (44.4%) felt PBL was a time consuming method. It was also found student participation in the study dropped from the brainstorming session (n=77) to the presentation session (n=54). The authors attribute this to poor motivation. In regards to this, the authors suggest that training tutors to be better facilitators may have positive and influential motivational effects on students. They also discuss training the tutor for better student outcomes.

These two PBL studies were done at KMC Manipal Campus and Mangalore Campus, respectively.

Other methodologies

Through the database review, the researcher recognizes that other innovative methodologies have been implemented at Indian medical colleges (e.g. community-based learning, team-based learning, distance-based learning, and peer-guided learning). Additionally, some studies have demonstrated the modification of known CBL and/or PBL structures and/or the creation of “programs” that include components of various active learning designs. However, as these methodologies are often created to fit the individual institution’s needs, there is no globally accepted definition in identifying these unique learning methodologies. Such definitions are critical, as without them, it cannot be ensured that there is a common understanding of what is expected (Hartling et al., 2010), and therefore will not allow for an effective discussion regarding the findings, and is outside of the scope of this paper.

Summary

This chapter has provided background on medical education pedagogy, as pertaining to the student-centred approach, and a review of the literature surrounding CBL within medical education in India.

In the current landscape of CBL medical education research in India, there is a gap in understanding the student and faculty perceptions to a deeper degree. Student perceptions have only been assessed quantitatively; and to the best of this researcher’s knowledge, no CBL research in India (as per the limits described earlier) has been done through an in-depth qualitative lens. Additionally, only three CBL papers in India have assessed faculty perceptions. Although the

Ciraj, Vinod & Ramnarayan (2010) study was conducted at Kasturba Medical College Manipal Campus, it was through the quantitative methodology of a Likert-scale questionnaire. As such, there is a need to more comprehensively explore student and faculty perceptions in order to truly create an effective, acceptable and feasible curriculum.

This mixed-methods study is designed to thoroughly assess these perceptions at Kasturba Medical College Mangalore Campus (KMCMG). The data gathered in this study will therefore begin to help fill the gaps in the existing literature. The results will also be used by the researcher to recommend future directions for the Department of Community Medicine to undertake when moving forward with medical education innovation, particularly pertaining to CBL.

CHAPTER 3: METHODOLOGY

Introduction

This cross-sectional study, built on a conceptual framework that highlights the constructivist paradigm, used a mixed-methods approach to examine the perceptions of Kasturba Medical College faculty and students regarding a case-based learning (CBL) intervention. For this study, a questionnaire and focus group discussions were employed for students, and interviews were conducted with faculty. During data analysis, emphasis was placed on multiple triangulation (i.e. methodological and data) to demonstrate strength in the interpretation of the findings. While there were some limitations, considering the objectives of this research work, and the implementation and evaluation components with the CBL intervention, this study design best fits these conditions.

Ethical Consideration

Ethics approval was granted through the Hamilton Integrated Research Ethics Board and from the Institutional Ethics Committee from Kasturba Medical College Mangalore Campus (KMCMG) in April 2016.

Prior to the implementation of the CBL intervention, all participants were emailed a package with the letter of information explaining the voluntary nature of the study, purpose of the study, research procedures, potential risks and benefits, confidentiality, information about withdrawal, and the consent form (Appendix Aa, students; Appendix Ab, faculty). Students, during an orientation prior to implementation, were also provided a shortened version of the letter of information and consent form, and were verbally told that the participation was voluntary with

no consequences. Prior to the beginning of focus groups and interviews, participants were walked through the consent form, and their verbal consent was obtained.

Risks to the participants in the study were minimal. Participants may have felt uneasy about sharing their responses in front of others during the focus group discussions, and may have been uncomfortable with setting aside time in order to participate in the focus group discussions or interviews. As such, participants were informed that they did not have to answer all questions, and participants were also given advanced notice about focus group discussions and interviews in order to provide them with the appropriate flexibility in choosing a time that worked for their schedule. Participants were also made aware of the potential benefits of the study: the implementation and evaluation of the CBL intervention would help to inform the development of an appropriate and effective curriculum given KMCMG's faculty and student perceptual needs.

To ensure confidentiality, answers from the questionnaire could not be linked back to the participants, and during the focus groups and interviews, the participants were given a coded identification number in order to prevent any association with their private information.

All hard copies of consent forms and questionnaires were kept anonymous and confidential in a locked cabinet that was only accessible by the researcher and co-researchers at KMCMG. The audio-recording device, used for the focus group discussions and interviews, was password-protected. All transcribed verbatim from the audio-recording device, and data from the questionnaire, was transferred to electronic files (Word documents, Excel spreadsheets, and IBM Statistical Package for the Social Sciences (SPSS) 19.0), and kept on a password-protected computer, accessible only to the researcher. The archive of anonymized data, will be maintained for three years, after which time all files will be deleted from the personal password-protected

computer, and all hard copies of the consent forms and questionnaires will be shredded and discarded.

Participants were informed that they would have the option to view the results of the study upon its completion, and that they may contact the researcher at any time for further inquiry.

Disclosure of Potential Conflict of Interest

Dr. David LaPierre is a thesis committee member on this research project. He is the Founder and President of SharinginHealth, whose resources were used for the CBL intervention. Any competing interests were disclosed prior to the start of the research work. No financial gain was obtained from this study.

Conceptual Framework

Over the past few years, there has been a surge for medical education researchers to become strongly aware of the conceptual framework that underpins their research (Bunnis & Kelly, 2010; Todres, Stephenson & Jones, 2007). The purpose of using a conceptual framework is to be conscious about the ‘lens’ through which one views the phenomenon of interest (Tavakol & Sandars, 2014). Although many have outlined the importance of using a conceptual framework, a systematic review demonstrated that only 55% of published medical education experiments present a conceptual framework (Cook, Beckman, & Bordage, 2007). Equally important then, is the transparency by which medical education researchers need to “better inform [readers] about the assumptions and foundations of their work” (Bordage, 2009). As such, this sub-section aims to clarify the conceptual framework that underpins this study.

Terms and Definitions

Upon engaging in a scan of the literature regarding conceptual frameworks, it is important to note that the term ‘conceptual framework’ has sometimes been used in medical education research interchangeably with ‘research paradigm’ and ‘theoretical framework’. However, for the purpose of this study, all three terms have distinct meanings:

Conceptual framework: Is a term that encompasses the entirety of the process and relationships of the philosophical concepts and methodological approaches.

Research paradigm: Describes a “comprehensive belief system or a worldview that provides a general perspective to guide an understanding of the phenomenon under investigation” (Tavakol & Sandars, 2014). A research paradigm inherently holds philosophical relationships to a specific ontology (view of reality), epistemology (theory of knowledge) and methodology (approach to finding out the knowledge) (Tavakol & Sandars, 2014; Bergman, et al., 2012). Types of research paradigms include positivism, post-positivism, critical theory and constructivism.

Theoretical framework: Refers to discipline-specific theories and related concepts. For example, a theoretical framework for medical education research could be one or more adult learning theories; whereas a theoretical framework for psychology research could be one or more formation of identity-related theories.

Explaining the Conceptual Framework

Figure 1 (below) illustrates the relationship among the terms listed above, as well as other relevant terms that are applicable to this study.

CONCEPTUAL FRAMEWORK

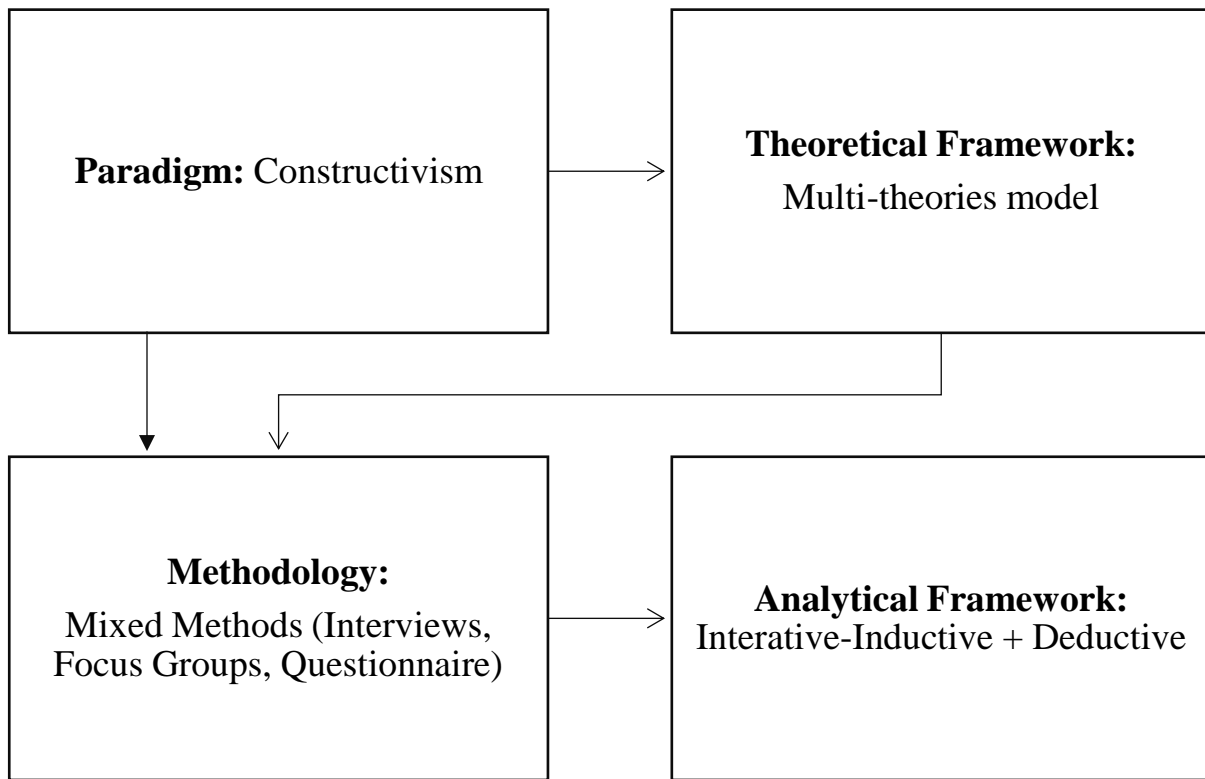


Figure 3. The conceptual framework used for this study.

The lens, or research paradigm, for this study is constructivism. Constructivists believe that “multiple truths are constructed by and between people,” which shapes the ontological view of reality being “socially and experientially based” (Bergman, et al., 2012). It follows then, that the apt methodology within the constructivist paradigm is associated with qualitative research (Tavakol & Sandars, 2014), and thereby focuses on an iterative-inductive approach to “recognize, understand, develop and contrast constructions through dialogue” (Bergman, et al., 2012). As such, common instrumentation tools include focus group discussions and interviews (Stalmeijer, McNaughton, & Van Mook, 2014).

In saying this, in an effort to gain further insight into the data, a quantitative research component was included in this study. Therefore, the present study is a mixed methodology. It is noted that quantitative methods generally have a different philosophical paradigm, since it is heavily based on deductive reasoning (Tavakol & Sandars, 2014; Bergman, et al., 2012). However, “the counterargument is that the two approaches are similar in their objectives, scope and nature of inquiry across methods and paradigms” (Thurmond, 2001). Additionally, the quantitative portion was used as a complementary, and more so, as a supportive tool in making stronger assumptions based on the results from the qualitative data. As such, the constructivism paradigm still takes precedence on the researcher’s views and assumptions.

In regards to the theoretical framework, often quantitative researchers use an existing theory to frame their hypothesis (Auerbach & Silverstein, 2003). Additionally, qualitative researchers may use a deductive approach based on a theoretical framework to pre-create categorical themes, which will help “organize the qualitative dataset for interpretation” (Tavakol & Sandars, 2014). Both approaches were undertaken for this study. In the context of this research, the most appropriate theories would be those related to adult learning in medical education. There are a number of adult learning theories (see: Taylor & Hamdy, 2008; Torre et al., 2006), but the pertinent one with regards to CBL is the “Multi-Theories Model” (Taylor & Hamdy, 2013), as explained in Chapter 2. As the multi-theories model includes the learner being internally or externally challenged by their existing knowledge, discussing new information and building new concepts, and finally reflecting on their knowledge (Taylor & Hamdy, 2013), it naturally assumes its place well within the constructivist paradigm.

While the above explanation of this study’s conceptual framework is novice in comparison to some of the works in the literature, it is hoped that by stating these assumptions and relationships

which created the study design, that readers can more “critically engage” with this study’s analysis of the results (Bunniss & Kelly, 2010).

Design of the Study

As noted above, this is a mixed methods study. The study population consists of 3rd year, 6th semester medical students (n=248) and faculty from the Department of Community Medicine (n=10).

For years, researchers have debated about the use of qualitative versus quantitative methods (Bryman, 1984; Schifferdecker & Reed, 2009). However, the integration of both approaches have been gaining momentum, as researchers begin to recognize that the combination produces a greater range of knowledge regarding the phenomenon under question (Maudsley, 2011; Boet et al., 2012). Therefore, in the general sense, a mixed-methods study is desirable for this research work, and more specifically, important for two reasons. First, since there is little-to-no knowledge about CBL in this study population, qualitative methods are effective for gaining a deeper understanding of new phenomena (Tavakol & Sandars, 2014; Auerbach & Silverstein, 2003). Second, the use of quantitative methods will allow for a generalization and for predictions to be made of the study population (Tavakol & Sandars, 2014). The combination of both the qualitative and quantitative approaches will thus result in the development of unique insights, and ultimately speak to the credibility of CBL being implemented at KMCMG.

Content Creation

Two case studies were created through a co-development process between SheringinHealth and KMCMG faculty. KMCMG co-researchers first determined the case topics (animal bites exposure and acute diarrheal disease), student learning objectives, and case story. These case

topics were chosen due to their frequency in the region, and the case stories were built around real-life situations. The preliminary case study outline was then created by SharinginHealth. There was continual input from KMCMG faculty to refine the questions and answers. The final products resulted in two case studies that were rooted in the local context. Upon completion, the case studies underwent a thorough content validation process with topic experts from KMCMG, and any critical suggestions and/or changes were made.

Simultaneously, a tutor guide was created that paralleled the case studies, had a dedicated space after each question for facilitators to write any higher-order questions that may stimulate further discussion or concept reminders for themselves, and at the end of the guide, a reminder on how to effectively facilitate a reflection and debrief period (Appendix Ac, Animal Bite Exposure; Appendix Ad, Acute Diarrheal Disease).

Study Instrument Creation

Questionnaire

The Likert scale was developed in 1932 by Rensis Likert to assess the degree to which participants agree or disagree with a statement (Likert, 1932). Likert scales are frequently used in medical education research and are considered an effective tool for the collection and eventual analysis of stakeholder perceptions (Sullivan & Artino, 2013). As such, for this study, a 5-point Likert scale questionnaire was developed (Appendix Ae). In order to ensure rigour of the questionnaire, best practice guidelines by Burns & colleagues (2008) were followed.

First, the literature was scanned in order to generate concepts for the questionnaire. This process was continued until no new concepts were observed (ie. sampling to redundancy). From here, five main themes were determined:

1. Knowledge Acquisition and Application
2. Development of Inquiry
3. Influence of Small-Group Work
4. Role of the Tutor
5. Personal Enjoyment and Satisfaction

Thematic-related questions were then chosen from a validated and standardized self-administered survey that had already been implemented at KMCMG, within the Department of Community Medicine to a similar study population (2nd year medical students) (Joseph et al., 2015). By preparing the questionnaire using questions from a pre-validated survey to a similar study population, this is thought to have increased content and construct validity (Cummings, Newman, & Hulley, 2013). It has also ensured that the comprehension of the questionnaire would not be affected by language skills, education and culture (Burns et al., 2008). For each theme, four questions were chosen, and were placed in the body of the questionnaire.

The first three questions were demographic-related (age, gender, where schooling took place before medical college (in India or abroad)). The purpose of using demographic questions was two-fold. First, “these are simple, nonthreatening questions that “warm up” the respondent” (Passmore et al., 2002). Secondly, descriptive statistics to determine association between the demographic variables and questions could be done, in order to gain further insight of the data. To end the questionnaire, two overview statements were included that addressed perceptions on a holistic level:

1. I would like to have more CBL sessions than traditional lecture-based sessions
2. CBL enhances my overall learning experience

A total of 25 questions were thus included on the questionnaire. This is the maximum limit of questions to be included on a questionnaire in order to minimize respondent burden, since lengthy questionnaires are less likely to be completed (Burns et al., 2008). The time taken to complete the survey by the students was 5-10 minutes.

Semi-Structured Focus Group Discussions

Parker and Tritter (2006) state that “focus groups are valuable because they provide one method for capturing group interaction and harnessing the dynamics involved to prompt fuller and deeper discussion and the triggering of new ideas.” Focus group discussions have popularly been used in medical education research in order to explore and explain phenomena under investigation (Stalmeijer, McNaughton & Van Mook, 2014), and as such, semi-structured focus group discussions were used in this study. The purpose of the semi-structured format was to ensure that participants had an opportunity to explore the question, but also to allow the researcher the option to create pre-determined questions that would directly relate to the study objectives.

In order to employ a sound process for focus group discussions, the focus group AMEE Guide No. 91 was used (Stalmeijer, McNaughton & Van Mook, 2014). As per Box 4 and Box 5 in the focus group AMEE Guide No. 91 (Stalmeijer, McNaughton & Van Mook, 2014), a focus group guide was created (Appendix Af). As such, this study’s focus group guide followed the use of a “question route”, which included introductory questions, key questions, and concluding questions. The introductory questions were more open-ended to allow the participants to feel at ease and become used to the environment of sharing ideas and thoughts amongst others. The key questions were categorized into the five themes that paralleled the flow and thematic-related questions in the questionnaire:

1. Knowledge Acquisition and Application
2. Development of Inquiry
3. Influence of Small-Group Work
4. Role of the Tutor
5. Personal Enjoyment and Satisfaction

Finally, the concluding questions allowed participants to provide overall thoughts on their learning experience and how that may influence them as future physicians. To end the focus group discussions, participants were explicitly asked if they had any suggestions for areas of improvement, if they found any feature of CBL particularly great, or if they had any last thoughts they wanted to mention.

The focus group discussions lasted 25-30 minutes and were audio-transcribed. Five focus groups were conducted, with a total number of participants at 37. The optimal size of a focus group discussion is between six to ten participants (Stalmeijer, McNaughton & Van Mook, 2014). In this study, one group had 5 participants, three groups at 7 participants, and one group had eight participants. Of note, based on discussions within the earlier focus groups, a question that was purposefully added into the focus group guide as later focus group discussions continued, was in regards to the importance of a faculty orientation.

Pilot Test – Questionnaire & Focus Group Discussions

In order to establish face validity, the questionnaire and focus group questions were reviewed by research team members. Additionally, both instruments were piloted by convenience sampling to five medical students who attend medical school in Ontario, Canada. They were asked to review the questions while keeping in mind the time required to read through the questionnaire,

and the following concepts when answering: flow, significance, acceptability, and identifying unusual, redundant, irrelevant or poorly worded questions (Stalmeijer, McNaughton & Van Mook, 2014). They were also given an opportunity to suggest and explain if there were any questions that should not be asked, and if there were any questions that should be added. There was no major critical feedback, and as such, no revisions were made.

Semi-structured Interviews

The interviews served the same purpose as the focus group discussions, with the aim to understand the perceptions of faculty. Interviews were used, rather than focus group discussions, since there was a small number of faculty, and to accommodate faculty schedules. Similar to the focus group discussions, the interviews were semi-structured in nature. Yin (2009) proposes that a well-conducted interview welcomes an open-ended conversational style, while gaining in-depth focused responses from the interviewees. To facilitate this, an interview guide was also created (Appendix Ag), and followed the same question route highlighted by Stalmeijer, McNaughton & Van Mook (2014). For the interview guide, the key questions were categorized into two themes:

1. Faculty Development-Related Questions
2. Perceptions of the Student Experience

While the first theme focused on the faculty's experience as a CBL tutor, the second theme posed the exact same questions from the five themes addressed during the focus group discussions. The purpose of this was to better organize data such that data triangulation analysis could occur at ease.

The guide was face validated by the research team. Seven interviews were conducted and audio-transcribed. The total length of the interviews ranged between 20–30 minutes.

Operation of CBL Intervention

The CBL intervention took place over a period of one week, with two CBL sessions, one for each case study.

The study population was 3rd year, 6th semester students (n=248), which was determined by convenience sampling. With the large class size, it was determined that the class would be split into Batch A and Batch B, whereby Batch A would attend the CBL session on animal bite exposure (ABE) and Batch B would attend the CBL session on acute diarrheal disease (ADD). Student categorization into Batch A or B was randomly determined based on their roll number; all even numbered students were placed in Batch A, and all odd numbered students were placed in Batch B.

Ten faculty members could be available per CBL session. Four of the ten faculty members were considered “tutors”, which is equivalent to the North American term of “teaching assistants.” “Tutors” are hired individuals who recently graduated from the MBBS program from KMCMG, and do not hold a lecturer or professor appointment. Their responsibilities include exam proctoring, but not lecturing or creating class material. Until otherwise mentioned, these “tutors” will still be noted as faculty in this paper.

As only 10 faculty members were available per CBL session, 10 groups were created, with 12–13 students. Students were randomly assigned by the 20th number into each of these groups, based on their roll numbers (Table 1). For example, if students were in Batch A, Group 1 was made up of student roll numbers 2, 22, 42, 62, and so forth until student roll number 242. One group during the ADD session had two tutors present, as an extra faculty member was available during the session day and wanted to participate. Depending on classroom size and room availability, some rooms had two groups simultaneously.

Group	Student Roll #
1	2 22 42 62 82 102 122 142 162 182 202 222 242
2	4 24 44 64 84 104 124 144 164 184 204 224 244
3	6 26 46 66 86 106 126 146 166 186 206 226 246
4	8 28 48 68 88 108 128 148 168 188 208 228 248
5	10 30 50 70 90 110 130 150 170 190 210 230
6	12 32 52 72 92 112 132 152 172 192 212 232
7	14 34 54 74 94 114 134 154 174 194 214 234
8	16 36 56 76 96 116 136 156 176 196 216 236
9	18 38 58 78 98 118 138 158 178 198 218 238
10	20 40 60 80 100 110 140 160 180 200 220 240

Table 1. Students participating in the acute diarrheal disease session randomly assigned to group.

Prior to CBL Sessions

Prior to the CBL sessions, orientations were given to both the students and the faculty.

One 20 minute PowerPoint presentation was created for the students, and run by the researcher. The purpose was to describe the principles, methodology and practice of CBL, and to explain the purpose of the research and the process they would undergo. Along with this, they were told about the confidentiality and anonymity of participating. Students also had an opportunity to ask any questions or to bring up any concerns they might have. At the end of the orientation, students were given a short version of the letter of information and the consent form to voluntarily participate in the CBL sessions. The full letter of information was emailed to them that evening. Finally, students were also give session objectives and reading resources ahead of time to review.

The faculty who were to participate as tutors for the CBL intervention also underwent a three-step orientation process, which was co-run by the researcher and a co-researcher from KMCMG. The first step was a 20 minute PowerPoint presentation to ensure a uniformed understanding of the CBL approach and to go over small-group facilitation skills. A second 20

minute meeting was held to go over the ABE tutor guide, and the session process in detail. Tutors had an opportunity here to suggest any additions to the answer key and clarify any concerns they may have had. Finally, a 10 minute meeting was held immediately before the first CBL session to answer any remaining questions.

During CBL Sessions

During the CBL sessions, students worked in teams to meet the objectives, while the tutor facilitated the discussion. While Batch A was having a CBL session on ABE, Batch B was having a traditional-styled lecture on ABE. Similarly, while Batch B was having a CBL session on ADD, Batch A was having a traditional-styled lecture on ADD. All sessions (CBL or traditional-styled lecture) were set for 1.5 hours in length.

It is important to note the external situations that were surrounding the CBL sessions. Just prior to the CBL sessions, students had been on a break from college for about a month due to a water crisis in the town (to be explored further in Chapter 5). Additionally, the ABE session took place six days prior to their sessional exams, and the ADD session took place three days prior to their sessional exams (to be explored further in Chapter 5). Moreover, the concepts from the topic of ABE (whether students were in CBL or in the traditional lecture-based group), was coming on their upcoming exam, whereas the concepts from the topic of ADD were not (to be explored further in Chapter 5). Students knew this beforehand.

Data Collection

At the end of each CBL session, students completed the questionnaire, and had an opportunity to sign up to receive further information about participating in the focus group discussions if they were interested.

In the weeks following, focus group discussions and interviews were held. Although prompts were used that guided the semi-structured focus group discussions and interviews, the discussions were primarily directed by the participants. As such, an iterative process was employed at this stage, as the guides evolved as new themes emerged from previous focus group discussions and interviews.

For both focus group discussions and interviews, theoretical sampling was employed, whereby data collection continued until data saturation was reached (Corbin & Strauss, 2008).

Data Analysis

The data from the questionnaire was analyzed by Microsoft Excel and SPSS version 19 software. Descriptive statistics, including mean (SD) and frequency was calculated. To address the associations between questions and demographics (gender, age, schooling area), the Pearson *Chi* square test was used, where a p value ≤ 0.05 represents statistical significance.

All interviews and focus group discussions were audiotaped and transcribed into text data by the researcher. The transcribed text was analyzed by hand by the researcher. Before beginning the coding process, the researcher read over the transcripts three times in order to obtain an overall impression of the data. The coding procedure followed that which is outlined by Auerbach & Silverstein (2003, p 37-40), beginning with identifying “Relevant Text”, which is described as “cut[ting] down the text to manageable proportions... by reading through the text with [your] specific research concerns in mind.” Next, “Repeating Ideas” were identified, which are “similar words and phrases” used by different research participants “to express the same idea.” Repeating ideas were then categorized into “Themes” that were previously noted and/or determined through the coding process. Finally, “Theoretical Constructs” were determined, which are referred “to the abstract grouping of themes.” A theoretical narrative was created in order to express the results.

Triangulation

Triangulation is a data analysis method that “involves the convergence of multiple data sources to enhance the credibility and validity of the findings” (Boet et al., 2012). This study employs the use of two types of triangulation in order to strengthen the interpretation of the findings. First, in order to gain the best representation of the student perception, methodological triangulation is used to compare the data from the questionnaires and the focus group discussions. Second, in order to gain a more comprehensive understanding regarding CBL, data triangulation is used to compare the data from the student focus group discussions and the faculty interviews (Thurmond, 2001). Based on any relationships found, the researcher constructed a narrative description. Ultimately, triangulation also helps support the credibility and confirmability of the researcher’s analysis (Yin, 2009), thereby improving internal validity for the researcher to make logical conclusions (Gibbert, Ruigrok & Wicki, 2008).

Limitations of Methodology

As with any verbal report, the focus group discussions and interviews had the potential to include social desirability bias, recall bias, and response bias (Stalmeijer, McNaughton & Van Mook, 2014). In order to combat this issue, the triangulation approach to analysis was used, which would provide a more rounded understanding. Additionally, to improve the credibility, reliability and rigour of the study, the focus group discussions and interview guides could have been validated by a qualitative expert. In the same vain, the questionnaire was not assessed for reliability, and at minimum, may have only met face validity.

Summary

This chapter has provided the reader with a detailed explanation of the methodology used in this research study. This explanation includes the conceptual framework used, the design study details, data collection procedures, data analysis procedures and limitations as they pertain to the study design. The following chapter, Chapter 4, will describe and analyze the data findings and provide a narrative description.

CHAPTER 4: DATA FINDINGS

Introduction

In this section, the findings describe the perceptions of the CBL intervention implemented at Kasturba Medical College Mangalore Campus (KMCMG), as expressed by the faculty and students. The findings will focus on the demographics of the student participants, followed by an overview of the questionnaire results, and thorough content analyses of the semi-structured focus groups and interviews. Through methodological and data triangulation, emerging and overlapping themes will also be highlighted in order to demonstrate reliability within the findings.

141 students volunteered to participate in the study (51% response rate of 248 students in total). All participating students completed the questionnaire. 35 students volunteered to attend the focus group discussions, and 7 faculty participated in the interviews.

Demographic Findings

The demographic data from participating students was collected from the questionnaire, is described in Table 2.

Characteristic	n (%)
Age	
18	0
19	0
20	39 (27.66%)
21	59 (41.84%)
22	32 (22.69%)
23	9 (6.38%)
24	2 (1.42%)
≥25	0
Gender	
Male	69 (48.94%)
Female	72 (51.06%)
Majority of Schooling Before Medical School	
In India	120 (85.11%)

Abroad	21 (14.89%)
--------	-------------

Table 2. Demographic data from the student questionnaire. Describes age, gender and majority of schooling before medical school (n=141).

The student participants had a range of ages, with the majority of students at 21 years of age (n=59, 41.84%), followed by 39 students (27.66%) at 20 years of age, and 32 students (22.69%) at 22 years of age. The smallest two age groups were 23 (n=9, 6.38%) and 24 (n=2, 1.42%), respectively. In regards to gender, there were 69 male (48.94%) participants and 72 female participants (51.06%). Finally, predominantly, the participants had completed their schooling before medical school in India (n=120, 85.11%), with only 21 students (14.89%), having completed their prior education abroad.

The next table addresses the associations between these three demographic variables and overall perceptions towards CBL (questions 24 and 25 from the questionnaire).

Characteristic (Q24): I would like to have more CBL sessions than traditional lecture-based sessions						
Age (years)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
20	1 (0.7%)	1 (0.7%)	7 (5.0%)	13 (9.2%)	17 (12.1%)	39 (27.7%)
21	1 (0.7%)	2 (1.4%)	9 (6.4%)	25 (17.7%)	22 (15.6%)	59 (41.8%)
22	0	1 (0.7%)	6 (4.3%)	8 (5.7%)	17 (12.1%)	32 (22.7%)
23	0	0	5 (3.5%)	1 (0.7%)	3 (2.1%)	9 (6.4%)
24	0	0	0	1 (0.7%)	1 (0.7%)	2 (1.4%)
						X²= 13.47 p= 0.6383
Gender						
Male	0	3 (2.1%)	12 (8.5%)	23 (16.3%)	31 (22.0%)	69 (48.9%)
Female	2 (1.4%)	1 (0.7%)	15 (10.6%)	25 (17.7%)	29 (10.6%)	72 (51.1%)
						X²= 3.421 p= 0.4900
Prior schooling						

In India	2 (1.4%)	3 (2.1%)	22 (15.6%)	39 (27.7%)	54 (38.3%)	120 (85.1%)
Abroad	0	1 (0.07%)	5 (3.5%)	9 (6.4%)	6 (4.3%)	21 (14.9%)
						X²= 2.649 p= 0.6182
Characteristic (Q25): CBL enhances my overall learning experience						
Age (years)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
20	1 (0.7%)	1 (0.7%)	2 (1.4%)	15 (10.6%)	20 (14.2%)	39 (27.7%)
21	1 (0.7%)	1 (0.7%)	7 (5.0%)	25 (17.7%)	20 (17.7%)	59 (41.8%)
22	0	0	6 (4.3%)	9 (6.4%)	17 (12.1%)	32 (22.7%)
23	0	0	4 (2.8%)	1 (0.7%)	4 (2.8%)	9 (6.4%)
24	0	0	0	0	2 (1.4%)	2 (1.4%)
						X²= 16.86 p = 0.3949
Gender						
Male	0	1 (0.7%)	9 (6.4%)	21 (14.9%)	38 (27.0%)	69 (48.9%)
Female	2 (1.4%)	1 (0.7%)	10 (7.1%)	29 (20.6%)	30 (21.3%)	72 (51.1%)
						X²= 4.212 p = 0.3781
Prior schooling						
In India	2 (1.4%)	2 (1.4%)	13 (9.2%)	43 (30.5%)	60 (42.6%)	120 (85.1%)
Abroad	0	0	6 (4.3%)	7 (5.0%)	8 (5.7%)	21 (14.9%)
						X²= 5.430 p = 0.2460

Table 3. Pearson Chi-squared association test ($\alpha = 0.05$) between demographic variables and overall perception characteristics towards case-based learning among medical students (Q24 = question 24 from the questionnaire; Q25 = question 25 from the questionnaire).

As per the Pearson *Chi* square test, there is no statistically significant difference between the student demographic variables (age, gender, schooling) and desire for more CBL sessions than traditional lecture-based sessions. Similarly, there was not a significant difference between the

student demographic variables (age, gender, schooling) and the perception of CBL enhancing the student's overall learning experience (Table 3).

The associations between the three demographic variables and all other characteristics from the questionnaire were also analyzed by the Pearson *Chi* square test. There is a strong association between schooling and questions 4, 7, and 16 (Appendix Ba). There is a greater proportion of students who did their schooling prior to medical school in India, who believe that CBL effectively helps to acquire new information (question 4), than those who completed their schooling abroad ($p=0.016$). Similarly, a greater proportion of students who completed their schooling in India felt CBL did enhance their clinical approach (question 7) ($p= 0.008$), and that the role of the facilitator was important during the CBL sessions (question 16) ($p=0.001$) (Appendix Ba). No other questionnaire items were associated with statistical significance.

Quantitative Findings

The results from the questionnaire are found in Appendix Bb. Although all participating students completed the questionnaire, there were seven students that left one to three questions blank or double-marked. All means for each of the thematic related questions (questions 4–23), was greater than 4, thereby representing that a large proportion of students agreed or strongly agreed with all of thematic-related items.

Theme 1: Knowledge acquisition and application

124 participants (87.9%) believed that CBL helps to link basic science concepts to clinical knowledge and clinical cases. However, 14 (9.9%) were neutral and 2 (1.4%) were in disagreement. Additionally, just over half of all participants ($n=72$, 51%) agreed that CBL efficiently helped them to understand key principles of the subject area (Appendix Bb, Table 4).

Theme 2: Development of inquiry-mindset

In this theme, the largest proportion of neutral-placed votes was for being undecided about whether CBL improves independent thinking (n=24, 17.0%). Additionally, 6 students (4.2%) did not believe that CBL supports the drive for curiosity. However, the largest proportion of students (n=119, 84.4%) that believed in a characteristic from this theme was that of CBL improving problem solving abilities (Appendix Bb, Table 5).

Theme 3: Influence of small-group work

Participants equally agreed that CBL enhances the ability to work productively as a team member, and that it enhances skills in group learning that are relevant to medical practice (n=72, 51.1%). However, 6 students (4.2%) did not believe in CBL's ability to enhance productivity as a team member, nor in the enhancement of communication skills (Appendix Bb, Table 6).

Theme 4: Performance and role of the tutor

80 students (56.7%) strongly agreed that the tutor effectively facilitated the CBL sessions in a way that ensured the discussions were on track. This item also scored the highest mean of all the thematic-related questions, at 4.4043 (\pm 0.8016). 88.7% of respondents (n=125) believed that CBL effectively facilitates interaction between teaching staff and students, and 88% (n=124) opined that the facilitator has an important role in CBL sessions. Additionally, although about half of the students (n=71, 50.4%) strongly agreed that their tutor effectively facilitated the CBL sessions in a way that ensured equal participation of group members, 5% (7 students) were in disagreement (Appendix Bb, Table 7).

Theme 5: Personal satisfaction and enjoyment

In the final theme, 86.5% of participants (n=122) enjoyed CBL in the sense of applying and integrating course material using real-life situations. However, 25 students (17.7%) were

undecided and 6 students (4.2%) were not satisfied with the work load required prior to the CBL sessions (Appendix Bb, Table 8).

Content Analysis: Student Focus Groups

The following section is a theoretical narrative to provide the story of the CBL intervention through the lens of the student participants. Although the focus guide was employed with the five pre-determined themes to explore (Knowledge acquisition and application; Development of inquiry mindset; Influence of small-group work; Tutor performance and tutor role; Personal satisfaction and enjoyment), the resultant constructs after coding included new considerations. The resultant repeating ideas, themes, and theoretical constructs from the focus group discussions are presented in Appendix Bc, Tables 9-15. The seven main theoretical constructs that emerged were:

1. Constructing the Definition and Purpose of CBL
2. Knowledge Acquisition
3. Influence of Small-Group Work
4. Constructing the Role of the CBL Tutor
5. Personal Satisfaction and Enjoyment
6. Influence of CBL on Students as Future Physicians
7. Areas of Improvement

In total, there were five focus groups, with each group ranging from five to seven students (n=37).

Constructing the Definition and Purpose of CBL

The discussion surrounding the CBL intervention began with the students sharing their ideas on how they would define CBL. Most students used similar words and concepts, such as CBL being “interactive” and an “integration between theoretical and practical knowledge.” The term

“two way learning” continuously arose, and students implicitly defined this with the concept of CBL being an approach where students and professors “come together... to discuss ideas and other modalities about the topic.” One student also described CBL as “the reverse of the orthodox way of learning, which is theory class.” During this introductory component, the purpose of CBL from the student perspective also began to formulate. One student described CBL as a method “to increase our clinical perspective on things, and become better doctors.” Another student stated, “[CBL] brings out the clinical and our spontaneous sides in regards to how we react to various situations and how well we apply our knowledge” (Appendix Bc, Table 9). These ideas related to definition and purpose of CBL were shared amongst all students of the focus group discussions.

Knowledge Acquisition

Moving forward into exploring thematic-related questions, the discussion transitioned into understanding their perceptions regarding knowledge acquisition. It was quickly noted that CBL was an effective way to gain knowledge. Students stressed that they gained knowledge due to a variety of reasons, such as being “one to one with the professor and a few others”, and since CBL was “interesting”, “if you gained knowledge while it is interesting, [the student thought] that it was the best way to learn.” However, there was one student that found the animal bites exposure case study “very direct”, since the diagnosis had already been given. This made the student feel as though the case was “more on the theoretical aspect”, and the student would have preferred “to explore and come out with differentials” instead. That being said, every student agreed that CBL supported the recollection of knowledge, and many discussed being able to recollect the animal bites exposure CBL lesson and concepts on the exam.

Naturally, the discussions then flowed into the exploration of CBL being a better method for gaining and recollecting knowledge than reading individually from books or from traditional lecture-styled classes. The ideas that arose for this included having the opportunity to interact, discuss and receive individual attention from the tutor. In relation to the latter idea, one student expressed, “When someone teaches with experience or shares, you remember more than what you’ve read on your own. And obviously when you hear more, you process more.”

Furthermore, although students greatly expressed that CBL enhanced their clinical approach, and suggested ways in which they developed an inquiry-type mindset, their greatest pitfall in gaining knowledge was due to time-related concerns. All students expressed that “the timing was really wrong because [they] had vacation for a month, and then [they] had to come back and study for exams]. Due to these factors, they did not feel like paying attention or participating. Some students who had participated in the animal bites exposure CBL also revealed that they needed more time for preparation, of at least a week. One student also conveyed their individual concern of CBL being “very new”, and thus needing more than one week to prepare (Appendix Bc, Table 10).

Influence of Small-Group Work

Another important construct that was discussed was the influence of small-group work. The common idea was best expressed by an individual who articulated that:

“[CBL] helps to pull in ideas from different groups of people, so whatever was missed by one person, can be enhanced by another. When a lot of ideas are put together, it helps with solving the problem faster and in a better way.”

An idea that emerged in almost all focus groups was the advantages of working with new individuals. Due to the randomized group selection process, one student noted this experience as:

“We generally don’t get to interact with these people... and it was like igniting our minds since some people would ask a question and that would enhance ideas. So I feel in this way, not only can you deal with a problem, but you also get to know people.”

Many students expressed that they were meeting others they had never met before, and one focus group in particular zoned in on the benefits of not being placed in the same group as their friends. As stated by one student, “I think it's better to not have friends in the group, because if you have friends, you would take it lightly”, which was supported by another student who said, “When you have friends, you're in your comfort zone, so you won't use your brain to the maximum.” On the other hand, one student did express that not knowing anyone in the group was “awkward in the beginning.” There were also a range of other concerns that were brought to attention, such as some members being passive, while others were dominant, and interaction being limited to just the student and teacher, rather than student to student (Appendix Bc, Table 11).

The Construction of the Role of a CBL Tutor

Next, the discussion flowed into the construction of the role of a CBL tutor. All students felt that a tutor was important, for reasons such as providing direction and correcting mistakes. One student also expressed that the tutor is important “because if the tutor is enthusiastic, it really brings a spark in the group, and charges [the students] to have a much more better discussion.” Common characteristics of an effective tutor included patience, being able to “make everyone feel more comfortable”, and ensuring that the tutor is “open to learning [themselves], [as CBL is] not just imparting knowledge to others, but it should be a two-way process.” Some students also stressed

that the tutor should truly want to be a part of the CBL experience, otherwise the resulting outcome may be an ineffective CBL session.

In line with this, a concept that quickly emerged from the earlier focus groups, and was purposefully added into the focus group guide as later focus group discussions continued, was the importance of a faculty orientation. Three main ideas that arose in regards to this was that if tutors participated in an orientation: the tutor would be able to facilitate student learning effectively to a higher degree, the tutor will have an opportunity to learn how to deal with “spontaneous discussion”, and as one student put it, “if the team is bad [the tutor will have] the capacity to build up the team dynamics and encourage the students to interact.”

The main concern within this construct was in regards to inherent “tutor-capacity” (i.e. having the qualities to best support the student experience). One student blatantly shared their thoughts as follows:

“We should assess the professor’s involvement, because at the end of the day, we don’t know how happy they will be teaching just 8 of us...So if they are not interested, or if in the process they lose interest, then I think CBL will take a lower step than [traditional lecture-based] classes. So unless and until the professors are really dedicated and 100% for it, I do not think we should go for it.”

Another student suggested to employ a “rotating system”, such that students would have an equal opportunity to have a “good facilitator.” One student also briefly mentioned their concern with the shortage of faculty, and whether the CBL process would be feasible and sustainable (Appendix Bc, Table 12).

Personal Satisfaction and Enjoyment

In regards to personal satisfaction and enjoyment, the majority of students “loved it” and believed CBL to be “an amazing experience.” The reasons for enjoyment varied from CBL being primarily conversational to being able to retain more information for their exams. An idea that was consistently brought up was that CBL was a “two-way method”, and as one student put it, “I loved it because it’s not just the professor who is speaking... we get to share thoughts and they can hear us.” However, there were a few concerns from students. Quite a few students suggested that those who attended the animal bites exposure session enjoyed it more since the concepts were coming on their exams. Another said that they “[were not] satisfied with just one... [the student] would actually suggest having a couple more sessions, so that [students] can really know what is going on.” One focus group also touched on the idea that the curriculum should not be completely changed into the CBL style, otherwise “it becomes monotonous” (Appendix Bc, Table 13).

Influence of CBL on Students as Future Physicians

Nearing the end of the discussion, students explored what sort of influence CBL would have on them as future physicians. It was agreed amongst all that CBL would “definitely help... [as] CBL will help to practically apply [their knowledge].” All focus groups mentioned that the resemblance to real-life scenarios would be beneficial since this is what they would have to face in the future. Some students also mentioned CBL “help[ing] to build core skills that [they will] need later in life”, such as communication and teamwork skills (Appendix Bc, Table 14).

Areas of Improvement

Although throughout the focus group discussion, students suggested areas of improvement, to conclude the focus group discussion sessions, students were explicitly asked if they would like to express any concerns.

First, in regards to future CBL case topics and questions, it was noted by all that topics should be included based on what will be on the immediate upcoming exam. One student declared that, “[students] care about what is coming up right now, rather than what is going to help later”, which was supported by another student who said that if it was not incorporated into the exam schedule, “it’s not something [they] would follow up with later.” In line with this, all students expressed that having topics related to what will arise on the exam will act as an incentive for students to attend and pay greater attention to CBL sessions in the future. Additionally, many students suggested that future CBL topics should be those that are common to India and ones that they would see in their everyday practice. With regards to CBL questions, two students from separate focus groups said that questions should be made more challenging.

The second and final area for improvement was in regards to the CBL session process, and the encompassing characteristics. As many had previously discussed issues with group dynamics, it was suggested to include an “introductory period [to] become comfortable with everyone in the group.” Additionally, one individual suggested “hav[ing] either a class on the subject before or after... [as] maybe it would help the students retain the subject better.” Finally, one focus group discussed the inclusion of audio-visual aids. A student noted that “with audio visual [aids], we can make [CBL] more interesting... and more effective and efficient” (Appendix Bc, Table 15).

Methodological Triangulation: Student Focus Group and Questionnaire

This section will methodologically triangulate the data in order to highlight certain themes in which there were areas of convergence between the questionnaire results and student focus group discussions.

Knowledge Acquisition

To begin, with a mean value of 4.220 (\pm 0.7568), the results of the questionnaire support the students strong view during the focus group discussions that CBL effectively helps in acquiring new information.

Although 86% of students (n=122) believed this to be true, there were 16 undecided students (11.3%) and 3 students in disagreement (2.1%) (Appendix Bb, Table 4). This could perhaps be attributed to the time-related concerns (Appendix Bc, Table 10), which was consistently brought up during all focus groups.

Enhancing the Clinical Approach

85.8% of students (n=121) believed that CBL enhances the clinical approach. This supports the large proportion of students during the focus group discussion who expressed the idea that, “[CBL] helped with [the] clinical approach, because it’s like simulation of a real clinical setting, where we discuss cases in an impromptu and on the spot manner.”

However, 16 students (11.3%) were neutral and 4 students (2.8%) were non-agreeing. One student put their experience as, “I definitely think it would improve the clinical approach, but I think the cases should be more challenging.” Another student considered and deemed, “I really think that if it was at the right time, because unfortunately it was not for us, I think it is a really efficient tool.” As such, perhaps some students found hindrances in the process that acted as a barrier for CBL to positively affect their clinical approach.

Development of Inquiry-Type Mindset

Although students did engage in positive discussions regarding the development of the inquiry-type mindset (Appendix Bc, Table 10), the length of discussion time in exploring this theme was the shortest, in comparison to other themes, for all of the focus groups. Additionally,

the responses lacked the same critical depth of explaining their ideas and experiences, in comparison to other themes. Perhaps this aligns with why this theme had the largest proportion of neutral votes (n=83) across the four characteristics of the theme, in comparison to the others on the questionnaire (n=64, knowledge acquisition and application; n=80, small group work; n=53, tutor performance and role of tutor; n=70, personal satisfaction and enjoyment) (Appendix Bb).

Influence of Small-group Work

With regards to small-group work, the quantitative results describe a large proportion of neutral votes (n=80) and 21 votes of disagreement across the four theme characteristics. The 21 votes of disagreement is also the largest proportion in comparison to other themes (n=9, knowledge acquisition; n=18, development of inquiry-type mindset; n=17, tutor performance and role of tutor; n=20, personal satisfaction). This aligns with the focus group discussions, which had a number of concerns related to small-group work, specifically more than in any other theme that emerged. For example, in relation to the characteristic ‘CBL enhances my ability to work productively as a team member’, one student had the following experience to share that hindered their ability to work productively to a high degree:

“I strongly feel that [good] team dynamics is very much needed in CBL [for it] to take place effectively. So, the problem is that not everyone has the proper experience of sharing or thinking as one team or brainstorming as one team. So hence, you know, some of them get oblivious to the dynamics. So in my experience, I felt personally, there was a lot of dominance and passiveness.”

It is also important to note, that the large majority of students in the focus group discussions had plenty of positive experiences and ideas related to small-group work. There were 463 votes of agreement across the four characteristics of this theme, and this large proportion, in comparison to

neutral and disagreement votes in this theme, therefore aligns very well with the focus group discussions. Many students expressed similar thoughts as follows:

“When we were discussing, different opinions and views come up, so we get to know more things that we ourselves would never have thought about. So it broadens our thinking to different approaches.”

Role of the Tutor

During the focus group discussions, all students strongly expressed that CBL effectively facilitates interaction between faculty and students, and that the role of the tutor was important. It is not surprising then, that these two characteristics scored the highest levels of agreement (n=125, 88.7%; n=124, 88%, respectively) in comparison to any other characteristic on the questionnaire. Important to note, however, is that 7 students (5%) did not agree that their tutor effectively facilitated the CBL sessions in a way that ensured equal participation of group members. This concern was reflected well during the discussion, as described by ideas surrounding the importance of a tutor orientation and the potential of a rotation system to reduce bias.

Personal Satisfaction and Enjoyment

Finally, in regards to personal satisfaction and enjoyment, the focus group discussions aligned well with the quantitative result of 86.5% of students (n=122) enjoying the ability to apply and integrate course material using real-life situations. Moreover, 84.4% of students (n=119) felt CBL enhanced their interest in the topic. Two students describe their experience as follows:

“Individually, even if the person is not interested in the topic or that subject, when we come as a group, the looking at the wide change or whatever changes, I don’t know, but people get interested in the topic, and they want to speak about it, they want to learn about it!”;

“I went with the notion that it was going to be a waste. Like, we’ve never tried this, why not, it’s 20 years later, why suddenly this new rule. But it was helpful. It made community medicine interesting.”

Additionally, 83% of students (n=118) were satisfied with the amount of time that was available during the CBL sessions. As one student puts it, “the time that we got during the discussion, that was used judiciously, because within the 20-30 minutes, we got to know the topic. It was actually more than what we gained if we were reading individually.” Other students in the focus group also agreed with this statement.

However, within this theme, the largest proportion of votes for neutrality (n=25, 17.7%) and disagreement (n=6, 4.1%), came from being undecided or unsatisfied with the work load required prior to the CBL sessions. The underlying reasons for this could be due to the external circumstances, such as the wrong time for implementation due to exams, which students consistently mentioned. Or, as one student shared, “there wasn’t enough time for preparation, given that this is something very very new to me. I definitely need more than one week, to actually get ready for CBL.”

Overall

In regards to having more CBL sessions, there were 6 students (4.2%) who would not like more sessions, and 27 students (19.1%) who were neutral. The negativity and/or passiveness represented in the questionnaire could have been attributed to factors mentioned earlier (e.g. facilitator issues, not enough time), which were discussed during focus groups; however, two students during the focus groups also said that the entire curriculum should not be changed into CBL. However, overall, 108 students (76.6%) would like to have more CBL sessions than

traditional lecture-based sessions. This was reflected during the focus group discussions, as a large majority of students expressed similar sentiments such as: “I think it was really really interesting way to learn. Because I remembered a lot more, more than if I had read it myself, and it was fun and exciting. And it should be held more regularly!”

Content Analysis: Faculty Interviews

The following section is a theoretical narrative to provide the story of the CBL intervention through the lens of the faculty participants. The repeating ideas, themes, and theoretical constructs are presented in Appendix Bd, Tables 16-20. The five main theoretical constructs to address are:

1. Constructing the Definition of a CBL Tutor
2. Considerations of the Faculty CBL Experience
3. CBL versus Other Educational Methods
4. Perceptions Towards the Student CBL Experience
5. Areas of Improvement

In total, there were seven interviews. All of these interviews were with faculty members, not with the “tutors” (hired individuals who recently graduate with an MBBS, who do not hold a lecturer or professor appointment). Due to limited time, interviews with faculty were prioritized since they are permanent members of the department who would be more likely to impact the longer implementation of CBL. Two interviews were conducted with faculty members who are part of the study team. As their perceptions on CBL may have been more developed and/or they may have greater insight into CBL due to their participation on the research team, ideas that were unique to them are pointed out in the associated tables, and their individual thoughts will be explicitly mentioned during the following narrative. Additionally, one interview participant did

not attend all of the faculty orientation sessions, and this same participant was the only member to not have had prior experience to facilitating in PBL sessions.

Constructing the Definition of a CBL Tutor

The interviews began with exploring how the interviewees defined a “CBL tutor.” All were in agreement that the role of the CBL tutor was to facilitate, not to lecture, and also to “prevent [students] from deviating” if the discussion was going in the wrong direction. Additionally, some interviewees mentioned the role of ensuring that there is equal contribution from all of the students.

Transitioning into the ideas of what skills an effective tutor should have, in regards to communication, one interviewee expressed that the tutor “should know how to address a heterogeneous group... [and should] understand [the audience], then strategize how [the facilitator] is going to address each [student], and tackle the group as a whole.” Many interviewees indicated that having the skillset to “guide” students to the answer, rather than blatantly providing it, was significant. Finally, a co-researcher interviewee also raised the importance of tutors having the skillset to effectively summarize the exercise during the debrief section of the CBL process (Appendix Bd, Table 16).

Considerations of the Faculty CBL Experience

There were many themes discussed under this theoretical construct, which describes successes and challenges of the tutor experience, preparation considerations for the tutor, and thoughts regarding a faculty orientation (Appendix Bd, Table 17). While there was an array of common successes, such as students coming prepared and students being actively involved, two interviewees raised the very specific idea of the tutor having an opportunity to learn as a success.

One interviewee put it as follows, “[CBL] further enhanced my knowledge... [the students] have a new [way of] thinking, and you might learn something new.”

There were also a range of common challenges, such as unpreparedness of students. Due to this, one interviewee shared that, “just to make sure the CBL went forward, we actually ended up teaching them”, in reference to the ADD session. To add to this, a co-researcher interviewee had a similar experience, stating that, “the students had not read and come... we tried to go through the whole exercise and encourage and motivate... but since they were not prepared, it was not up to the expectations.” Another common challenge, as one interviewee put it, was that “there will be some members in the group who will never participate... whether you show a carrot or a stick, they will not do anything.” Furthermore, another challenge mentioned by a co-researcher interviewee, was there being “a number of mispoints [during the discussions], so that adds more responsibility on the facilitator.”

Moving into a more extensive discussion on tutor responsibilities regarding material and time needed for preparation, most tutors agreed that it was not stressful or a burden. Although two interviewees expressed that more preparation was needed, one had a unique viewpoint on this not being a drawback. This interviewee explained it as follows:

“I feel it is more when compared to chalk and talk... since we're dealing with small group of students, whatever doubts they have, we have to be able to clarify that...Otherwise for theory, we are preparing from only one textbook. In this CBL... we have to cover clinical, standard, and other relevant articles and textbooks.”

When asked if this was a stress-factor, the interviewee said:

No I think, because we are dealing with bedside teaching also, and with CBL if we are giving more emphasis on the clinical aspect... it will be better for them, but also for us when we take their viva.”

Contrarily, the other interviewee felt that, “it takes a lot of time to prepare, so if students aren’t prepared, then it goes to a flop show.”

Furthermore, all tutors opined in the importance of a faculty orientation in order to understand the educational method and their role. One of the co-researcher interviewees also suggested that small-group skills could be gained during this time.

Overall, all faculty enjoyed the CBL facilitation process. One interviewee said, “theory classes are boring, so thank you”, and another stressed the following, “I felt very satisfied, because it was the first time I saw my students actually thinking.” (Appendix Bd, Table 17).

CBL versus Other Educational Methods

One theoretical construct that emerged upon coding was in regards to the perception towards CBL versus other educational methods. All faculty strongly believed that CBL was a better method than the didactic traditional method, noting that small-group teaching, discussion, and interaction all play critical roles in better understanding concepts. However, one interviewee felt that PBL was better than CBL, for the following reason: “I think PBL is more fruitful... [because] the students have an hour of brainstorming... and everything is a learning objective... so [the student] covers everything.” A co-researcher interviewee added that in PBL, students have a better opportunity to develop their leadership skills (Appendix Bd, Table 18).

Perceptions Towards the Student CBL Experience

The discussion then moved into what the faculty perceived the students experienced during the CBL sessions.

Although one interviewee felt that “it’s difficult to judge whether [the students] gained knowledge unless you evaluate [them]”, all others were in strong agreement that there was a high level of knowledge acquisition. One interviewee even tried referencing Confucius’ proverb (What I hear, I forget; What I see, I remember; What I do, I understand), revolving around the ‘learning by doing’ principle, while another referenced that CBL promotes higher levels of learning as per Bloom’s taxonomy pyramid.

In regards to student preparation, it was generally agreed that there was enough time, but that because they had come back from vacation and exams were coming up, they did not prepare effectively. Additionally, the idea of a topic not being on an upcoming exam or assessment was considered a hindrance by the majority of faculty. As one co-researcher put it, “they had sessional exams coming up, and [ADD] was not in the exam, so they did not prepare.”

Additionally, most faculty believed that the student’s clinical approach was developed due to CBL simulating what they would experience in their day to day life as a physician, however, two were unsure. One interviewee expressed, “there should be other things to aid [the case study], because if you’re just talking – I don’t know how much it will improve their clinical skills, I really doubt that.”

Furthermore, when it came to the development of the inquiry-like mindset, opinions were split in regards to critical thinking. For example, one interviewee felt that although “critical thinking has been improved, critical thinking doesn’t mean that [the students] have understood the [topic/problem/concept], but that they have just questioned the [topic/problem/concept].” Contrarily, a co-researcher interviewee said critical thinking was improved “for sure because [the students] needed the cognitive aspect and understanding of the case in order to apply their

knowledge to the case correctly.” In regards to curiosity building, most faculty supposed it was improved by “giving the story in parts” and through the discussions, which would allow for “students to get more ideas and build on each other’s thinking.” One interviewee disagreed and suggested that “[if we used a video, instead of just sitting and talking]... they would have developed curiosity.”

Moving forward, all faculty believed that group dynamics was very influential during the session, and that there were many advantages to working in small groups, such as gaining further in-depth knowledge. One of the co-researcher interviewees also suggested that this experience of working with others could lead students to engage in “combined studying and further bonding” outside of class. However, one interviewee concluded that since “[the students] only had one interaction, we cannot conclude that [CBL] has been helpful” in developing small-group related skills.

Furthermore, all faculty believed that the students enjoyed the session based on how they interacted during the discussions and based on what some students said to the faculty after the CBL session. One interviewee, recounting their conversation with the students after the session exclaimed, “Add more sessions! As per the students, I am the messenger of the students, and I am telling you. So they are interested, and they will definitely take up more of the CBL sessions!” However, a few interviewees did believe that the experience would have been more enjoyable if the students had been more prepared.

Finally, six out of seven faculty strongly believed that CBL is meaningful for students as future physicians. The one interviewee who was unsure stated, “We only had one session... [so]

we have to try it on a long run, and do more experiments, and look at consistency and persistency of students” before making that assumption.

Areas of Improvement

Finally, to conclude the discussion, a wide range of areas of improvements were acknowledged. The most common idea was that CBL sessions should be done at a “better time” (i.e. not close to exam time), such that students can come more prepared.

Areas of improvement that were brought up by only the co-researcher interviewees included the importance to better train (e.g. in regards to small-group skills) and better prepare (e.g. thoroughly go through material) faculty, particularly through an orientation. It was also raised by one of the co-researcher interviewees that there is the hindrance of infrastructure and manpower, and the need to “convince faculty [that CBL] is really good and [that] it really works.”

In regards to improving student participation, there was a range of solutions, such as providing formative evaluation and students having input in topic choice for future CBL sessions. Co-researcher interviewees added the potential solution of providing scheduled curriculum time to go over the material, and considering “collective leadership” (i.e. rotational opportunity for all student members to have a leadership role during the session).

Data Triangulation: Students Focus Groups and Faculty Interviews

This part of the analysis will review the underlying themes that exist between the information provided by both students and faculty participants. This will highlight the merging themes, bringing agreement to, as well as cross validating the study findings (Thurmond, 2004). The themes being discussed include (a) CBL versus traditional lecture-based method (b) influence on students as future physicians, and finally (c) areas of improvement and future considerations.

These constructs, as well as the sub-themes will provide a collective understanding of how CBL is perceived and where further efforts are needed.

CBL versus Traditional Lecture-Based Method

One of the most prominent emerging themes from both stakeholders was the concept of CBL as the preferable and more effective approach in comparison to the traditional lecture-based method.

One common idea that arose was the ability for interaction between faculty and peers and the increased peer-to-peer interaction. One student expressed, “Because of the interaction, our attention span was much better, and we definitely gain much more in CBL than in the normal class.” In line with this, one faculty interviewee stated that in CBL, “one to one interaction can happen so they can have a better understanding of all the concepts.”

Another common idea that arose to support CBL as more effective, was due to its ability to increase knowledge retention and recollection. One interviewee noted that in a successfully collaborating CBL group, the students “definitely will know more about the topic and they will retain it for a longer duration, rather than them reading the topic or if we take the topic in a standard lecture.” Similarly, a student noted, “I paid attention in class to the [ABE] topic, but for me, it was better solved in CBL because when we were discussing, it could be retained in permanent memory.” Another faculty interviewee explained how knowledge is retained and recollected due to the “learning by doing principle” as follows:

“If I was a student, and if this particular CBL was targeted to me and my group, the advantage that I get is that in my exam, if I get a question on [ABE] or ADD, I’ll go back to that particular classroom and think ‘oh, [ABE], I remember that’. So it’s that doing part, that participatory part, that will help the student in the long run... [in] that way, they have gained immensely.”

Many students would agree with this, and as one student put it, “I would say [CBL] is an amazing experience because all of us could discuss the case and because of that we could retain more than we normally do from our theory classes, and we could answer better during our exams.” Furthermore, other students from one focus group brought up that CBL would help them to remember the symptoms of the particular disease better for when they have to attend clinical postings.

Additionally, CBL was found to be more effective than the traditional lecture-based method because CBL was generally more enjoyable since it promoted involvement and activeness. As one faculty interviewee observed, “In lecture-based method, there is usually not so much students involved [sic]. In CBL, I can see the students are much more involved and they are very much happy.” One student expressed the following:

“It’s definitely more enjoyable... there’s no point sitting in class for one hour. We don’t even listen to half of the class, and we lose concentration. It’s not possible to concentrate consistently for 40-45 mins. But when we’re in a discussion, I think everyone pays attention.”

This idea is supported by a faculty interviewee who stated that CBL was better because “students were active... and that’s better than simply sitting in a classroom listening or not listening.” In line with this, the concept of monotony was brought up. One faculty interviewee stated, “they enjoy it... because this was [one of the] very few chances where they also were involved and they had to break their monotony from the lecture classes.” Similarly, a student noted their experience as, “I felt it was very much more enjoyable since [CBL] is not monotonous, and we were able to concentrate for that one to one and a half hour.”

Ultimately, data triangulation supports that CBL is a better methodology than the traditional lecture-based method for this study population.

Influence on Students as Future Physicians

Both students and faculty believe that CBL would have a positive influence on students as future physicians. One faculty interviewee suggested that multiple choice questions were not as helpful as CBL, and put it as such:

“Such scenarios are going to become their realities... rather than the mugging up of 4 or 10 mark questions... [so] in the long run [the CBL scenarios] are going to be more useful for them. This is how their clinical thinking is built up. So I think that will be helpful for them in the future.”

Students agreed with this idea of CBL bringing increased realism to their studying. As one student put it:

“I think it will definitely help, since it’s just like bedside teaching in medicine and surgery which helps us to see patients, and when you practically see something, it helps us to remember it more, and you apply it more in your life. So in the same way, CBL will definitely help when we become doctors.”

This idea of resemblance to real-life scenarios carried on throughout all focus groups, with one student saying, “yes [CBL] will [help us as future physicians], because the way the cases are given to us are like the realistic scenarios that can happen to us in the future.” Another student mentioned indicated their thoughts as:

“CBL integrates all the subjects of paraclinical, clinical and non-clinical in a single disease or single problem... and I think that's the sort of approach that is needed when we become physicians.”

Additionally, students expressed that CBL sessions would help with collaboration and communication skill development, which was put by one student as, “In the future, it’s not just you studying, you’re going to have a group of people working with you.” Similarly, a faculty interviewee noted that CBL would be meaningful to them in this regard as well, stating that, “Yes. Definitely it is going to alter their perceptions... they will develop group dynamics... and will definitely improve their communication skills.”

Areas of Improvement and Future Considerations

Students and faculty had a range of suggestions for areas of improvement and future considerations. To begin, although the majority of students and faculty felt the case study problems were effective, two students expressed that the case studies should not be “direct.” One student explained it as follows:

“The [ABE] case was very direct for us, so we already came with a fixed perception with how it was supposed to go. I wish we didn't know anything about it, and that we were allowed to explore and come out with differentials, and then finally know what the diagnosis was. Because of this... I felt like it was based more on the theoretical aspect of it, and that we weren't allowed to use our differential knowledge.”

This idea that case study problems should provide an opportunity for students to also determine the diagnosis was also expressed by a faculty member, who indicated that the CBL problems “should not be entirely theoretical. It should be more clinical focused, where they come up with a diagnosis. Such problems would be better, than [only] ask[ing] what needs to be done.”

Second, with the challenges that the faculty faced, an area of improvement was student preparedness. One faculty interviewee voiced:

“We felt that the whole [CBL process] is fruitful only if students read... Everything rests on the students. If they don’t read and come, if they don’t prepare well, the entire process becomes a waste.”

Similarly, one student said, “[CBL] will only be effective if the students are sincere, because if you don’t read, you’ll just be sitting there and saying nothing.”

Thirdly, all faculty and students agreed that the hindrance for student preparation was three-fold: students had just come from vacation, students had exams coming up, and the topic of ADD was not on the exam.

Finally, while all students and faculty agreed on the importance of a faculty orientation, there is strong data triangulation specifically between the students and the co-researcher interviewees with regards to tutor skill and knowledge development through a better orientation. Specifically, one student’s story was the following:

“The moderator we had, she was – she just told us what we already knew, like what was in the book. It didn’t really add to our knowledge. Because she’s like, ‘discuss and let me know’, but then she just read out the answer. So it wasn’t much use. So I feel like the moderator, they should go through [the orientation] process, so they know what kind of problems we can face and what sorts of questions can pop up when it’s spontaneous discussion.”

In line with this, one of the co-researcher interviewees, who was placed in a group with another tutor, expressed similarly that the other tutor may not have had the correct understanding of CBL and/or the skillset to effectively facilitate a session. While reflecting on this, the co-researcher interviewee revealed, “I realized that in spite of the orientation, we need a couple of sessions, and perhaps even a mock session.”

Overall, the triangulation of this data is able to highlight that the findings (CBL is considered a more valuable educational method, CBL meaningful for students as future physicians, and areas of improvements) are valid and reliable.

Summary

The results of this mixed-methods study provides evidence supporting CBL from both faculty and students. A number of themes emerged during the study that were not pre-determined. The quantitative data collected triangulates and supports findings from the qualitative data. Similarly, the findings between the students and faculty agree and build upon one another. Chapter 5 will now present a discussion of these findings, limitations, and recommendations.

CHAPTER 5: DISCUSSION

Introduction

This study was designed to answer the following research questions:

1. What are the perceptions of Kasturba Medical College (Mangalore Campus) faculty and students towards CBL?
2. What is the relationship between the perceptions of Kasturba Medical College (Mangalore Campus) faculty and students towards CBL?
3. What are areas of improvements and future considerations in regards to implementing a CBL curriculum?

In an effort to answer these questions, the researcher collected qualitative data from focus group discussions with students, as well as from interviews with faculty. Additionally, the questionnaire that was designed for this study was used to further capture the perceptions of students and provide additional demographic information. Although there were some limitations to the study, to be described later in this chapter, the following discussion of the data will provide insights and recommendations for the Department of Community Medicine at Kasturba Medical College Mangalore Campus (KMCMG) to consider prior to potentially implementing a future CBL curriculum.

Findings

What are the perceptions of KMCMG's students and faculty towards CBL?

Overall, the data demonstrates that the majority of students and faculty welcomed CBL, minimally as a learning and teaching method in medical college.

Student Perceptions

The construct of CBL. A critical advantage of qualitative research is that researchers gain a broader and deeper understanding of participants' subjective experience (Auerbach & Silverstein, 2003). As such, understanding how CBL has been interpreted by the student is vital in capturing the perceived inherent properties of the CBL methodology, as it will determine whether students' perceptions align with the literature-conceived notion of what CBL is and what CBL's purpose is. This can ultimately help to contextualize a CBL curriculum that best fits a target population. For this study, students found the interactive nature, integration of theory and practice, and collaborating with students and faculty main components of CBL. In regards to purpose, students believed that the goal of CBL was to enhance their acquisition and application of clinical knowledge, both in terms of determining differential diagnosis and determining the management/treatment plan. Overall, they suggested that the purpose of CBL would be to help them to become better physicians. These understandings align well with the literature (Srinivasan et al., 2007; Thistlethwaite et al., 2012). In a general sense, this suggests that these students find meaning in CBL in the same way that medical educators do, and thus that the CBL process is meeting the goals that medical educators hope for students to achieve.

Student enjoyment and satisfaction. Additionally, the positive feedback that emerged when students described CBL holds an implicit understanding that students appreciate the CBL process and find it valuable. This was further supported by the quantitative and qualitative results, which demonstrates that the vast majority of students found personal satisfaction and enjoyment in CBL. Students appreciated a deviation from the "monotonous" classes to an environment where discussion between faculty and students – a "two way" learning process – is emphasized. Students also found satisfaction in knowledge acquisition (ie. being able to retain information and answer

exam questions easier to a higher degree). In line with exam preparation, many students felt that those in the animal bite exposure (ABE) session had a greater level of enjoyment than those in the acute diarrheal disease (ADD) session, since ABE was part of their exam. This suggests that students appreciate learning activities that are aligned with assessments. In higher educational practice, this is known as “constructive alignment”, where all factors of the learning system (course objectives, learning activities and assessment tasks) align with each other (Biggs, 2006). Biggs writes, “[students] will learn what they think they will be assessed on, not what is in the curriculum, or even on what has been ‘covered’ in class.” Ramsden (1992) relates this to student interest by explaining that, “the student’s intention to understand or to reproduce material is very clearly related to his or her interest in carrying out the learning task, either for its own sake or in response to external requirements.” Therefore, since students knew concepts of ADD would not be on the upcoming exam, their interest level could have been reduced, and could potentially be a factor for why less students came for the ADD session, in comparison to the ABE session. Thus, a critical factor for students to be engaged in CBL sessions is related to whether the case study topic will be on the immediate-coming exam. This alignment is also favourable since it promotes deep learning (Biggs, 1996).

Quantitative findings. Furthermore, in the present study: 87.9% of students believed that CBL helps to link basic science concepts to clinical knowledge, 84.4% believed CBL improves their problem solving abilities, 88.7% believed CBL effectively facilitates interaction between teaching staff and students, and 84.4% of students believed that CBL enhanced their interest in the subject topic. The findings of this study are consistent with the positive results of other CBL studies implemented in the Indian context. A study by Chari & Gade (2013) describe 77.3% of students feeling that CBL helped them in relating basic science concepts to paraclinical and clinical

subjects. In another study by Jamkar et al. (2007), the majority of students significantly felt that CBL improved their clinical reasoning skills and developed a good relationship with teachers. A microbiology CBL intervention also found that 69.2% experienced enhanced analytical skill (Ciraj, Vinod & Ramnarayan, 2010). Finally, a study by Joshi, Nilawar and Thorat (2013), describe that a majority of students (73%) opined that CBL enhanced interest in the learning topic.

Influence of small-group work. Moreover, a theme that largely emerged in the student focus group discussions was the influence of small-group work. Student perceptions aligned with the literature in that small-group work does foster learning and improves communication through discussion (Thistlethwaite et al., 2012; Hansen & Krackov, 1994). The perceptions that students shared are further supported by Edmunds & Brown (2010) who describe that discussion can facilitate thinking, particularly in developing cognitive skills (Figure 4). Importantly, the development of these cognitive skills are nurtured throughout the CBL process and the Multi-Theories model, as described in Chapter 2. In particular, these skills would be developed to a high degree during stage two, the elaboration and refinement phase, when learners are seeking out to unfold new concepts primarily through discussion with other students in the small group.

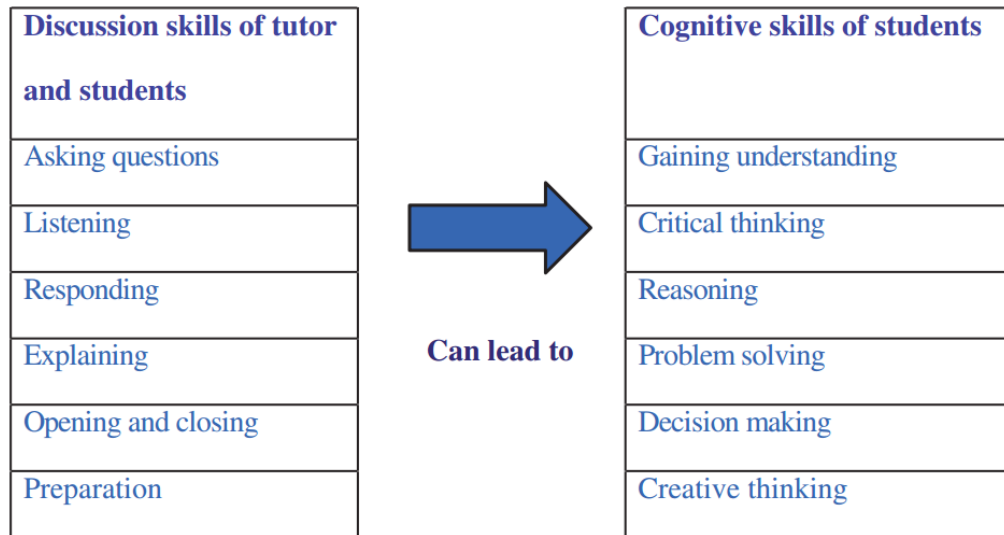


Figure 4. Discussion leading to cognitive skill development in medical students (Edmunds & Brown, 2010).

Interestingly, all focus group discussions pinpointed the advantage and preference of working with new students in their CBL small group sessions, rather than working alongside the same students they have been working with for the past 1.5 years during clinical postings. Students described that the benefits of this included: having the opportunity to meet new people, being able to listen to a diverse range of ideas, and being able to harness critical thinking power to a greater degree in comparison to if they were working with friends. As described by Taylor & Hamdy (2013), “the more diverse a learning group’s membership is, the more likely the individuals within the group are able to learn.” Crabtree & Miller (1999) also explain that working alongside new individuals in a small group can facilitate both idea-creation and conflicting perspectives, which may allow group members to consider the topic in a new way. Therefore, future small group learning with this study population should allow students to be placed in heterogeneous groups, in which members do not already know each other.

Prior schooling. Interestingly, there were significant associations between questionnaire items and the schooling demographic variable (schooling in India versus schooling abroad prior to medical college). A significantly larger proportion of students who had been schooled in India felt that: CBL helped acquire new information ($p=0.016$), enhanced their clinical approach ($p=0.008$), and believed the role of the facilitator was important ($p=0.001$). Although no other CBL studies in India have assessed this variable, a PBL experience at Kasturba Medical College Manipal Campus did. In that study, Nanda & Manjunatha (2013) describe that the Indian schooling system is teacher-centred, and that PBL would pose a cultural conflict within traditional Indian communication style. They go on to suggest that there could likely be differences between students who schooled in India versus those who schooled abroad from the USA, UK and Malaysia, as the latter schooling systems permit more freedom in teaching style and encourage questioning from students. Since KMCMG has a large intake of international students, this study's researcher thought it important to also consider the schooling factor. However, Nanda & Manjunatha's (2013) study did not find any significant differences between the two groups. Contrastingly, the PBL study done by Joseph et al. (2015) at KMCMG demonstrated that there was a greater proportion of Indian schooled students who believed PBL enhanced their ability to work productively as a team member. This study similarly demonstrated that the Indian schooled students were more appreciative of certain factors. However, this dissonance between what was expected and what occurred provides a realm for future studies to investigate. Perhaps the Indian schooled students found this new method more effective because they had not experienced it prior, and therefore did not have a baseline for judgement. Regardless, pertaining to this study, the results show a prominent difference between how students perceive knowledge-gain dependent on where they have completed their prior schooling. This is problematic if gaining knowledge is enhanced for a

particular group of students only. Therefore, further quantitative, and more purposeful qualitative, studies should be done in order to see if there is a persistent and larger discrepancy, as all students should have an equal opportunity to gain knowledge in an effective manner.

Faculty Perceptions

Construct of a CBL tutor. Similar to understanding the subjective experience of the students, it is equally important to understand the experience of faculty. In particular, understanding how they construct the definition of a CBL tutor will shed light onto what faculty find meaningful, but also to help understand where gaps may lie. In general, faculty believed that the role of the tutor is to facilitate, to prevent deviation of the discussion, and to ensure there is equal contribution from all group members. An apparent concept that has been left out of their construct is the idea of being an influential “role model” to students. As Harden & Crosby (2000) explain, there are twelve roles to a medical educator, including being a role model (Figure 5). They go on to explain that medical educators “serve as role models not only when they teach students while they perform their duties as doctors, but also when they fulfill their role as teachers in the classroom, whether it is in the lecture theatre or the small discussion or tutorial group” (Harden & Crosby, 2000).

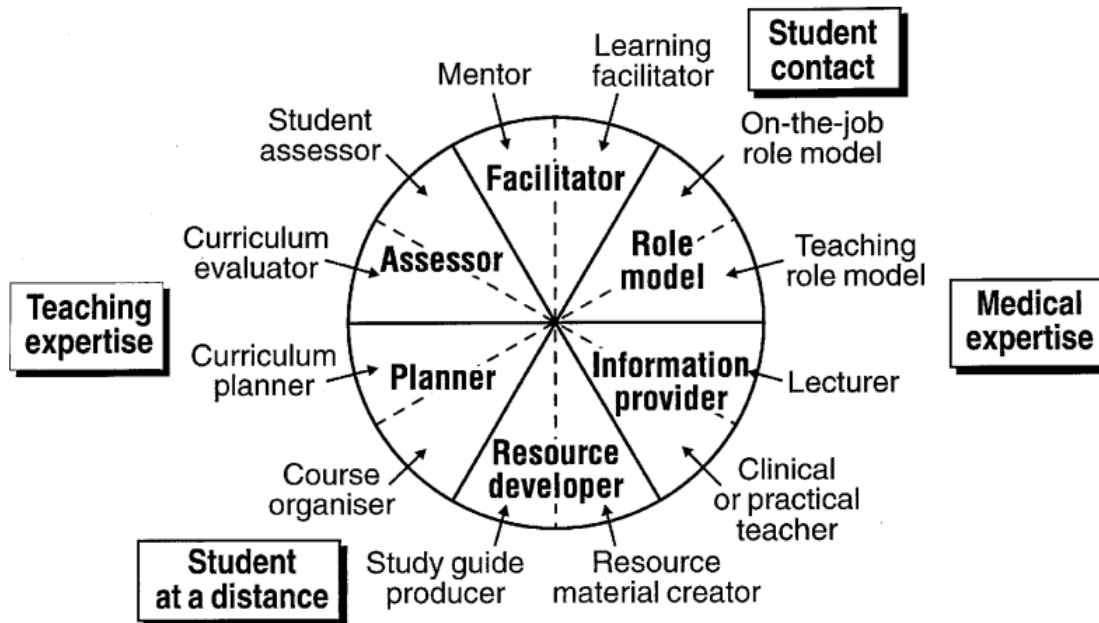


Figure 5. The twelve roles of a medical educator (Harden & Crosby, 2000).

In one review, it is noted that many educators do not see themselves as role models, and may consider the idea as “pretentious and paternalistic” (Squires, 1992). Although positive and/or negative thoughts on what the faculty opine about their role as a role model was not explored in these interviews, and therefore an assumption cannot be made, the fact that being a role model was not considered suggests they may not recognize themselves as role models. Such recognition should be brought to attention, as “the teacher has a unique opportunity to share some of the magic of the subject with the students. They can kindle, in the students, a curiosity and quest for a better understanding of the topic and the relevant pathophysiology by their own personal example that is difficult to reproduce in an instructional text” (Harden & Cosby, 2000). Therefore, future faculty development initiatives should incorporate time for speaking with faculty regarding their understanding about being a role model for students, and further research could be considered in exploring the construct of the role model. This is especially important as the student is influenced

by the example set before them, both in regards to how a medical educator may approach the subject and the attitudes that the medical educator embraces (Harden & Crosby, 2000; Squires, 1992).

Successes and challenges. In line with exploring the subjective experience, understanding what the faculty consider a success and challenge allows for a deeper look into what may make CBL purposeful versus not. The majority of faculty found success in CBL when students were prepared and when they witnessed students being active during discussion. Co-researcher interviewees also found success in being able to consciously act as a facilitator (rather than a lecturer), and noting that the discussions will be beneficial for students who do not come prepared and more generally for students during their exam. Aside from one item, all other successes have to do with the student experience – that being, if the facilitator perceives during the actual session that the student is gaining, the facilitator finds success in the process. Moving forward then, in order for facilitators to fully recognize these successes, it is important that they themselves have a chance to reflect on the process. Doing so may fortify their interest in being a facilitator and believing that a facilitator is important, which may ultimately influence students during the sessions in a positive manner. In reflecting, it is also important for faculty to review the challenges. The main challenge presented by the faculty was unpreparedness in students. Some faculty felt defeated, suggesting that no matter what one does, there will always be students who do not come prepared or participate. One CBL Indian medical college study demonstrated that 56% of faculty found it difficult to involve shy and less interested students in the group discussion (Gade & Chari, 2013). In order for faculty to overcome these feelings and issues, emphasis on small group facilitation skills should occur by exploring problems in groups, perhaps by role play or by faculty

discussing with each other on how to overcome these group dynamics issues (Rothwell, 2010; Edmunds & Brown, 2013).

Faculty inapprehension. Another important concept is faculty belief and motivation in a new medical education method. Although other studies have shown faculty apprehension with regards to this (Jones, 2001; Graffam, 2007), this study did not exhibit such a barrier. All faculty expressed positive levels of enjoyment in participating in the CBL sessions. This could perhaps be attributable to the fact that six out of seven of the faculty members interviewed have had experience with conducting PBL in the past. As such, this may have comforted them in the idea of introducing CBL as a new educational intervention (Ciraj, Vinod & Ramnarayan, 2010). Additionally, since faculty were involved in the design process of the case, and three of the seven faculty interviewed were direct case study contributors, this engagement with the development of the intervention may have encouraged motivation and cooperation (Ciraj, Vinod & Ramnarayan, 2010).

What is the relationship between the perceptions of students and faculty towards CBL?

Although there were areas for improvement, data from both students and faculty revealed that CBL was perceived to be better than the traditional lecture-based method and to positively influence students as future physicians.

CBL versus Traditional Lecture-Based Method

There were three main reasons for why student and faculty preferred CBL over the traditional lecture-based method: increases faculty-to-student and peer-to-peer interaction, ability to increase knowledge retention and recollection, more enjoyable due to involvement and activeness. These perceptions align with what has been cited in the literature by other Indian medical colleges that have assessed CBL interventions. For example, Chari & Gade (2013), found

that 86% of students and 75% of faculty felt that CBL would promote better teacher-student

Phase	Learner's roles	Teacher's roles
Dissonance phase	<ul style="list-style-type: none"> Identify prior (base-line) knowledge, skills and attitudes Recognise what is unknown Recognise personal development and learning needs Participate in planning personal learning objectives and relevant experiences 	<ul style="list-style-type: none"> Provide the context in which the student can learn. Increase extrinsic motivation through appropriate tasks Help learner to recognise or promote internal motivation factors Explore the learner's prior knowledge and experiences Help student to identify his/her learning needs and the relevance of each
Refinement phase	<ul style="list-style-type: none"> Think of many possible explanations or solutions to the case or problem. Work out which are the most likely resources to refine the possibilities Actively participate in the activity and experiences Refine the information into a hypothesis 	<ul style="list-style-type: none"> Ensure the relevant learning experiences are available – at the appropriate level for the learner
Organisation phase	<ul style="list-style-type: none"> Test and re-test the hypothesis Organise the information into a “story” that makes sense to the learner 	<ul style="list-style-type: none"> Provide advance organisers for the learners – structures upon which they can continue to build. Encourage reflection in action
Feedback phase	<ul style="list-style-type: none"> Articulate the knowledge, skills or attitudes developed Provide feedback to peers and staff Accept, and if appropriate act upon feedback received from others 	<ul style="list-style-type: none"> Reflection on the learning experience (in action and on action) Provide feedback to the learner, formally or informally. Accept, and if appropriate act upon feedback received from the learner
Consolidation phase	<ul style="list-style-type: none"> Reflection in the light of prior knowledge Reflection on the learning process Evaluate personal responsibility for the learning Development of knowledge, skills and attitudes 	<ul style="list-style-type: none"> Provide opportunities for the learner to rehearse and/apply their new knowledge Encourage reflection on action.

relationships. Importantly, however, is that these three factors align with the constructivist view on adult learning, specifically through the Multi-Theories Model (Figure 6). Interaction, knowledge retention and active participation all are interconnected components of the Multi-Theories Model, in which students and teachers have mutually dependent and critical roles in participating through the various phases. For example, the dissonance and feedback phase exemplify the importance of interaction between students and teachers, while the refinement phase and organisation phase apprise active participation from students, and the consolidation phase through reflection permits for a higher level of knowledge retention.

Figure 6. Learner’s and teacher’s roles during the different phases of the “Multi-Theories Model” (Taylor & Hamdy, 2013).

Influence on Students as Future Physicians

Both students and faculty believed that CBL would have a positive influence on students as future physicians due to two major reasons: CBL permitted for learning through simulated real-life scenarios, and supported the development of skills needed in their career (e.g. collaboration and communication). This is comparable with other studies in India. For example, Jamkar et al. (2007) state, “the text book scenario may not adequately depict the problem in the way that a student can ultimately relate it to a real world situation. A medical student, for example who has learnt diagnostic skills through a text based scenario may be at loss when confronted with a real world patient”, while Kireeti & Reddy (2015) describe that when cases are linked to real situations, students get a “genuine feel” for what may occur during clinical practice. Additionally, another study done in India describes that both students and faculty believed CBL to be helpful in the future due to skill development (communicative, analytic and collaborative) (Gade & Chari, 2013). These results are encouraging in the use of CBL, as ultimately, the education method that is implemented should be perceived (by both students and faculty) to support students in becoming the best possible future physician they can be.

What are areas of improvements and future considerations in regards to implementing a CBL curriculum?

As described in the results section, there was data triangulation in regards to areas of improvement and future considerations.

Case Creation

A few students and faculty felt that the CBL case studies should have been less direct, and would have preferred students to make a diagnosis, as the case focused on the management of the clinical case. Williams (2005) describes structured cases to be those in which students are given a

disease and diagnosis, whereas an unstructured case is one where students identify the disease and diagnosis. One CBL study (Sutyak, Lebeau & O'Donnell, 1998) describes that the medical students preferred an unstructured approach to their cases. However this experiment was considered as preliminary evidence, and therefore cannot be taken as fully relevant (Williams, 2005). Downer & Swindells (2003) suggest that the best way to create a case is to consolidate in the learner for their opinions. As such, engaging students in a deeper discussion around case creation and target outcomes (e.g. focusing on treatment plan or diagnosis) will allow for the formation of an appropriately challenging and effective case study.

Student Preparedness/Interest/Participation

Both students and faculty felt that a major area for improvement was in regards to student preparedness, interest and/or participation.

As discussed earlier with regards to Biggs' (1996, 2006) and Ramsden's (1992) work on constructive alignment and interest, to motivate students, the CBL session should align with the assessments; CBL concepts should arise on any immediate upcoming exam or assessment. In the case that an exam or another type of summative assessment will not be occurring soon, an alternative is to use formative evaluation during the CBL session to increase participation (Ramsden, 1992), which was also suggested by one of the faculty members during the interviews. Additionally, Ferris (2015) suggests that providing students with leadership opportunities within small group discussions is beneficial not only for skills development, but also in promoting increased dialogue. An interesting suggestion by a co-researcher interviewee was to provide "collective leadership," which would allow all individuals to have a defined and principal role, and may improve student participation. Furthermore, two students and one faculty member

suggested the use of audio-visual aids to support the student learning experience, but also as a method to better engage students in the material. Edmond & Brown (2010) also suggest that using such resources (e.g. animations of physiological processes, video-sequences of diagnosis) will enhance the student learning experience and improve interest. Finally, all students and faculty indicated that a major hindrance to student preparedness/participation/interest was due to suboptimal timing of the CBL intervention, since it occurred immediately after a month of vacation and before the students' exam period. This was a clear limitation in the study, and will be discussed further in the upcoming Limitations section.

Faculty Orientation

For this study, a three-part faculty orientation was provided, as explained in Chapter 3: Methodology. All students and faculty agreed that a faculty orientation should occur to help faculty understand their role, the expectations, and how to appropriately facilitate a small group given various group dynamic influences. However, based on some negative and ineffective experiences, students and co-researcher interviewees strongly advocated for a more robust orientation process. The need for a faculty orientation will be explored in the following Recommendations section.

Limitations

It is imperative to note that this data has been obtained from a single department in a single medical college, which is not representative of any other department at the medical college, let alone the whole country. There are many internal and external factors in existence at the national-, state-, college- and departmental-level that influence whether or not an innovative medical education intervention can be implemented. For example, since Kasturba Medical College is a large, privately run institution, it has the infrastructure required to implement and pilot such

interventions. Therefore, these study findings may not be extrapolated to smaller medical colleges that are government run, due to constraints in human resources, technical capacity or financial means. As such, while some results and recommendations may be generalized to the greater context of India and similar low- and middle-income countries, it is important to still keep in mind that the results and recommendations are very much a representation of and for the specific department studied in this research work.

Perhaps the largest limitation to the study was the unforeseeable water crisis that occurred in the Mangalore town, where KMCMG is situated. Originally, the planned three-week timetable was as follows:

May 10th, 2016 = student orientation

May 17th, 2016 = CBL session 1 (animal bites exposure)

May 24th, 2016 = CBL session 2 (acute diarrheal disease)

However, the water crisis greatly affected the town of Mangalore, and an appropriate level of water could not be received in order to sustain the hostels and the medical college. As a result, students were sent home from May 2nd to May 29th, 2016. This forced the three-week planned CBL intervention to be completed within one week:

May 31st, 2016 = student orientation

June 4th, 2016 = CBL session 1

June 7th, 2016 = CBL session 2

This was the only possibility, as the students' schedule for all department courses had to be reorganized to make up for lost time. Additionally, since their exams were to begin on June 10th,

students had longer days of class than normal in order to address all the material on their exams. Overall, the factors of vacation time and exam period may have been confounding variables (lowering internal motivation and prioritizing exam preparation, respectively), affecting the students' experience with CBL negatively.

Another limitation to the study was resource availability. First, gathering enough faculty members was difficult, and as such during both CBL sessions, four of the ten faculty were actually “tutors.” As previously mentioned, “tutors” are hired individuals who have recently graduated from the MBBS program at KMCMG, and do not have a lecturer or a professor appointment. Their responsibilities are similar to that of a North American graduate student acting as a “teaching assistant,” with duties such as exam proctoring, but “tutors” do not lecture or create class material, and spend the majority of time of clinical roles at peripheral medical clinics. By the faculty tutors were not considered subject matter experts. This may have led to differences between group discussions (Harden & Crosby, 2000). On one hand, because these tutor positions are often short-term, their level of commitment to the department may not be as strong as a permanent faculty member; therefore, they may be indifferent, not willing to put in the same amount of effort, or not inherently as motivated to try make a new intervention successful. Alternatively, in order to demonstrate potential success for future employment, they may be keener to try new methods. In either case, while Hay & Katsikitis (2001) describe that students led by experts had higher test scores and levels of learner satisfaction, they describe that non-expert tutors are able to become better facilitators if trained in facilitation skills. Along with human resource constraint, the other resource limitation was that of information technology. As mentioned earlier, active learning methods are often complemented by the use of information technology and computer-assisted learning, which have the added benefit of being able to support limited teaching staff (Jones et al.,

2001; McCoy et al., 2015). While the use of information technology was suggested for this intervention, using laptops, tablets or PowerPoints was not feasible (during the CBL sessions) at this time due to unavailability, and the medical college is set up such that KMCMG students only have access to WiFi in the library, not in classrooms. The last constraint was the availability of rooms. The Department of Community Medicine has four dedicated and allocated rooms for their use, which could accommodate a maximum of five groups. As such, for this study, permission had to be granted from other departments to use their rooms. If the CBL process was continued, consistently having to ask other departments to borrow their rooms would be difficult and the outcome may be unpredictable.

Additionally, all students in this study were exposed to the CBL intervention, however the questionnaire and focus group discussions did not explicitly ask for comparisons between the CBL and traditional based lecture method. Pre- and post-focus group discussions and/or questionnaire could have been implemented as a method for comparison. Finally, given the pre-set curriculum structure and the limited time frame to implement and evaluate the research work, an academic evaluation could not be done (i.e. pre- and post-tests to directly observe and assess students' knowledge gain). Testing academic performance could be considered in correlating the objective and subjective experiences of knowledge acquisition.

Recommendations

Based on the results of this research study, the researcher recommends four main suggestions when moving forward with medical education innovation in the Department of Community Medicine at KMCMG.

First, it is hoped that further CBL implementation work is studied, over a longer period of time, with more CBL sessions, for the experience for students and faculty to be better developed. The repeat study could serve to validate or dispute the findings of this current study. Contrasting findings would allow the department to critically examine how best to move forward with modifying the implemented CBL operational structure or exploring new avenues in the realm of medical education innovation. Complimentary findings will serve to support the development of CBL within the department curriculum.

Second, it has been noted by this study that adaption of this method is difficult, since class size is large, number of faculty available is low, and allocated department-specific rooms are limited. As such, in order to best overcome this barrier, perhaps the number of group formations can be limited and shifted through some rotational process in order to design an effective but resource-light version of CBL. This can be best determined with an open and honest dialogue between the Head of the Department and the faculty members. Alternatively, Downer & Swindells (2003) describe how case studies can be effectively incorporated into PowerPoint presentations during lecture classes in order to engage a larger audience. Students can also vote on case study question options, simply by showing a raise of hand, making the lecture more interactive. This is not to suggest that such an activity would engage students in a similar level of inquiry-based learning as CBL does; however, it does provide a low-resource alternative to incorporate active learning strategies.

Third, a well-developed orientation to CBL should be created for both students and faculty. An orientation will help to overcome concerns from students and faculty from embracing the new methodology in the future. In regards to students, by reviewing the principles of active learning methodologies and the dynamics of effective small group practices, student motivation towards

trying new methodologies improves, as does their willingness to engage in a more effective interaction with faculty (Hartling et al., 2010; Jamkar et al., 2007). An orientation also provides an opportunity for students to ask questions, such that concerns and erroneous preconceived ideas may be diminished. In regards to faculty, it is important that they understand that implementing such teaching approaches will promote higher order thinking, and ultimately better clinical outcomes (Gade & Chari, 2013; Ciraj, Vinod & Ramnarayan, 2010). Furthermore, orienting faculty with effective facilitation methods will help ease the process for faculty to work with different student dynamics and interest ranges. Moreover, it will ensure that there is a uniform understanding amongst all faculty members about their role and expectations, such that all sessions can be facilitated in a more homogenous fashion.

Finally, faculty and students should be engaged throughout the design and implementation process to increase motivation and enhance the resultant CBL experience (Jamkar et al., 2007). Although some faculty were actively involved in the design stages, more effort should be made such that all faculty are involved. This may include suggesting potential topics, creating the case stories from their clinical experience, reviewing/editing the case study and/or leading the tutor guide creation. Such responsibility promotes a sense of accountability and interest, particularly at the design stage (ie. the creation of content, materials and resources). Additionally, many medical schools around the world have a student council/team that advocates for medical education innovation at their medical school. These students work with each other and with faculty to look at the literature, available resources, and medical school goals in order to provide input on future curriculum development initiatives (International Federation of Medical Students, 2015). As students are the stakeholder that medical educators hope to positively affect with educational methods, it proves consequentially, then, that the student voice should be at the centre of potential

new innovations. In this study, many students greatly and enthusiastically expressed during the focus group discussions that they would like more CBL sessions, and suggested specific topics (those that they see in their day to day clinical work, and those that are significant to the Indian context) that they would find helpful if the learning of those topics were formatted in the CBL structure. Many other students suggested modifications to the CBL process that would be less burdening on the limited resources available. These students have opinions and ideas that they would like to share, and more importantly, are excited to share. One faculty member interviewee also suggested that students should have input into the curriculum overall (i.e. which topics to learn about, and which learning methodologies to use for the topics). Including students in the various stages would motivate them to take their learning more seriously, and would also increase interaction between faculty and students. Taken together, the student and faculty experience can only be enhanced to a higher level through such a co-development process. The enthusiasm and momentum that would be generated from this co-development process will support future medical education reform at KMCMG to be sustainable and meaningful.

Future Strides for Medical Education in India

This section will describe two areas to consider when moving forward with medical education change in the general Indian context.

Stakeholder Analysis

In order for medical education reform to occur, it is imperative that all stakeholders participate in an open exchange discussion and debate about future directions and recommendations (Frenk et al., 2010). This includes students and young professionals, college officials, non-governmental organizations, government agents, international agencies, and donors.

Pursuing an institutional-specific analysis, for example by conducting key informant interviews, will help to elucidate a range of important considerations. For example, what are the values (ideologies, philosophies) and knowledge (research evidence, cultural-specific knowledge) of the stakeholders that may be deep-rooted in the society and difficult to change? What are the interests (goals and objectives) that different policy actors and organizations pursue, taking into account the political and socioeconomic forces that influence them? Finally, what role do the organizational structures of the region, state, country and international system play in making procedures and rules for policy change? Deriving these answers are critical in order to understand how all of these actors fit into the bigger picture of determining whether medical education reform measures are feasible and whether there exists will for the effort.

Upon the completion of institutional-analysis, a comprehensive study should be done to compare and contrast these analyses between all medical colleges in India. Inter- and intra-regional trends will be more solidified with such a qualitative backbone, and would highlight pitfalls and areas of opportunity.

Currently, there is a bountiful amount of literature that is examining the influence of the government and private sector in India, and how these two constituencies conflict and work together to frame medical education policies. Some studies describe that the rapid expansion of the private sector has led to regional inequality in the quality-production and distribution of physician graduates, leading to severe health system imbalances across communities (Davey et al., 2013; Mahal & Mohanan, 2006; Sood & Adkoli, 2000; Vallyamma, Deshpande & Gayathree, 2009). Other research has demonstrated that the private sector excels in being able to meet the overwhelming demand for medical education in India, largely because the government has budgetary constraints and limited infrastructure (Choudhury, 2014). Research has also

demonstrated the disproportionate number of private medical colleges within regions (e.g. about two-thirds of the total medical colleges in the southern region are in the private sector and are within only in three states: Pondicherry, Karnataka and Kerala), and that those states with fewer private medical colleges have significantly less public expenditure in medical education (Choudhury, 2014). Moreover, while some studies argue that private medical colleges produce ill-fitted graduate physicians (Vallyamma, Deshpande & Gayathree, 2009; Sood & Adkoli, 2000), others have shown private medical college students excelling, for example in the southern states due to availability of qualified faculty who return from abroad to teach (Choudhury, 2014).

The extent to which various internal and external factors shake and shape the Indian medical education system is beyond the scope of this paper. However while other scholars have undertaken exhaustive policy analysis projects in this regard, to compliment this, a qualitative stakeholder analysis will permit for an in-depth look on why the policies have been framed the way they are at the institution, regional, state, and country level (Howlett, Ramesh & Perl, 2010). This will lead to new insights that can help to frame how reform strategies should move forward.

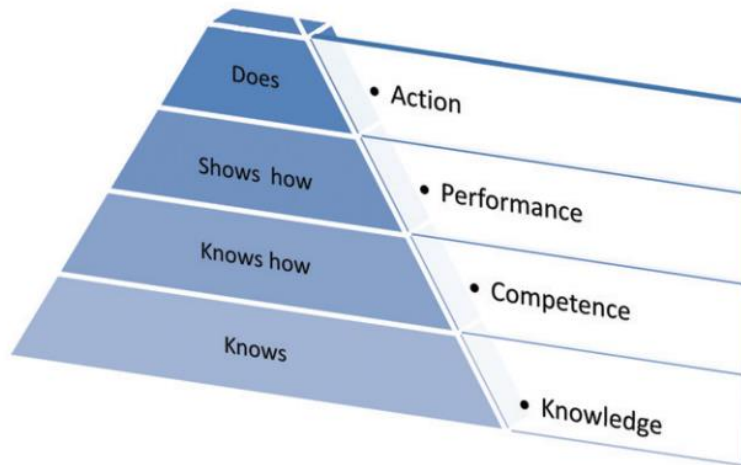
It was stated at the beginning of this dissertation that medical education reform is important to produce graduate physicians who must face (amongst many other challenges) the problems of inequality, while providing patients with evidence-based best-practice care. However, unless all stakeholders come together to share in the efforts to address issues, to recognize all of the factors that inhibit or encourage change, medical education reform will likely not be effective, sustainable or plausible.

Future Curriculum Changes

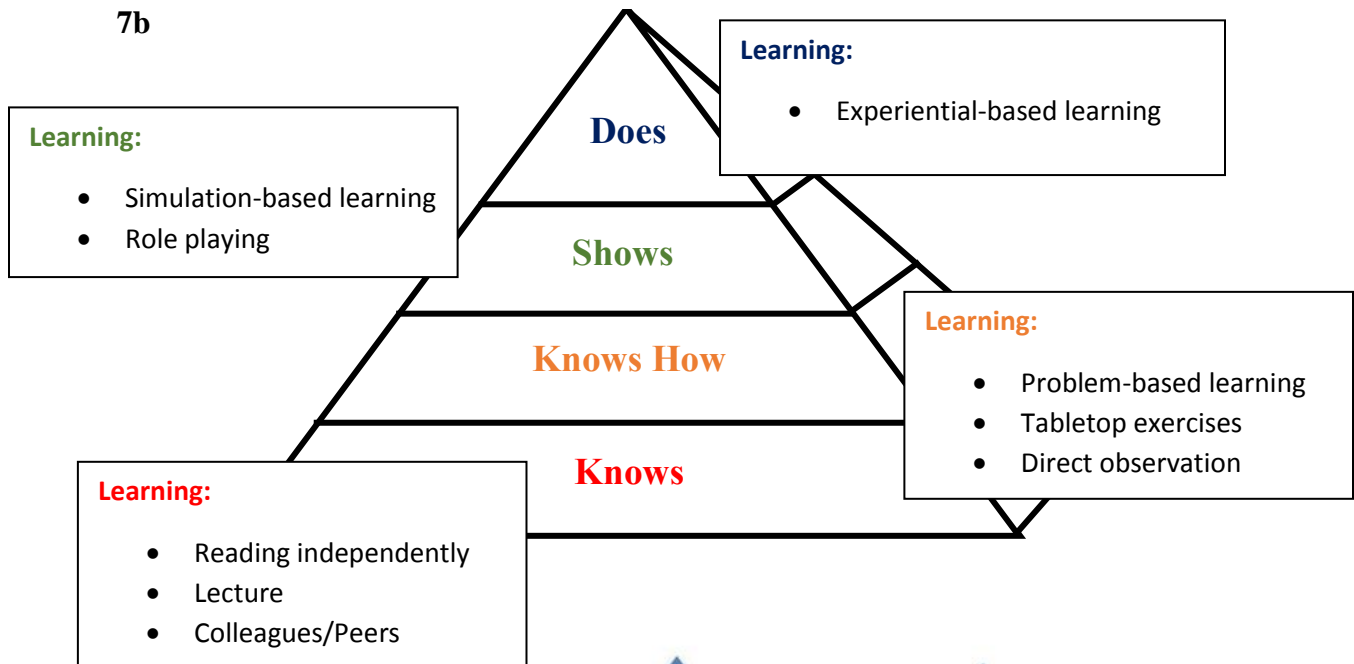
Concurrently with advocating for a student-centred approach, medical education scholars have stated that curricula should also uphold the commitment to promoting social responsibility and helping to shape the competence, values and principles of future graduate physicians (Frenk et al., 2010). A reorientation of the curriculum is needed in such a way that future physician graduates in India can become more responsive to the needs of marginalized populations (Dasgupta, 2014). In order for medical educators to know what kind of methodologies should be employed to help support the growth of such future physician graduates, Miller’s pyramid (Miller 1990) can be referenced.

Miller’s pyramid is a widely known model in medical education, and may work as an extension of Bloom’s taxonomy (Bloom et al., 1956). It can be used as a guide to help with planning the framework for a curriculum. The pyramid describes four levels of learning outcomes: knows, knows how, shows how, and does (Figure 7a). Taylor & Hamdy (2013) state that the pyramid is significant because it highlights that the ultimate goal of training a future physician graduate is to ensure that the graduate “can take their place in the workforce (Action).” As described by Miller (n.d.), depending on the curriculum methodologies employed, a medical student may be limited to the lower levels of the pyramid, rather than engaging with activities that support higher-level outcomes (Figure 7b). At “knows”, learners gain knowledge by learning activities such as reading independently and attending didactic lectures. In “knows how,” learners have a self-directed approach to learning, through PBL, tabletop exercises or direct observation. This is where CBL would sit as well. In “shows,” simulation-based learning and role playing may take precedence, and finally at “does,” the learner is actually experiencing the act. Koh & Dubrowski (2016) also suggest that the higher two tiers promote skills and attitude development, while the bottom two are limited to knowledge acquisition (Figure 7c).

7a



7b



7c

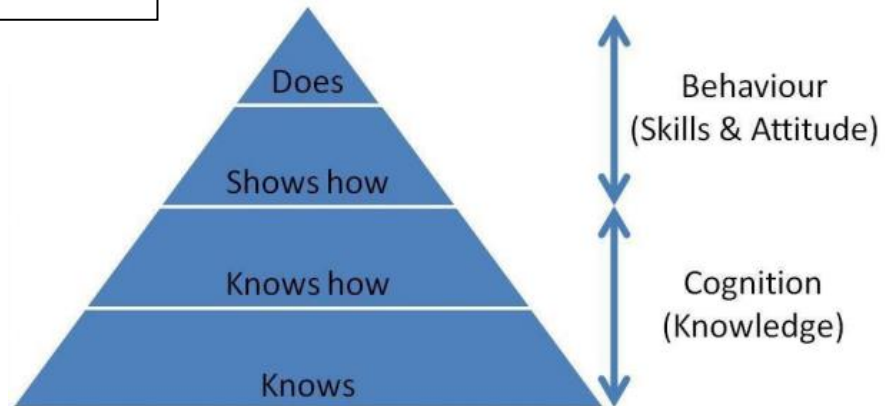


Figure 7. Miller’s pyramid. **7a.** The four levels (Taylor & Hamdy, 2013); **7b.** Learning methodologies mapped onto the pyramid. Revised from Miller (n.d.). **7c.** Knowledge, skills and attitude mapped onto the pyramid (Koh & Dubrowski, 2016).

The pyramid suggests that the use of CBL is limited in some aspects for the student to gain the best learning outcomes. In order for future physicians to build and harness those skills and attitudes that are necessary to serve in a socially responsible way, perhaps CBL should be integrated with other methodologies, such as role playing.

Although it is too early or improbable to expect Indian medical colleges to take such a large leap when many barriers and limitations still exist, it is hoped that this brief discussion may ignite ideas for future modified versions of CBL that best fit within an Indian medical college's context. For example, the Department of Community Medicine at KMCMG, inherently as per the topics that the department teaches and values it strives to instill in students, has a great opportunity to explore these sorts of innovations that will promote future clinicians to attain both knowledge and values to best keep pace with the changing dynamics of health care in India. For example, case stories and sessions can be contextualized to a greater degree – the story may be situated in a rural community, the student may be 'working' as a medical officer scouting rural communities, role playing may include learning how to co-communicate with a trusted rural-village community health care worker on how to "break bad news." Implicit in all of these ideas are an opportunity to help students understand and experience how to appropriately engage in community health work as a physician that is respectful and up to the standards of high-quality care.

Summary

As with any new intervention, differences between the program-on-paper and the program-in-action are inevitable. However, this study has demonstrated that the CBL intervention was widely seen as effective and acceptable by both students and faculty at KMCMG. The limitations posed to the study can be revisited in another light when recognizing that there are a range of new

and exciting possibilities, as per the recommendations. The last chapter of this dissertation will now conclude with final thoughts.

CHAPTER 6: CONCLUSION

An effective medical curriculum is needed to assure the development of skilled future graduate physicians, particularly in resource-limited countries, where challenges are abundant and diverse. The knowledge gained from this study is multi-fold, and the conclusion will begin with examining the implications of the methodology and results.

This study began with the premise that there was a lack of locally-relevant literature to understand how to guide medical education reform in India. More specifically, CBL in the Indian medical context was limited to a handful of papers, and those available lacked an in-depth, qualitative outlook on the student perspective. To the best of the researcher's knowledge, this is the first time a CBL intervention in India has explored the medical student construction of how CBL is defined and where students find purpose in it. It is also the first time that an in-depth qualitative approach to assess the medical student experience of a CBL intervention in India has been undertaken. These subjective and insightful results could not have emerged from a purely quantitative approach. Therefore, the mixed-methods approach provided an avenue to investigate a new phenomenon that captured the individual experience, but also permitted for the generalizability of results across groups. The second implication is that the implementation and evaluation of this intervention will help to inform the future development of an effective, acceptable and feasible curriculum given the contextual needs. It can be solidified by these results that aside from a few areas of improvement, students and faculty welcome CBL. The data demonstrates that CBL was more effective than the traditional lecture-based method and positively influential in affecting the student as a future physician. There were a range of other outcomes, such as acquisition and application of knowledge, improved skills and enhancement of interest the subject topics. Overall, most students and faculty would be glad to engage in more CBL sessions.

To conclude, medical education is rapidly changing, and many challenges remain for the future, particularly when contextualizing a learning and teaching methodology. However, the struggle to achieve success will be worthwhile to ensure that the best is being done for our students, and ultimately, for our patients.

REFERENCES

- Amin, Z., Burdick, W., Supe, A., & Singh, T. (2011). The Flexner report and contemporary medical education in South Asia: An exception. *Academic Medicine*, 86(6):662-663.
- Anderson, M. B. (2000). A snapshot of medical students' education at the beginning of the 21st century: Reports from 130 schools. *Academic Medicine*, 75(9):n9.
- Auerbach, C. F., & Silverstein, L. B. (2003). *An Introduction to Coding and Analysis: Qualitative Data*. New York: New York University Press.
- Banchi, H., & Bell, R. (2008). The many levels of inquiry-based learning. *Science Child*, 46:26–29.
- Baum, K. D., & Axtell, S. (2005). Trends in North American medical education. *The Keio Journal of Medicine*, 54(1):22-28.
- Bergman, E., de Feijter, J., Frambach, J., Godefrooij, M., Slootweg, I., Stalmeijer, R., & van der Zwet, J. (2012). AM last page: A guide to research paradigms relevant to medical education. *Academic Medicine*, 87(4):545.
- Biggs, J. (1996). Enhancing teaching through constructive alignment. *Higher Education*, 32(3):347-364.
- Biggs, J. (2003). Aligning teaching for constructing learning. *Higher Education Academy*, 1-4.
- Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I, Cognitive domain*. Longmans Green.
- Boet, S., Sharma, S., Goldman, J., & Reeves, S. (2012). Review article: Medical education research: an overview of methods. *Canadian Journal of Anesthesia*, 59(2):159-170.
- Bonwell, C. C., & Eison, J. A. (1991). *Active Learning: Creating Excitement in the Classroom. 1991 ASHE-ERIC Higher Education Reports*. Washington, DC: ERIC Clearinghouse on Higher Education.
- Bordage, G. (2009). Conceptual frameworks to illuminate and magnify. *Medical Education*, 43(4):312-319.
- Bryman, A. (1984). The debate about quantitative and qualitative research: A question of method or epistemology? *The British Journal of Sociology*, 35:75-92.
- Bunniss, S., & Kelly, D. R. (2010). Research paradigms in medical education research. *Medical Education*, 44:358-366.
- Burns, K. E., Duffett, M., Kho, M. E., Meade, M. O., Adhikari, N. K., Sinuff, T., & Cook, D. J. (2008). A guide for the design and conduct of self-administered surveys of clinicians. *Canadian Medical Association Journal*, 245-252.

- Carrera, L. I., Tellez, T. E., & D'Ottavio, A. E. (2003). Implementing a problem-based learning curriculum in an Argentinean medical school: Implications for developing countries. *Academic Medicine*, 78(8):798-801.
- Chan, W. P., Hsu, C. Y., & Hong, C. Y. (2008). Innovative "Case-Based Integrated Teaching" in an undergraduate medical curriculum: development and teachers' and students' responses. *Annals Academy of Medicine Singapore*, 37(11):925–960.
- Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice. *AAHE Bulletin*, 39:3-7.
- Choudhury, P. K. (2014). *Role of private sector in medical education and human resource development for health in India*. New Delhi: Institute for Studies in Industrial Development.
- Ciraj, A., Vinod, P., & Ramnarayan, K. (2010). Enhancing active learning in microbiology through case based learning: Experiences from an Indian medical school. *Indian Journal of Pathology and Microbiology*, 53(4):729.
- Cook, D. A., Beckman, T. J., & Bordage, G. (2007). Quality of reporting of experimental studies in medical education: A systematic review. *Medical Education*, 41(8):737-745.
- Cooke, M., Irby, D., Sullivan, W., & Ludmerer, K. M. (2006). American medical education 100 years after the Flexner report. *The New England Journal of Medicine*, 355:1339-1344.
- Corbin, J., & Strauss, A. (2008). *Basics of qualitative research*. Sage Publications, Inc.
- Crabtree, B. F., & Miller, W. L. (1999). *Doing qualitative research*. Thousand Oaks, CA: Sage Publications.
- Cummings, S. R., Newman, T. B., & Hulley, S. B. (2013). Chapter 15: Designing questionnaires and interviews. In S. B. Hulley, S. R. Cummings, W. S. Browner, D. G. Grady, & T. B. Newman, *Designing Clinical Research (4th Ed.)* (pp. 2-13). Philadelphia: Lippincott Williams & Wilkins.
- Dasgupta, S. (2014). Reforms in medical education: Optimising quantity and quality. *Indian Journal of Public Health*, 58(1):1-4.
- Davey, S., Davey, A., Srivastay, A., & Sharma, P. (2013). Privatisation of medical education in India: A health system dilemma. *International Journal of Medicine and Public Health*, 4(1):18-22.
- Desmarchais, J. E. (1993). A student-centered, problem-based curriculum: 5 years' experience. *Canadian Medical Association Journal*, 148:1567-1572.
- Deswal, B. S., & Singhal, V. K. (2016). Problems of medical education in India. *International Journal of Community Medicine and Public Health*, 3(7):1905-1909.

- Downer, A., & Swindells, S. (2003). *Developing Clinical Case Studies: A Guide for Teaching*. Retrieved from AETC National Resource Center: http://www.go2itech.org/HTML/CM08/toolkit/tools/print/casebased/Developing_Clinical_Case_Studies.pdf
- Duffy, T. (2011). The Flexner report - 100 years later. *Yale Journal of Biology and Medicine*, 84(3):269–276.
- Dupuis, R. E., & Persky, A. M. (2008). Use of case-based learning in a clinical. *The American Journal of Pharmaceutical Education*, 72(2):Article 29.
- Edmunds, S., & Brown, G. (2010). Effective small group learning: AMEE guide No. 48. *Medical Teacher*, 32:715-726.
- Entiwistle, N. (2009). *Teaching for Understanding at University. Deep*. Basingstoke: Palgrave Macmillan.
- Ferris, H. (2015). The use of small group tutorials as an educational strategy in medical education. *International Journal of Higher Education*, 4(2):225-228.
- Foord-May, L. (2006). A faculty's experience in changing instructional methods in a professional physical therapist education program. *Physical Therapy*, 86(2):223-325.
- Frenk, J., Chen, L., Bhutta, Z. A., Cohen, J., Crisp, N., Evans, T., . . . Zurayk, H. (2010). Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *The Lancet*, 376:1923-1958.
- Gade, S., & Chari, S. (2013). Case-based learning in endocrine physiology: an approach toward self-directed learning and the development of soft skills in medical students. *Advances in Physiology Education*, 37:356-360.
- Garvey, M. T., O'Sullivan, M., & Blake, M. (2000). Multidisciplinary case-based learning for undergraduate students. *European Journal of Dental Education*, 4(4):165–168.
- Gibbert, M., Ruigrok, W., & Wicki, B. (2008). What passes as a rigorous case study? *Strategic Management Journal*, 29(13):1465-1474.
- Graffam, B. (2007). Active learning in medical education: Strategies for beginning implementation. *Medical Teacher*, 29:38-42.
- Hansen, J. T., & Krackov, S. K. (1994). The use of small group case-based exercises in human gross anatomy: A method for introducing active learning in a traditional course format. *Clinical Anatomy*, 7(6):357-366.
- Harden, R. M., & Crosby, J. (2000). AMEE Guide No 20: The good teacher is more than a lecturer - the twelve roles of the teacher. *Medical Teacher*, 22(4):334-347.
- Hartling, L., Spooner, C., Tjosvold, L., & Oswald, A. (2010). Problem-based learning in pre-clinical medical education: 22 years of outcome research. *Medical Teacher*, 32(1):28-35.

- Hay, P., & Katsikitis, M. (2001). The 'expert' in problem-based and case-based learning: Necessary or not? *Medical Education*, 35(1):22-26.
- Howlett, M., Ramesh, M., & Perl, A. (2009). *Studying public policy: Policy cycles & policy subsystems*. Toronto: Oxford University Press.
- Hunt, D. P., Haidet, P., Coverdale, J. H., & Richards, B. (2003). The effect of using team learning in an evidence-based medicine course for medical students. *Teaching and Learning in Medicine*, 15:131-139.
- International Federation of Medical Students Association. (2015). *Medical Education*. Retrieved from International Federation of Medical Students Association: <http://ifmsa.org/medical-education/>
- Jamkar, A. V., Burdick, W., Morahan, P., Yemul, V. Y., Sarmukadum, & Singh, G. (2007). Proposed model of case based learning for training undergraduate medical student in surgery. *Indian Journal of Surgery*, 69:176-183.
- Jones, R., Higgs, R., de Angelis, C., & Prideaux, D. (2001). Changing face of medical curricula. *The Lancet*, 357:699-703.
- Joseph, N., Rai, S., Jain, A., Nelliyanil, M., & Kotian, S. M. (2015). Perception towards problem based learning among medical students of a private medical college in south India. *British Journal of Medicine & Medical Research*, 9(5):1-10.
- Joshi, K. B., Nilawar, A. N., & Thorat, A. P. (2014). Effect of case based learning in understanding clinical biochemistry. *International Journal of Biomedical And Advance Research*, 5(10):516-518.
- Kireeti, A. S., & Reddy, D. S. (2015). Case based learning (CBL), a better option to traditional teaching for undergraduate students in curriculum of paediatrics. *Asian Journal of Biomedical and Pharmaceutical Sciences*, 5(45):39-41.
- Koh, J., & Dubrowski, A. (2016). Merging problem-based learning with simulation-based learning in the medical undergraduate curriculum: The PAIRED framework for enhancing lifelong learning. *Cureus*, 8(6):e647.
- Krishnan, P. (1992). Medical education. *Health Millions*, 18(1-2):42-44.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 22(140):55.
- Mahal, A., & Mohanan, M. (2006). Growth of private medical education in India. *Medical Education*, 40(10):1009-1011.
- Marton, F., & Saljo, R. (1997). Approaches to learning. In F. Marton, D. J. Hounsell, & N. J. Entwistle, *The experience of learning*. 2nd ed. (pp. 39-58). Edinburgh: Scottish Academic Press.

- Maudsley, G. (2011). Mixing it but not mixed-up: mixed methods research in medical education (a critical narrative review) . *Medical Teacher*, 33:e92-e104.
- McCoy, L., Pettit, R. K., Lewis, L. H., Bennett, T., Carrasco, N., Brysacz, S., . . . Schwartz, F. N. (2015). Developing technology-enhanced active learning for medical education: Challenges, solutions, and future directions. *The Journal of the American Osteopathic Association*, 115(4):202–211.
- Medical Council of India. (2011). *Vision 2015*. Retrieved from MCI India: http://www.mciindia.org/tools/announcement/MCI_booklet.pdf
- Miller, G. E. (1990). The assessment of clinical skills/competance/performance. *Academic Medicine*, 63:pS63.
- Miller, G. T. (n.d.). *Measuring Outcomes*. Retrieved from <http://goo.gl/KEaMUP>
- Motagi, M., N, K., & Patil, S. (2015). Evaluation of different teaching modalities for better understanding of subject in first year medical students. *International Journal of Biomedical Research*, 6(05):320-322.
- Naik, S. (2014). Medical education in India: Problems and solutions. *Indian Journal of Rheumatology*, 19-22.
- Nair, S. P., Shah, T., Seth, S., Pandit, N., & Shah, G. V. (2013). Case based learning: A method for better understanding of biochemistry in medical students. *Journal of Clinical & Diagnostic Research*, 7(8):1576-1578.
- Nanda, B., & Manjunatha, S. (2013). Indian medical students' perspectives on problem-based learning experiences in the undergraduate curriculum: One size does not fit all. *Journal of Educational Evaluation for Health Professions*, 10:11.
- Papanna, K. M., Kulkarni, V., Tanvi, D., Lakshmi, V., Kriti, L., Unnikrishnan, B., . . . Sumit Kumar, S. (2013). Perceptions and preferences of medical students regarding teaching methods in a Medical College, Mangalore India. *African Health Sciences*, 13(3):808–813.
- Parker, A., & Tritter, J. (2006). Focus group method and methodology: Current practice and recent debate. *International Journal of Research in Education Methodology*, 29(1):23–37.
- Passmore, C., Dobbie, A., Parchman, M., & Tysinger, J. (2002). Guidelines for Constructing a Survey. *Family Medicine*, 281-286.
- Planning Commission of India. (2011). *High Level Expert Group Report on Universal Health Coverage for India*. Retrieved from Planning Commission: http://planningcommission.nic.in/reports/genrep/rep_uhc0812.pdf
- Ramsden, P. (1992). *Learning To Teach in Higher Education*. London: Routledge.

- Rothwell, D. J. (2010). *In Mixed Company: Communicating in Small Groups. 7th ed.* Wadsworth Publishers.
- Schifferdecker, K. E., & Reed, V. A. (2009). Using mixed methods research in medical education: basic guidelines for researchers. *Medical Education*, 43:637-644.
- Setia, S., Bobby, Z., Ananthanarayanan, P. H., Radhika, M. R., Kavitha, M., & Prashanth, T. (2011). Case based learning versus problem based learning: A direct comparison from first year medical students perspective. *WebmedCentral Medical Education*, 2(6):WMC001976.
- SharinginHealth. (n.d.). *About SharinginHealth*. Retrieved from SharinginHealth: <http://www.sharinginhealth.ca/site/about.html>
- Solanki, A., & Kashyap, S. (2014). Medical education in India: Current challenges and the way forward. *Medical Teacher*, 36(12):1027-1031.
- Sood, R. (2008). Medical education in India. *Medical Teacher*, 30:585–591.
- Sood, R., & Adkoli, B. V. (2000). Medical education in India - Problems and prospects. *Indian Academy of Clinical Medicine*, 1(3):210-212.
- Squires, G. (1999). *Teaching as a Professional Discipline*. London: Falmer Press.
- Srinivasan, M., Wilkes, M., Stevenson, F., Nguyen, T., & Slavin, S. (2007). Comparing problem-based learning with case-based learning: Effects of a major curricular shift at two institutions. *Academic Medicine*, 82(1):74–82.
- Stalmeijer, R. E., McNaughton, N., & Van Mook, W. N. (2014). Using focus groups in medical education research: AMEE Guide No. 91. *Medical Teacher*, 36:923-939.
- Sullivan, G. M., & Artino, A. R. (2013). Analyzing and interpreting data from Likert-type scales. *Journal of Graduate Medical Education*, 5(4):541-542.
- Supe, A., & Burdick, W. P. (2006). Challenges and issues in medical education in India. *Academic Medicine*, 81(12):1076-1080.
- Sutyak, J., Lebeau, R., & O'Donnell, A. (1998). Unstructured cases in case-based learning benefit students with primary care career preferences. *The American Journal of Surgery*, 175(6):503-507.
- Tathe, S. S., & Singh, A. L. (2014). Case based lectures versus conventional lectures for teaching medical microbiology to undergraduate students. *International Journal of Current Research and Review*, 6(4):35-41.
- Tavakol, M., & Sandars, J. (2014). Quantitative and qualitative methods in medical education research: AMEE Guide No 90: Part 1. *Medical Teacher*, 36:746-756.
- Taylor, D., & Hamdy, H. (2013). Adult learning theories: Implications for learning and teaching in medical education: AMEE Guide No. 83. *Medical TEacher*, 35:e1561-e1572.

- Thistlethwaite, J. E., Davies, D., Ekeocha, S., Kidd, J. M., MacDougall, C., Matthews, P., . . . Clay, D. (2012). The effectiveness of case-based learning in health professional education. A BEME systematic review: BEME Guide No. 23. *Medical Teacher*, 34(6):e421-e444.
- Thurmond, V. A. (2001). The point of triangulation. *Journal of Nursing Scholarship*, 33:3(253-258).
- Todres, M., Stephenson, A., & Jones, R. (2007). Medical education research remains the poor relation. *British Medical Journal*, 335:333-335.
- Torre, D. M., Daley, B. J., Sebastian, J. L., & Elnicki, M. (2006). Overview of current learning theories for medical educators. *The American Journal of Medicine*, 119(10):903-907.
- Vallyamma, P., Deshpande, S. R., & Gayathree, L. (2009). Mal-distribution of medical manpower resultant decay of the Indian medical education system: Existing problems and possible solutions. *British Journal of Medical Practitioners*, 2(1):46-49.
- Walton, H. (1997). Small group methods in medical teaching. *Medical Education*, 31:459-464.
- Williams, B. (2005). Case based learning—a review of the literature: is there scope for this educational paradigm in prehospital education? *Emergency Medicine Journal*, 22:577-581.
- Yin, R. K. (2009). *Case Study Research: Design and Methods*. SAGE.

APPENDECIES

APPENDIX A

Appendix Aa: Letter of Information/Consent Form for Students



Letter of Information/Consent

Date: _____

Perceptions of medical students and faculty towards a case-based learning intervention at an Indian medical college

Student Investigator:

Raksha Sule, BMSc

MSc in Global Health
(Candidate, 2016)

McMaster University

Phone: 416-830-8892

Email: suler@mcmaster.ca

Supervisor:

Dr. Andrea Hunter, MD, FRCPC,
Dip Trop Med

McMaster Children's Hospital

Associate Professor, McMaster
University

Email: hunteaj@mcmaster.ca

Co-Investigators:

Dr. David LaPierre

Family Medicine

Western University

E: david@sharinginhealth.ca

Dr. Animesh Jain

Professor and Head,

Community Medicine

Deputy Convener, Medical
Education Unit,

Kasturba Medical College

Phone: 91 98450 32334

E: animesh.jain@manipal.edu

Dr. Nitin Joseph

Associate Professor,

Community Medicine

Kasturba Medical College

E: nitin.josep@manipal.edu

Purpose of the Study:

As part of my thesis, you are invited to take part in this study that explores the perceptions of medical students and faculty during a case-based learning intervention.

There is an increasing global trend in medical education that is shifting away from the didactic, teacher-centred approach, to a model that is student-centered and encompasses an active learning design. Examples of active learning methods include case-based learning (CBL) and problem-based learning (PBL). Such a paradigm shift has been justified by studies demonstrating a multitude of improvements in outcomes, including: critical thinking, communication, team-based dynamics and clinical competence.

Current literature predominantly focuses on medical schools in North America and Europe. However, research describing these curricula changes from lower-resourced countries highlight a range of barriers from both students and faculty, particularly in regards to PBL.

As such, with our CBL intervention, we are hoping to understand the perceptions of medical students and faculty in regards to acceptability and effectiveness of the method. We also hope to gain insight into any educational system limitations, and human resource and economic constraints that may hinder the success of CBL in the Kasturba Medical College context.

Research Procedures:

This study will take place within the Department of Community Medicine at Kasturba Medical College.

All students will attend a CBL orientation, where you will learn about the CBL methodology in detail, and have an opportunity to ask any questions.

You will then randomly be assigned to either the CBL group or the traditional group.

If you are in the CBL group, you will be divided into groups of 6-8 students, and be assigned a faculty tutor. Each week, for two weeks, you will be given a case study on some community medicine topic, and will collaborate with your group to work through the cases. You will be given the objectives and relevant case resources as support, one week prior. Your assigned tutor will act as a facilitator, and will help you with any issues that may arise during your work. If you are in the traditional group, you will receive a formal lecture. All sessions each week, regardless of being in the CBL or traditional group, will last for two hours.

If you are in the CBL group, prior to the end of the second week's session, you will be given a survey to complete in class. This survey will assess your perception on various factors in regards to the CBL intervention. There will also be a few demographic/background information questions, such as your age, gender and nationality. The survey will be no longer than 25 questions, and will not take longer than 15 minutes. Additionally, you will be invited to a focus group in the weeks after. The number of students in each focus group will not exceed eight students. During this time, you will have the opportunity to further share your opinions on the CBL intervention. The focus groups are semi-structured in nature, as such, although prompts will help guide the discussion, the direction of conversation will primarily be led by you and the other members in the group. The focus groups will be audio-recorded to help with accuracy of transcription. Participation in the focus group will not take longer than 30-45 minutes.

At a later time during the semester, after the data collection is completed, you will be switched from the traditional group to the CBL group (and vice versa), to have an equal opportunity in the participation of the intervention model.

Potential Harms, Risks or Discomforts:

The risks involved in participating in this study are minimal. While I hope to encourage a welcoming environment to share your thoughts during the focus group, you may feel uneasy or worried about how others in the group may react. As such, you do not need to answer any questions that make you feel uncomfortable.

Additionally, as your time is valuable, you will be given two weeks advanced notice prior to the beginning of the focus groups. Additionally, I have set aside a two week period specifically for focus groups. Taken together, this will hopefully provide you with the appropriate flexibility in choosing a time that works for your schedule.

Furthermore, it is not likely that there will be any harms or discomforts from participating in the survey.

Below, in the Confidentiality section, I describe the steps I am taking to protect your privacy during the survey and focus group. Participation in this study will not affect your student evaluations and/or grades.

Potential Benefits:

An effective medical curriculum is needed to assure the development of skilled future graduate physicians who will be able to overcome the challenges that they will have to face, particularly in developing countries. The implementation and evaluation of this CBL intervention will help to inform the development of an appropriate and effective curriculum given Kasturba Medical College's contextual needs. By understanding your perceptions as medical students, it can be solidified whether case-based learning is effective and acceptable to you as learners. Additionally, by exploring the perceptions of faculty members, barriers and solutions to limitations can be deduced.

As part of this thesis project, you will have the benefit of helping to shape how CBL curricula can be implemented at Kasturba Medical College.

Confidentiality:

Survey: Beyond the collection of demographic data (ie. age, gender and nationality), your answers cannot be linked back to you. The physical copies of the survey will be kept in a locked cabinet that only I will have access to. During data analysis, information will be kept on a password-protected computer file, on a password-protected laptop. Once the study has been completed, an archive of the data, without any identifying information, will be maintained. Data will be kept for 3 years, after which time, the data will be destroyed.

Focus Group: While I will take the necessary precaution of asking the other members of the focus group to keep what you say confidential, it is important for you to understand that I cannot guarantee that they will do so. Additionally, to ensure anonymity during audio-recording and data analysis, you will be given a coded identification number. The coded identification number is important, since if we use your quotes/ideas, this coded identification number will ensure that all

of your quotes/ideas are linked to one another, but those reading the final results will not be able to link you personally (e.g. name, age, gender) to any of your shared quotes/ideas. Only I will know what coded identification number is attached to what name. Additionally, Indian faculty co-researchers will only have access to aggregated data, such that links to individuals cannot be made. The audio-recording device will be kept in a locked cabinet that only I will have access to. During data analysis, information will be kept on a password-protected computer file, on a password-protected laptop. Once the study has been completed, an archive of the data, without any identifying information, will be maintained for 3 years, after which time, the data will be destroyed.

At the beginning of the focus group, I will review the confidentiality process again, and will ask for your oral consent.

Participation and Withdrawal:

Your participation in this study is voluntary. If you decide to be part of the study, you can withdraw, for whatever reason, even after signing the consent form and/or part-way through the study.

If you decide to withdraw, there will be no consequences to you. In cases of withdrawal, any data from the focus group you have provided will be destroyed unless you indicate otherwise. However, once you have submitted your responses for the anonymous survey, your answers will be put into a database and will not be identifiable to you; this means that once you have submitted your survey, your responses cannot be withdrawn because I will not be able to identify which responses are yours.

You can withdraw from this study up until approximately July, 2016, when I expect to be submitting my thesis. To withdraw, please email Raksha Sule at: suler@mcmaster.ca

Information about the Study Results:

I expect to have this study completed by approximately the end of August, 2016. If you would like a brief summary of the results, please indicate below.

Questions about the Study:

If you have questions or need more information about the study itself, please contact me (Raksha Sule) at: suler@mcmaster.ca

This study has been reviewed by the Hamilton Integrated Research Ethics Board (HiREB). The HiREB is responsible for ensuring that participants are informed of the risks associated with the research, and that participants are free to decide if participation is right for them. If you have any questions about your rights as a research participant, please call the Office of the Chair, HiREB, at 905.521.2100 x 42013

CONSENT

You will be asked to provide oral consent during the focus group.

1. I would like a more detailed explanation about the confidentiality process regarding the focus group now (please check mark).

YES _____

NO _____

2. I would like to receive a summary of the study's results (please check mark).

YES _____ Please send them to me at this email address: _____

NO _____

3. I agree to be contacted about a follow-up focus group, and understand that I can always decline the request.

YES _____ Please contact me at: _____

NO _____

- I have read the information presented above about the study being conducted by Raksha Sule of McMaster University and her co-researchers.
- I have had the opportunity to ask questions about my involvement in this study and to receive additional details I requested.
- I have been given a signed copy of this form. I understand that if I agree to participate in this study, I may withdraw from the study at any time or up until approximately July, 2016.
- I agree to participate in the study.

Name of Participant (Printed)

Signature)

(Date)

Consent form explained in person by:

Name and Role (Printed)

(Signature)

(Date)

Appendix Ab: Letter of Information/Consent Form for Faculty



Inspiring Innovation and Discovery

Letter of Information/Consent

Date: _____

Perceptions of medical students and faculty towards a case-based learning intervention at an Indian medical college

Student Investigator:

Raksha Sule, BMSc

MSc in Global Health (Candidate, 2016)

McMaster University

Phone: 416-830-8892

Email: suler@mcmaster.ca

Supervisor:

Dr. Andrea Hunter, MD, FRCPC, Dip Trop
Med

McMaster Children's Hospital

Associate Professor, McMaster University

Email: hunteaj@mcmaster.ca

Co-Investigators

Dr. David LaPierre

Family Medicine

Western University

E: david@sharinginhealth.ca

Dr. Animesh Jain

Professor and Head,

Community Medicine

Deputy Convener, Medical
Education Unit,

Kasturba Medical College

Phone: 91 98450 32334 E:

animesh.jain@manipal.edu

Dr. Nitin Joseph

Associate Professor,

Community Medicine

Kasturba Medical College

E: nitin.josep@manipal.edu

Purpose of the Study:

As part of my thesis, you are invited to take part in this study that explores the perceptions of medical students and faculty during a case-based learning intervention.

There is an increasing global trend in medical education that is shifting away from the didactic, teacher-centred approach, to a model that is student-centered and encompasses an active learning design. Examples of active learning methods include case-based learning (CBL) and problem-based learning (PBL). Such a paradigm shift has been justified by studies demonstrating a multitude of improvements in outcomes, including: critical thinking, communication, team-based dynamics and clinical competence.

Current literature predominantly focuses on medical schools in North America and Europe. However, research describing these curricula changes from lower-resourced countries highlight a range of barriers from both students and faculty, particularly in regards to PBL.

As such, with our CBL intervention, we are hoping to understand the perceptions of medical students and faculty in regards to acceptability and effectiveness of the method. We also hope to gain insight into any educational system limitations, and human resource and economic constraints that may hinder the success of CBL in the Kasturba Medical College context.

Research Procedures:

This study will take place within the Department of Community Medicine at Kasturba Medical College.

Each week, for two weeks, you will be responsible for facilitating a group of 6-8 students through two case studies related to the topic of community medicine.

All faculty tutors will attend a CBL orientation prior, where you will be guided through the tutor facilitation process, and be given further instructions on your role for the intervention. You will also have an opportunity to ask any questions or relay any concerns at this time.

You will then be invited to attend an interview to share your opinions on the CBL intervention. The interviews are semi-structured in nature, and as such, although prompts will help guide the discussion, the direction of conversation will primarily be led by you. The interview will be audio-recorded to help with the accuracy of transcription. Participation in the interview will not take longer than 30 minutes.

Potential Harms, Risks or Discomforts:

The risks involved in participating in this study are minimal. As your time is valuable, you will be given two weeks advanced notice prior to the beginning of the interviews. Additionally, I have set aside a two week period specifically for interviews. Taken together, this will hopefully provide you with the appropriate flexibility in choosing a time that works for your schedule.

Below, in the Confidentiality section, I describe the steps I am taking to protect your privacy during the interview.

Potential Benefits:

An effective medical curriculum is needed to assure the development of skilled future graduate physicians who will be able to overcome the challenges that they will have to face, particularly in developing countries. The implementation and evaluation of this CBL intervention will help to inform the development of an appropriate and effective curriculum given Kasturba Medical College's contextual needs. By understanding medical students' perceptions, it can be solidified whether case-based learning is effective and acceptable to them as learners. Additionally, by exploring your perceptions as faculty members, a deeper understanding of barriers and solutions to limitations can be deduced.

As part of this thesis project, you will have the benefit of helping to shape how CBL curricula can be implemented at Kasturba Medical College.

Confidentiality:

To ensure anonymity during the interview, you will be given a coded identification number. The coded identification number is important, since if we use your quotes/ideas, this coded identification number will ensure that all of your quotes/ideas are linked to one another, but those reading the final results will not be able to link you personally (e.g. name, gender) to any of your shared quotes/ideas. Only I will know what coded identification number is attached to what name. Additionally, Indian faculty co-researchers will only have access to aggregated data, such that links to individuals cannot be made. The audio-recording device will be kept in a locked cabinet that only I will have access to. During data analysis, information will be kept on a password-protected computer file, on a password-protected laptop. Once the study has been completed, an archive of the data, without any identifying information, will be maintained for 3 years, after which time, the data will be destroyed.

At the beginning of the interview, I will review the confidentiality process again, and will ask for your oral consent.

Participation and Withdrawal:

Your participation in this study is voluntary. If you decide to be part of the study, you can withdraw, for whatever reason, even after signing the consent form and/or part-way through the study.

If you decide to withdraw, there will be no consequences to you. In cases of withdrawal, any data from the interview you have provided will be destroyed unless you indicate otherwise.

You can withdraw from this study up until approximately July, 2016, when I expect to be submitting my thesis. To withdraw, please email Raksha Sule at: suler@mcmaster.ca

Information about the Study Results:

I expect to have this study completed by approximately the end of August, 2016. If you would like a brief summary of the results, please indicate below.

Questions about the Study:

If you have questions or need more information about the study itself, please contact me at:
suler@mcmaster.ca

This study has been reviewed by the Hamilton Integrated Research Ethics Board (HiREB). The HiREB is responsible for ensuring that participants are informed of the risks associated with the research, and that participants are free to decide if participation is right for them. If you have any questions about your rights as a research participant, please call the Office of the Chair, HiREB, at 905.521.2100 x 42013

CONSENT

You will be asked to provide oral consent during the interview.

1. I would like a more detailed explanation about the confidentiality process regarding the interview now (please check mark).

YES _____

NO _____

2. I would like to receive a summary of the study’s results (please check mark).

YES _____ Please send them to me at this email address: _____

NO _____

3. I agree to be contacted about a follow-up interview, and understand that I can always decline the request.

YES _____ Please contact me at: _____

NO _____

- I have read the information presented above about the study being conducted by Raksha Sule of McMaster University and her co-researchers.
- I have had the opportunity to ask questions about my involvement in this study and to receive additional details I requested.
- I understand that if I agree to participate in this study, I may withdraw from the study at any time or up until approximately July, 2016.
- I have been given a signed copy of this form. I agree to participate in the study.

Name of Participant (Printed)

(Name and Role (Printed))

(Signature)

(Signature)

(Date)

(Date)

Consent form explained in person by:

Appendix Ac: Tutor guide for the case-based learning session on “Animal Bite Exposure.”

Tutor Guide: Animal Bite Exposure

Introduction

Case-based learning (CBL) can be described as “structured inquiry.” That being, the opportunity for students to engage in active discovery and application of knowledge through case study and facilitator guidance.

The role of the facilitator is to guide learning through asking appropriate questions that promote analysis, discussion and resolution for the specific clinical problem at hand. Facilitators help to identify gaps in student’s knowledge, while simultaneously providing guidance for self-directed learning.

In this session, facilitators will work with a group of about 12 students to support students’ achievement in meeting all the learning outcomes and completing the case study. In preparation for the case, facilitators should:

- Look over the case thoroughly and be familiar and comfortable with the objectives, sequence of questions and expected content and complexity of students’ answers in regards to the case.
- Invest time into looking over the resources that students are required to read.
- May invest extra time into thinking and writing out higher-order questions (ie. guiding questions) that can be asked to help guide the students in their learning process. This will be rewarding for both the students in their self-directed learning journey, but also to the tutor, as it will stimulate an enriching dialogue between the tutor and students.

Please see “Faculty Orientation: Case-Based Learning Two-Pager” sheet for further details regarding facilitating tips, group dynamic scenarios, ideas on what to do if students finish early, and details for debrief/reflection.

Timeline

Total session time: 1.5 hours

Introduction and case formulation	20 min
Case study	50 min
Debrief	20 min

Tutor Guide

Case idea and conception: Dr. Nitin Joseph, Dr. Animesh Jain

Case development and authors: Rebecca Green LaPierre (RD), Dr. David LaPierre

Reviewers: Dr. Ramesh Holla, Dr. Animesh Jain

Opening Story:

You are the medical officer at a Primary Health Centre in the Udupi District. Late one afternoon, Mrs. and Mr. Kamath bring their two children, Suhana aged 2 years and Vijay aged 4.5 years, to see you, after both children had been bitten by the family's pet dog. The dog bites happened approximately two hours ago, and both children have sustained bites on their hands.

Question 1: What are the two main questions you should ask the parents relevant to rabies?

What other things you would like to know?

Facilitating Comments 1:

Answer 1:

1. Has the family pet been vaccinated against rabies?
2. What is the immunization status of both children?

You also should be curious about the dog's behaviour. Was it provoked? Is biting out of character for the animal? Does it look sickly? Any unusual behaviour the parents have noticed that would give clues as to whether or not the dog has rabies.

Case Story: Parents Report

- They do not know if the dog has been vaccinated, as the dog was given to them about two years ago when a family relative had to move away. They have not noticed any unusual behaviour.
 - Their daughter Suhana's immunization status is appropriate for her age.
 - Their son, Vijay, was vaccinated for rabies at age 3.5 years, after he sustained a minor aberration following a Category II dog bite (not from the family's pet dog). He is also immunized appropriately for his age.
-

Question 2: What must you determine as you examine the children's hands?

Facilitating Comments 2:

Answer 2:

The following should be determined:

1. What is the category of contact?

Category I	Category II	Category III
touching or feeding animals, licks on intact skin	nibbling of uncovered skin, minor scratches or abrasions without bleeding	single or multiple transdermal bites or scratches, licks on broken skin; contamination of mucous membrane with saliva from licks, contacts with bats

2. Are there signs of (skin) infection (e.g. spreading erythema, purulence, swelling, pain)?
3. Did the parents wash the children’s hand immediately after the dog bite occurred? Was appropriate hygiene/sanitation practiced (ie. soap and the use of a clean and dry towel)?

Case Story: Upon Examination

Upon examination, you determine that Vijay only sustained two minor scratches on his left hand. The skin was not broken and appears healthy and intact. No other scratches related to the dog bite were found on his upper appendages. Vijay reports he was not bitten anywhere else.

Suhana’s left hand has two deep puncture wounds. Bleeding has since ceased, and the area around the wounds is red, but not warm to touch. No other scratches related to the dog bite were found on her upper appendages. Suhana is not yet verbal and cannot report anything about her injury.

Mrs. Kamath reports she had both children rinse their hands under the rain barrel spout, and that when she noticed the daughter’s bleeding they decided to bring their children to the PHC.

Question 3: What is your treatment plan for Vijay, the 4.5 year old son?

Facilitating Comments 3:

- Facilitators should discuss tetanus prophylaxis and Inj. TT dosage/schedule.
- Have a list of substances that can be used as well those that should not be used (like hydrogen peroxide, Carbollic acid, nitric acid, Savalon, Cetavlon).

Answer 3:

His hand aberration would be classified as a Category II animal bite.

Since he has been previously vaccinated:

- Appropriate wound treatment (thoroughly flush and wash the wound for a minimum of 15 minutes with soap and water, detergent, providone iodine or other substances that kill the rabies virus e.g.alcohol, tincture iodine)
- Two intramuscular doses of a cell-derived vaccine separated by three days

If blood testing is available, it would be beneficial to confirm that antibody titres are at least 0.5 IU/ml.

Finally, since the wound was not washed with clean soap and water immediately after contact, emphasize the important of appropriate hand washing to the parents and to Vijay.

Question 4: What is your treatment plan for Suhana, the 2 year old daughter?

Facilitating Comments 4:

Answer 4:

Her hand aberration would be classified as a Category III animal bite, since she was bleeding.

Treatment should include:

- Immediate vaccination
- Local treatment of the wound
- Administration of rabies immunoglobulin

Also discuss: Cell Culture Vaccine (IM & ID schedules), and Rabies Immunoglobulin – equine and Human.

Question 5: How long do you continue PEP treatment for Suhana, and what should it include?

Facilitating Comments 5:

Answer 5:

Depending on vaccine type, the post-exposure schedule includes intramuscular doses of 1 ml or 0.5 ml given as five doses over four weeks.

One dose of the vaccine should be administered on days 0, 3, 7, 14 and 28. All intramuscular injections must be given into the deltoid region or, in small children, into the anterolateral area of the thigh muscle. Vaccine should never be administered in the gluteal region.

Treatment may be discontinued if the pet dog remains healthy throughout an observation period of 10 days; or if the animal is killed humanely and found to be negative for rabies by laboratory

examination. The treatment may be converted to pre-exposure prophylaxis by giving 4th dose on 21st or 28th day.

Question 6: What recommendations would you give to the parents to minimize rabies exposure in the future?

Facilitating Comments 6:

Answer 6:

Rabies is a vaccine-preventable disease.

- Vaccinating dogs is the most cost-effective strategy for preventing rabies in people due to transmission by rabid dog bite.
 - Children need to be taught to avoid stray animals.
 - Appropriate hand/wound washing immediately after animal contact (whether or not a wound has been sustained, as dog's saliva could enter body via non-intact skin and mucous membranes) needs to be emphasized.
 - Pre-exposure prophylaxis for persons at high risk of exposure to animal bites.
-

Debrief & Reflection

1. Congratulate the team on finishing the case and providing them with positive feedback on their teamwork.
2. Review the solutions, **ensuring that the students are the ones providing the answers and leading the discussion.**
3. Ask the students if they have any remaining questions regarding the topic. If there are any questions or misunderstandings, **see if another student can first try to answer the question or clear up the confusion.** If not, feel free to step in and provide a more detailed response.

Nearing the end, to encourage self-learning beyond the classroom, **ask if any students are curious about anything related to the topic, and encourage them to look it up and share with you or the other students in the group the next time you see each other** – even in passing by. This fosters a greater student-faculty relationship, encourages further critical thinking, and promotes relationship building between student peers.

Appendix Ad: Tutor guide for the case-based learning session on “Acute Diarrheal Disease.”

TUTOR GUIDE

Introduction

Case-based learning (CBL) can be described as “structured inquiry.” That being, the opportunity for students to engage in active discovery and application of knowledge through case study and facilitator guidance.

The role of the facilitator is to guide learning through asking appropriate questions that promote analysis, discussion and resolution for the specific clinical problem at hand. Facilitators help to identify gaps in student’s knowledge, while simultaneously providing guidance for self-directed learning.

In this session, facilitators will work with a group of about 12 students to support students’ achievement in meeting all the learning outcomes and completing the case study. In preparation for the case, facilitators should:

- Look over the case thoroughly and be familiar and comfortable with the objectives, sequence of questions and expected content and complexity of students’ answers in regards to the case.
- Invest time into looking over the resources that students are required to read.
- May invest extra time into thinking and writing out higher-order questions (ie. guiding questions) that can be asked to help guide the students in their learning process. This will be rewarding for both the students in their self-directed learning journey, but also to the tutor, as it will stimulate an enriching dialogue between the tutor and students.

Please see “Faculty Orientation: Case-Based Learning Two-Pager” sheet for further details regarding facilitating tips, group dynamic scenarios, ideas on what to do if students finish early, and details for debrief/reflection.

Timeline

Total session time: 1.5 hours

Introduction and case formulation	20 min
Case study	50 min
Debrief: Review and final questions	20 min

TUTOR GUIDE

Case idea and conception: Dr. Nitin Joseph

Case development and authors: Dr. David LaPierre, Dr. Rushi Parikh

Reviewers: Dr. Nitin Joseph, Dr. Priya Rathi, Dr. Animesh Jain

Opening Story

Gopal is a child of 9 months presenting to your tertiary hospital with diarrhea and dysentery. You are the pediatric physician caring for him.

The infant became ill 3 days ago, with six episodes of watery diarrhea daily. He had decreased feeding and increased irritability. The mother became very anxious and presented to the local auxiliary nursery midwife (ANM). She examined the child, initiated pre-referral management with an IV line, and then immediately refers the child to a tertiary hospital.

Question 1: What is your initial assessment?

Facilitator Comments 1:

Answer 1: This child could be quite ill, and requires rapid assessment for clinical stability.

With all potentially unstable patients, assess the ABCs - airway, breathing, and circulatory status.

Assess for level of dehydration, based on the IMNCI guidelines.

As you examine the child, gather further data regarding the history, including

- Type and volume of intake
 - Frequency, amount and consistency of diarrhea; is there any blood?
 - Look for signs of dehydration from top to bottom
 - Brief medical history (fever, food intake, Changes in behavior, deworming)
 - Check for weight of the child
 - Accordingly classify the type of dehydration the child is having
-

Case Story: After Initial Assessment

Based on your initial assessment, Gopal appears to be severely dehydrated. He appears lethargic, with poor skin turgor. His temperature is 38.6 °C, has a pulse rate of 160, pulse is feeble, systolic blood pressure 76mm of Hg and a respiratory rate of 30. Gopal does not cry tears and is unable to drink. He appears underweight (6kgs; grade 2 malnutrition).

Question 2: What is your initial management?

Facilitator Comments 2:

Answer 2: Given his clinical presentation, he should be provided with further fluid resuscitation at 100 ml per kg body weight, the first 30 ml per kg to be given in 1 hour and next 70 ml per kg to be given in 5 hours for an infant with reassessment regularly. Oral fluids may be provided when he is able to drink.

If there were bloody diarrhea, empiric antibiotics may be provided. The child should be admitted, with regular monitoring provided.

Question 3: What are the possible causes of his diarrhea?

Facilitator Comments 3:

Answer 3: His diarrhea seems to be infectious.

Diarrhoea could be infectious or non-infectious.

Infectious causes include:

Viral	Bacterial	Parasitic
<ul style="list-style-type: none"> ● Rotavirus 	<ul style="list-style-type: none"> ● Shigella ● Salmonella ● Campylobacter ● E coli ● Vibrio cholerae ● Aeromonas 	<ul style="list-style-type: none"> ● Entamoeba histolytica ● Cryptosporidium ● Giardia

Other potential causes of acute diarrhea include:

- Intussusception
- Appendicitis
- Lactose intolerance, food allergies

It is also prudent to consider other serious causes of systemic illness, including meningitis and pneumonia, when evaluating a sick child.

Question 4: What further assessment do you perform?

Facilitator Comments 4:

Answer 4: As care is provided to stabilize Gopal's condition, further extensive (detailed) clinical assessment should be performed. This should include:

- Respiratory, abdominal, and nervous system exam
 - Full medical history, including pregnancy and delivery
 - Immunization history
 - Dietary history
 - Social history, including living conditions and socioeconomic status
 - Laboratory investigations – Stool examination to know the cause of dysentery.
-

Case Study: Further Learnings from Mother

You learn that Gopal lives with his family in a rural home. He was not exclusively breastfeeding for 6 months; foods and animal milk were introduced at 4 months. You also learn that their drinking water is obtained from an open well, which is located 10m from the house.

Question 5: What factors do you identify from his history that would have led to this condition?

Facilitator Comments 5:

Answer 5:

- Open well
 - Exposure history- open well, (unrelated-travel, sick contacts, health care worker exposure)
 - Dietary history-time of introduction of complementary feeding, uncooked food, amount of feedings, timing of introduction of cow's milk (12 months, no more than 720 ml per day (about 24 oz per day; 1 oz = 30ml), solids at 6 months, avoid honey until 1 year, sugary drinks 2-3 oz (60-90 ccs/day) (unrelated-type of food related to certain bacteria, recent antibiotics)
-

Question 6: What advice do you provide for Gopal's mother to prevent further illness?

Facilitator Comments 6:

Answer 6: The drinking water is from an open well, which is not sanitary. It is also too close to the house; it should be at least 15m from potential sources of contamination, including the house.

- The well needs to be:
 - Periodically disinfected with bleaching power; periodic check of free residual chlorine levels to be maintained at 0.5 ppm at the end of 1 hour contact period
 - Covered to prevent further contamination
 - The mother should be counselled on:
 - Appropriate introduction of timing of food (e.g. complementary food must be started after 6 months of exclusive breast feeding)
 - Avoiding certain types of food (e.g. spoiled, drinks sweetened with sugar, carbonated beverages, fruit juices and sweetened tea).
 - Advised to give rice water, yoghurt, green coconut water, etc.
 - If unable to attain safe drinking water, then child should be given parboiled water in a clean vessel
 - Food given to the child must be prepared in hygienic condition
 - Other important concepts include:
 - Zinc supplementation reduces the duration and severity of diarrhea. 20 mg of Zinc to be given for children above 6 months for 10-14 days.
 - Immunization to be completed as per age for the child.
 - Vitamin A supplementation as per the Vitamin A prophylaxis programme.
 - Weight monitoring.
 - Complete the course of treatment as prescribed.
 - Improvement of sanitation, personal hygiene, food hygiene etc.
-

Question 7: What advice do you provide for community to prevent further illness?

Facilitator Comments 7:

Answer 7:

- Safe drinking water, personal and food hygiene, washing hands frequently, education of diarrhea related illnesses, breastfeeding for <6 months.
 - Rotavirus vaccination - Rota virus vaccination should not be initiated in a child aged more than 3 months due to risk of intussuception. Since Gopal's age is 9 months it can be deleted.
-

REFLECT AND DEBRIEF.

Appendix Ae: Questionnaire for students

Questionnaire

[Perceptions Towards a Case-Based Learning (CBL) Intervention]

Principal Investigator: Raksha Sule

Supervisor: Dr. Andrea Hunter

Co-Investigators: Dr. David LaPierre, Dr. Animesh Jain, Dr. Nitin Joseph

1. I am currently _____ years of age (check one):

a. 18	e. 22
b. 19	f. 23
c. 20	g. 24
d. 21	h. ≥ 25

2. I am a (check one):
 - a. Male
 - b. Female

3. The majority of my schooling before medical school (ie. 10 years or greater):
 - a. In India
 - b. Abroad

Questions 4 – 25: In comparison to the traditional approach (circle one)...	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Case-Based Learning (CBL) effectively helps in acquiring new information	1	2	3	4	5
CBL efficiently helps to understand key principles of the subject area	1	2	3	4	5
CBL helps to link basic science concepts to clinical knowledge and clinical cases	1	2	3	4	5
CBL enhances my clinical approach	1	2	3	4	5
CBL improves my independent thinking	1	2	3	4	5
CBL improves my critical thinking	1	2	3	4	5
CBL improves my problem solving abilities	1	2	3	4	5
CBL supports my drive for curiosity	1	2	3	4	5
CBL enhances my communication skills	1	2	3	4	5

CBL enhances my collaboration skills		1	2	3	4	5
CBL enhances my ability to work productively as a team member		1	2	3	4	5
CBL enhances my skills in group learning that are relevant to medical practice		1	2	3	4	5
The tutor effectively facilitated the CBL sessions in a way that ensured equal participation of group members		1	2	3	4	5
The tutor effectively facilitated the CBL sessions in a way that ensured the discussions were on track		1	2	3	4	5
CBL effectively facilitates interaction between teaching staff and students		1	2	3	4	5
The role of the tutor as a facilitator was important in the CBL sessions		1	2	3	4	5
I was satisfied with the work load required prior to the CBL sessions		1	2	3	4	5
I was satisfied with the amount of time that was available during the CBL sessions		1	2	3	4	5
I enjoyed applying and integrating course material using real-life situations		1	2	3	4	5
CBL enhances my interest in the subject matter		1	2	3	4	5
I would like to have more CBL sessions than traditional lecture-based sessions		1	2	3	4	5
CBL enhances my overall learning experience		1	2	3	4	5

Appendix Af: Focus group guide for students

Focus Group Guide

[Perceptions Towards a CBL Intervention]

Principal Investigator: Raksha Sule

Local Principal Investigator: Dr. Andrea Hunter

Co-Investigators: Dr. David LaPierre, Dr. Animesh Jain, Dr. Nitin Joseph

I. INTRODUCTIONS AND INSTRUCTIONS:

Hello, my name is Raksha Sule. Thank you for agreeing to participate in this focus group meeting. Just to remind everyone, I am looking to explore your opinions, as medical students, towards the case-based learning intervention.

We will begin by introducing ourselves, first names only. I will then hand you your coded identification number that will be used to anonymously identify your opinions. We will then walk through a few points from the consent form in more detail that you read earlier, and with your permission, I will record your oral consent on my consent log recorder. We will touch on confidentiality, the use of the tape recorder, and finally the goals of the project. After this, we will no longer use first names, which I will explain once we get to the tape recorder section.

Participants introduce themselves & I ensure appropriate oral consent is given

Confidentiality:

Let's take a few moments now to talk about confidentiality and to go over some basic ground rules for our focus group discussion today:

- Everyone's views are welcomed and important.
- The information which we will collect today will be attributable (*connected or associated*) to you via your coded identification number. The coded identification number is important, since if we use your quotes/ideas, this coded identification number will ensure that all of your quotes/ideas are linked to one another, but those reading the final results will not be able to link you personally (e.g. name, age, gender) to any of your shared quotes/ideas.
- We are assuming that when we learn about one another's views, they remain confidential. Anything heard in the room, should stay in the room.
- Having said this, and having made these requests, it should be understood that we cannot guarantee that the request will be honoured by everyone in the room.
- All voices are to be heard, so I will step in if too many people are speaking at once or to make sure that everyone has a chance to speak.
- I may also step in if I feel the conversation is straying off topic.
- You can expect this focus group to last about 30-45 minutes.

Use of Tape Recorder:

- This focus group will be recorded to increase accuracy and to reduce the chance of misinterpreting what anyone says.
- All tapes and transcripts will be kept under lock and key by me.
- Only I will know what coded identification number is attached to what name.
- Names will be removed from transcripts. Only my thesis supervisor, co-researchers and I will have access to the transcripts.
- For transcription purposes, I ask that you please say your coded identification number before you share your opinion. That will ensure we assign the correct code to each person's answers. I will give you a gentle reminder if you forget. Additionally, if you are sharing your opinion based on what another member in the group has said, please say their coded identification number as well.

Explanation of Goal

- My goal today is to learn from your experience.
- As such, please do not feel obligated to strive for agreement with others in the group. I am just as interested in recording a range of opinions, as long as they are truthful to your experience.

Consent Questions:

1. Do you have any questions or would you like any additional details?
2. Do you agree to participate in this interview, knowing that you can withdraw at any point with no consequences to you?

Record consent in consent log Appendix G

With that, I want to thank you for your helpful cooperation with this research, and we can get started. I will be turning on the tape recorder now, so just as a reminder, please speak up, and please say your coded identification number before you share your thoughts.

II. INTERVIEW QUESTIONS

Introduction

1. How would you define case-based learning?
2. Have you participated in case-based learning or problem-based learning in the past?
3. In general, how do you feel the case-based learning experience was for you?

Key Topical Questions

4. How was your experience in acquiring knowledge?

- a. What are your feelings regarding the preparation work required for the sessions?
 - i. How did you feel about the amount of preparation required?
 - ii. How did you feel about the resources given?
 - iii. What would you have liked to see more or less of?
 - b. Do you feel it was an effective and/or efficient method? Why or why not?
 - c. Do you feel you understand the material well? Why or why not?
 - d. How would this effect your clinical approach?
 - i. Do you feel CBL helps enhance your clinical approach? Why or why not?
 - ii. Do you believe CBL provides insight on clinical correlation and integration of knowledge with basic sciences? Why or why not?
5. How was your experience in the development of your inquiry skills?
- a. To what extent do you feel you developed critical thinking skills?
 - b. What are your feelings on the concept of curiosity building in CBL?
 - i. Do you feel you had an opportunity to be curious? Why or why not? To what extent?
 - c. To what extent do you feel you had an opportunity for independent thinking?
6. How was your experience working with a team?
- a. Were there any skills that you believe were developed (e.g. teamwork, leadership, delegation)? Why or why not? To what extent?
7. How was your experience with the tutor?
- a. What factors do you believe make an effective tutor?
 - b. Describe the role of the tutor.
8. Personally, did you find the CBL experience enjoyable or dull?
- a. Why, and to what extent?
 - b. Prior to beginning the CBL session, what were you feeling? Were you excited? Did you feel anxiety? Why or why not?
 - c. Do you believe your initial feelings changed over time? If yes, in what way? Why do you think that occurred?

Conclusion

9. Did you speak to any of your student peers or faculty tutors about your experience? If yes, can you please expand on what that discussion was like (e.g. what were some major themes you spoke about, were your thoughts similar or dissimilar and why or why not in your opinion)?
10. Will case-based learning effect your learning as a future doctor?
 - a. Why or why not? To what extent?
11. Have we missed anything? Is there anything that we should have talked about but didn't? Is there anything else you would like to add?

III. CONCLUSION

- Thank you all again for your participation with this research.
- In closing, a kind reminder that what was said in this room should stay in the room.

Appendix Ag: Interview guide for faculty.

Interview Questions
[Perceptions Towards a CBL Intervention]

Principal Investigator: Raksha Sule

Supervisor: Dr. Andrea Hunter

Co-Investigators: Dr. David LaPierre, Dr. Animesh Jain, Dr. Nitin Joseph

I. INTRODUCTIONS AND INSTRUCTIONS:

Hello, my name is Raksha Sule. Thank you for agreeing to participate in this interview. Just as a reminder, today's interview will be exploring your experience as a tutor during the case-based learning intervention. Before we get started, I would like to walk through a few points from the consent form in more detail that you read earlier, and with your permission, will record your oral consent on my consent log recorder.

Confidentiality:

I want to spend a few moments talking about confidentiality.

- The information which we will collect will not be attributable to you in any identifying way (e.g. name, gender).
- Rather, you will be given a coded identification number. The coded identification number is important as if we use your quotes or ideas, this coded identification number will ensure that all of your quotes/ideas are linked to one another, but those reading the final results will not be able to link you personally (e.g. name, previous experience) to any of your shared quotes/ideas.
- You can expect this discussion to last about 30 minutes.

Use of Tape Recorder:

- To increase accuracy and to reduce the chance of misinterpreting what you say, I will be using a tape recorder.
- Only I will know what coded identification number is attached to what name.
- Names will be removed from transcripts.
- Only my thesis supervisor, co-researchers and I will have access to transcripts.

Consent Questions:

1. Do you have any questions or would you like any additional details?
2. Do you agree to participate in this interview, knowing that you can withdraw at any point with no consequences to you?

Record consent in consent log

With that, I want to thank you for your helpful cooperation with this research, and we can get started.

II. INTERVIEW QUESTIONS

Introductory Questions:

- 1) In the context of CBL, what do you believe the role of a tutor is?
- 2) What is your general view on the role of the tutor? Are tutors necessary and important? Why or why not?

Faculty Development-Related Questions:

- 3) What was your experience like as a tutor?
 - a. What were some challenges you experienced?
 - b. What were some successes you experienced?
 - c. How was the preparation work for you as a tutor? What would you have liked to see more or less of?
- 4) Have you had experience in the past as a tutor for CBL or PBL? If yes, please expand. Did this affect how you went about your role as a tutor?
- 5) Have you had experience in the past as a learner for CBL or PBL? If yes, please expand. Did this affect how you went about your role as a tutor?
- 6) Are there any key skills you believe tutors should have in order to be an effective facilitator?

Perceptions of the Student Experience Questions:

- 7) What is your opinion on the extent to which students acquired knowledge?
 - a. Do you feel CBL is an effective and/or efficient method to acquire and apply knowledge? Why or why not?
 - b. Do you believe students understood the material well? Why or why not?
 - c. Do you believe students had an appropriate amount of preparation work? How was the quality of their preparation work? What would you have liked to see more or less of?
 - d. Do you believe this would positively or negatively affect students' clinical approach? To what extent and why?
- 8) What is your opinion on the extent to which students developed an inquiry-like mindset (e.g. do you believe they developed critical thinking skills)?
- 9) What is your opinion on group dynamics among the students?
 - a. Were there any skills that you believed were developed (e.g. teamwork, leadership, delegation)? Why or why not?
- 10) What is your opinion on whether or not students enjoyed CBL?
- 11) Overall, do you feel CBL is meaningful for students as future physicians?

Conclusion:

- 12) Did you speak to any of your faculty tutor peers or to your students about your experience? If yes, can you please expand on what that discussion was like (e.g. what were some major themes you spoke about, were your thoughts similar or dissimilar and why or why not in your opinion)?
- 13) Have I missed anything important? Is there anything else you would like to add?

APPENDIX B

Appendix Ba: Pearson *Chi* square test demonstrating the strong association between schooling and questions 4, 7, 16 (respectively, per two tables)

			Q4					Total
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Schooling In India	% within Schooling		.8%	1.7%	7.5%	50.0%	40.0%	100.0%
	% within Q4		100.0%	100.0%	56.3%	88.2%	88.9%	85.1%
	% of Total		.7%	1.4%	6.4%	42.6%	34.0%	85.1%
Abroad	% within Schooling				33.3%	38.1%	28.6%	100.0%
	% within Q4				43.8%	11.8%	11.1%	14.9%
	% of Total				5.0%	5.7%	4.3%	14.9%
Total	% within Schooling		.7%	1.4%	11.3%	48.2%	38.3%	100.0%
	% within Q4		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total		.7%	1.4%	11.3%	48.2%	38.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.171 ^a	4	.016
Likelihood Ratio	9.818	4	.044
N of Valid Cases	141		

			Q7					Total
			Strongly Disagree	Disagree	Netural	Agree	Strongly Agree	
Schooling	In India	% within Schooling	.8%	2.5%	7.5%	49.2%	40.0%	100.0%
		% within Q7	100.0%	100.0%	56.3%	92.2%	84.2%	85.1%
		% of Total	.7%	2.1%	6.4%	41.8%	34.0%	85.1%
Abroad		% within Schooling			33.3%	23.8%	42.9%	100.0%
		% within Q7			43.8%	7.8%	15.8%	14.9%
		% of Total			5.0%	3.5%	6.4%	14.9%
Total		% within Schooling	.7%	2.1%	11.3%	45.4%	40.4%	100.0%
		% within Q7	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
		% of Total	.7%	2.1%	11.3%	45.4%	40.4%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.779 ^a	4	.008
Likelihood Ratio	11.937	4	.018
N of Valid Cases	141		

			Q16					Total
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Schooling In India	% within Schooling		3.3%	6.7%	40.0%	50.0%	100.0%	
	% within Q16		66.7%	61.5%	96.0%	84.5%	85.1%	
	% of Total		2.8%	5.7%	34.0%	42.6%	85.1%	
Abroad	% within Schooling	4.8%	9.5%	23.8%	9.5%	52.4%	100.0%	
	% within Q16	100.0%	33.3%	38.5%	4.0%	15.5%	14.9%	
	% of Total	.7%	1.4%	3.5%	1.4%	7.8%	14.9%	
Total	% within Schooling	.7%	4.3%	9.2%	35.5%	50.4%	100.0%	
	% within Q16	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	.7%	4.3%	9.2%	35.5%	50.4%	100.0%	

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.722 ^a	4	.001
Likelihood Ratio	15.701	4	.003
N of Valid Cases	141		

Appendix Bb: Quantitative results from the questionnaire (questions 4-7). Tables are fragmented based on theme. Includes frequency, mean and standard deviation.

Characteristic	Strongly Disagree no. (%)	Disagree no. (%)	Neutral no. (%)	Agree no. (%)	Strongly Agree no. (%)	Mean (\pm SD)
Case-Based Learning (CBL) effectively helps in acquiring new information	1 (0.07%)	2 (1.4%)	16 (11.3%)	68 (48.2%)	54 (38.3%)	4.220 (0.7568)
CBL efficiently helps to understand key principles of the subject area	1 (0.07%)	2 (1.4%)	18 (12.8%)	72 (51.1%)	48 (34%)	4.131 (0.7524)
CBL helps to link basic science concepts to clinical knowledge and clinical cases	1 (0.7%)	1 (0.7%)	14 (9.9%)	65 (46.1%)	59 (41.8)	(4.285 (0.7325)
CBL enhances my clinical approach	1 (0.7%)	3 (2.1%)	16 (11.3%)	64 (45.4%)	57 (40.4%)	4.227 (0.7871)

Table 4. Perception of students regarding knowledge application and acquisition (questions 4-7 on the questionnaire).

Characteristic	Strongly Disagree no. (%)	Disagree no. (%)	Neutral no. (%)	Agree no. (%)	Strongly Agree no. (%)	Mean (\pm SD)
CBL improves my independent thinking	1 (0.07%)	3 (2.1%)	24 (17.0%)	62 (44.0%)	51 (36.2%)	4.1277 (0.8181)
CBL improves my critical thinking*	1 (0.7%)	2 (2.1%)	20 (14.2%)	68 (48.2%)	48 (34.0%)	4.1357 (0.7885)
CBL improves my problem solving abilities	1 (0.7%)	4 (2.8%)	17 (12.1%)	63 (44.7%)	56 (39.7%)	4.1986 (0.8126)
CBL supports my drive for curiosity	1 (0.7%)	5 (3.5%)	22 (15.6%)	64 (45.4%)	(49 (34.8%)	4.0993 (0.8393)

Table 5. Perception of students regarding development of inquiry-type concepts (questions 8 – 11 on the questionnaire). * = one participant left this blank (n=140).

Characteristic	Strongly Disagree no. (%)	Disagree no. (%)	Neutral no. (%)	Agree no. (%)	Strongly Agree no. (%)	Mean (\pm SD)
CBL enhances my communication skills*	1 (0.7%)	5 (3.5%)	27 (19.1%)	67 (47.5%)	41 (29.1%)	4.0071 (0.8323)
CBL enhances my collaboration skills	1 (0.7%)	4 (2.8%)	24 (17.0%)	68 (48.2%)	44 (31.2%)	4.0638 (0.8125)
CBL enhances my ability to work productively as a team member	1 (0.7%)	5 (3.5%)	16 (11.3%)	72 (51.1%)	47 (33.3%)	4.1277 (0.8055)
CBL enhances my skills in group learning that are relevant to medical practice	1 (0.7%)	3 (2.1%)	13 (9.2%)	72 (51.1%)	52 (36.9%)	4.2128 (0.7541)

Table 6. Perception of students regarding small group work (questions 12–15 on the questionnaire). * = one participant left this blank (n=140).

Characteristic	Strongly Disagree no. (%)	Disagree no. (%)	Neutral no. (%)	Agree no. (%)	Strongly Agree no. (%)	Mean (\pm SD)
The tutor effectively facilitated the CBL sessions in a way that ensured equal participation of group members	1 (0.7%)	6 (4.3%)	13 (9.2%)	50 (35.5%)	71 (50.4%)	4.305 (0.8614)
The tutor effectively facilitated the CBL sessions in a way that ensured the discussions were on track	1 (0.7%)	2 (1.4%)	16 (11.3%)	42 (29.8%)	80 (56.7%)	4.4043 (0.8016)
CBL effectively facilitates interaction between teaching staff and students **	1 (0.7%)	2 (1.4%)	11 (7.8%)	62 (44.0%)	63 (44.7%)	4.3237 (0.7442)

The role of the tutor as a facilitator was important in the CBL sessions	2 (1.4%)	2 (1.4%)	13 (9.3%)	52 (36.9%)	72 (51.1%)	4.3475 (0.8193)
--	----------	----------	-----------	------------	------------	--------------------

Table 7. Perceptions of students regarding tutor performance and role of tutor (questions 16-19 on the questionnaire). ** = two participants left this blank (n=139).

Characteristic	Strongly Disagree no. (%)	Disagree no. (%)	Neutral no. (%)	Agree no. (%)	Strongly Agree no. (%)	Mean (±SD)
I was satisfied with the work load required prior to the CBL sessions *	1 (0.7%)	5 (3.5%)	25 (17.7%)	68 (48.2%)	41 (29.1%)	4.0214 (0.8264)
I was satisfied with the amount of time that was available during the CBL sessions *	1 (0.7%)	4 (2.8%)	17 (12.1%)	67 (47.5%)	51 (36.2%)	4.1642 (0.8012)
I enjoyed applying and integrating course material using real-life situations **	1 (0.7%)	4 (2.8%)	12 (8.5%)	65 (46.1%)	57 (40.4%)	4.2446 (0.788)
CBL enhances my interest in the subject matter **	1 (0.7%)	3 (2.1%)	16 (11.3%)	66 (46.8%)	53 (37.6%)	4.2014 (0.7819)

Table 8. Perception of students regarding personal satisfaction and enjoyment (questions 20-23 on the questionnaire). * = one participant left this blank (n=140); ** = two participants left this blank (n=139).

Appendix Bc: The resultant repeating ideas, themes, and theoretical constructs from the student focus group discussions.

Table 9. Student perceptions: Constructing the definition and purpose of CBL.

Constructing the Definition and Purpose of CBL

- a. *Definition*
 - i. I would define CBL as interactive... [and] you learn a topic while approaching a problem.
 - ii. I think it is an integration between theoretical and practical knowledge.
 - iii. In CBL, there is a group approach; Students come together along with professor/supervisor... [and] we discuss ideas and other modalities about the topic; It's two way learning.
 - iv. I would define it as a clinical approach to our primary subjects.
 - v. It's the reverse of the orthodox way of learning, which is theory class.
- b. *Purpose*
 - i. It brings out the clinical and our spontaneous sides in regards to how we react to various situations and how well we apply our knowledge.
 - ii. It helps to increase our clinical perspective on things, and become better doctors.

Table 10. Student perceptions: Knowledge Acquisition and Application. * = deviating idea from one participant.

Knowledge Acquisition and Application

- c. *Gaining knowledge*
 - i. I think it was a very effective way of gaining knowledge, as you're on one to one with the professor and a few others. You pay more attention.
 - ii. I think it's the most productive way of learning something.
 - iii. Even after the session I learned new things that I didn't know before.
 - iv. It became more interesting to me. So if you gain knowledge while it is interesting, I think that is the best way to learn.
 - v. The rabies case was very direct for us, so we already came with a fixed perception with how it was supposed to go. I wish we didn't know anything about it, and that we were allowed to explore and come out with differentials, and then finally know what the diagnosis was. Because of this... I felt like it was based more on the theoretical aspect of it, and that we weren't allowed to use our differential knowledge. *
- d. *Recollecting knowledge*
 - i. It think it was amazing. I got an idea of the whole topic, and when it came in the exam, I could recollect everything without reading it again.
- e. *Gaining and recollecting knowledge is better in CBL than reading individually from books or from traditional lecture-style classes*

- i. Because of the interaction, our attention span was much better, and we definitely gain much more in CBL than in the normal class.
 - ii. I paid attention in class to the topic, but for me, it was better solved in CBL because when we were discussing, it could be retained in permanent memory.
 - iii. CBL gives attention to individuals, it's not like classroom learning, so teachers can correct our mistakes.
 - iv. When someone teaches with experience or shares, you remember more than what you've read on your own. And obviously when you hear more, you process more. That's why CBL is great.
- f. *Time-related concerns*
- i. The only problem was the timing was really wrong because we had vacation for a month, and then we had to come back and study for exams.
 - ii. We should have been given more time for preparation than the two or three days. It would have been more helpful... if at least a week is given.
 - iii. There wasn't enough time for preparation, given that this is something very very new to me. I definitely need more than one week, to actually get ready for CBL. *
- g. *Enhancing the clinical approach*
- i. Yes, I do believe it does help with clinical approach, because it's like simulation of a real clinical setting, where we discuss cases in an impromptu and on the spot manner.
 - ii. I definitely think it would improve the clinical approach, but I think the cases should be more challenging. *
- h. *Development of inquiry-type mindset*
- i. I learned how to think in a different way.
 - ii. It kind of enhances your curiosity and as a doctor that's the best part of having CBL.
 - iii. Being in a smaller group and being in the limelight forces you to grasp information... so it does challenge you, and makes you think of what to say and how to respond in a better way.

Table 11. Student perceptions: Influence of small group work.

Influence of Small-Group Work

- i. *Advantages of small-group work*
 - i. [CBL] helps to pull in ideas from different groups of people, so whatever was missed by one person, can be enhanced by another. When a lot of ideas are put together, it helps with solving the problem faster and in a better way.
 - ii. I think it brings about a very holistic growth of doctors, because when we're put in a small group, I think everyone gets a chance to speak, and in that way we improve our speaking and interaction skills.

- iii. I think working in a team was a major factor, because there were some kids who knew more, and that actually helps because they start with the topic and then you can wonder around.
- j. *Advantages of working with new individuals*
 - i. We generally don't get to interact with these people... and it was like igniting our minds since some people would ask a question and that would enhance ideas. So I feel in this way, not only can you deal with a problem, but you also get to know people.
 - ii. With different people, I think it's a very good experience, because you get to know other ideas... so that always works in favour of learning more and getting better group discussion.
 - iii. I think it's better to not have friends in the group, because if you have friends, you would take it lightly; When you have friends, you're in your comfort zone, so you won't use your brain to the maximum.
 - iv. It really helps to get to know everyone in your batch. We're a batch of 250, and that day I met four people that I never knew before.
- k. *Concerns with small-group work*
 - i. I would say a group discussion is very good, but at times you need [to work] individually, because you won't always have someone to reassure you that something is right. *
 - ii. I would like to say that the group I was in, the people did not interact much with each other. The interaction was mainly between the professor and the person who asked the question. So I think interaction between people should be more.
 - iii. The problem is that not everyone has the proper experience of sharing ideas or thinking as one team... I felt personally, there was a lot of dominance and passiveness.
 - iv. The team I was in, I barely knew any of them, so it was pretty awkward in the beginning.
 - v. I think it's too soon to tell [if CBL enhances small-group related skills] because we've only had one session.

Table 12. Student perceptions: Constructing the role of the CBL tutor.

Constructing the Role of a CBL Tutor

- a. *The importance of a tutor*
 - vi. It is very important for the tutor to give us direction, otherwise we're completely lost.
 - vii. I think it's important to have a tutor because there should be someone who has more depth in the knowledge of the topic, so he knows where we are making a mistake and to tell us what the right thing is.
 - viii. Yes the tutor plays a big role, because if the tutor is enthusiastic, it really brings a spark in the group, and charges us to have a much more better discussion.

- b. *Characteristics of an effective tutor*
 - ix. Patient.
 - x. He/she should be able to make everyone feel more comfortable.
 - xi. A good tutor is one who is open to learning himself. It's not just imparting knowledge to others, but it should be a two-way process.
 - xii. I think a tutor who is taking CBL should encourage this type of learning. If he himself doesn't like it, then he will just rush into it, and just want the class to get over fast, which is not a good thing.
 - xiii. I feel a good moderator is one that is confident enough to facilitate discussions, [and] has good knowledge about the topic.
 - xiv. He [should not] give the answers blatantly, he [should] just help us reach the answers ourselves.
- c. *Importance of a tutor orientation*
 - xv. I think training the tutor is very important in CBL, because even if the team is bad, he has the capacity to build up the team dynamics and encourage the students to interact.
 - xvi. I feel like the moderator should go through [an orientation] process, so they will know what... sorts of questions can pop up when it's spontaneous discussion.
 - xvii. It's very different from the traditional way of teaching, and orientation will of course help them to be able to teach the students well.
- d. *Concerns and areas for improvement*
 - xviii. We should assess the professor's involvement... unless and until the professors are 100% dedicated for it, I don't think we should go for it.
 - xix. I think the best way to reduce the bias, is to keep having a rotation system wherein the same set of students don't get the same facilitator... because the teaching capacity of each professor will definitely vary.
 - xx. I think the only problem is shortage of faculty; [but] CBL can be alternately managed, one day a particular group goes for a CBL, and the other group goes at some other time. I think that can help.

Table 13. Student perceptions: Personal satisfaction and enjoyment.

Personal Satisfaction and Enjoyment

- e. *Reasons for enjoyment*
 - xxi. I loved it because it's not just the professor who is speaking... We get to share thoughts and they can hear us. It's two way and I think that's the most important part.
 - xxii. I feel it was very enjoyable since it is not monotonous, and we were able to concentrate for that 1-1 1/2 hour; It's definitely more enjoyable... there's no point sitting in a class for one hour. We don't even listen to half of the class, be and we lose concentration. It's not possible to concentrate

consistently for 40-45 mins. But when we're in a discussion, I think everyone pays attention.

xxiii. It was a really amazing experience because all of us could discuss the case and because of that we could retain more than we normally do from our theory classes, and we could answer better during our exams.

f. *Considerations*

xxiv. I guess the people who went for rabies, they enjoyed it more since... it was already coming for exams.

xxv. I wasn't satisfied with just one... I would actually suggest having a couple more sessions, so that we can really know what is going on.

xxvi. Not everything should be [CBL], because otherwise it becomes monotonous.

Table 14. Student perceptions: Influence of CBL on Students as Future Physicians

Influence on Students As Future Physicians

g. *Approach-wise*

xxvii. CBL integrates all the subjects of paraclinical, clinical and non-clinical in a single disease or single problem... and I think that's the sort of approach that is needed when we become physicians.

xxviii. It will definitely help... CBL will help to practically apply [our knowledge].

h. *Resemblance to real-life scenarios*

xxix. Yes it will, because the way the cases are given to us are like the realistic scenarios that can happen to us in the future.

i. *Skill development*

xxx. Yes definitely... because individual opinions matter, but you need to be able to express that in a group... so I definitely think it helps you build core skills that you need later in life.

Table 15. Student perceptions: Areas for improvement

Areas for Improvement

j. *Potential CBL case topics and questions*

xxxi. I think a topic should be included based on the exam. This is a good way of getting people to participate in CBL... because people care about what is coming up right now, rather than what is going to help later; I think it would have been better if it was incorporated into our exam schedule, otherwise it's not something we would follow up with later.

xxxii. For certain diseases that are very common [in India], if there's CBL for these topics, we're never going to forget our approaches to these.

xxxiii. I think when it comes to the questions, it can be made more cryptic... it should not be too direct.

k. *The CBL session process and characteristics*

xxxiv. We didn't know what the process would be like, or what the professor would expect from us... Everyone would get a different faculty, so if some faculty is not ready for a two way thing, it would not be helpful for them.

xxxv. Maybe before each session of CBL, we should have some sort of period of time where we introduce ourselves... to become comfortable with everyone in the group.

xxxvi. If it was possible to have either a class on the subject before or after the CBL has happened, then maybe it would help the students retain the subject better.

xxxvii. I would like to add audio-visual aids to CBL; With audio-visual aids, we can make it more interesting... and make it more effective and efficient.

Appendix Bd: The resultant repeating ideas, themes, and theoretical constructs from the faculty interviews.

Table 16. Faculty perception: Constructing the definition of a CBL tutor. * = deviating idea from one participant (non-study faculty team member). ** = different idea from faculty members who were part of the study team.

Constructing the Definition of a CBL Tutor

a. Role of the tutor

- i. To facilitate; understand he is not a lecturer, but that he is a facilitator.
- ii. To prevent [students] from deviating; we can't just have a discussion where they are discussing wrongly. The role is important when discussion is haywire.
- iii. In order to have equal contribution [from all the students]; if someone is totally dominating, and to balance the session, you need somebody.
- iv. Ensure all of the [objectives]... are met. **

b. Skills of an effective tutor

- i. Effective communication; Good observer; Should know how to address a heterogeneous group... understand [the] audience, then strategize how you [as a facilitator] are going to address each one and tackle the group as a whole.
- ii. Thorough knowledge.
- iii. Student friendly; Can create an environment where everybody [can] speak.
- iv. Should guide, not give out the answer.
- v. Patience.
- vi. Time management skills.**
- vii. Summing up the exercise.**

Table 17. Faculty perception: Considerations of the faculty CBL experience. * = deviating idea from one participant (non-study faculty team member). ** = different idea from faculty members who were part of the study team.

Considerations of the Faculty CBL Experience

c. Successes

- i. Students came very prepared.
- ii. It further enhanced my knowledge... [the students] have a new [way of] thinking, and you might learn something new.
- iii. I was able to draw participation out of the 5 students, plus tried to involve [all others]; Students were actively involved.
- iv. I consciously made sure I was listening to them, facilitating them, and making sure not to teach them. **
- v. The beneficial discussions will help them for their exam. **
- vi. The students who came prepared helped the student's who didn't. **

d. Challenges

- i. There will be some members in the group who will never participate... whether you show a carrot or a stick, they will not do anything; We need to concentrate more on those who are not participating, but after a certain time it becomes exhaustive.
 - ii. Students were not prepared at all.
 - iii. I don't say I necessarily taught them, but for ADD, it was not part of [the] exam, so just to make sure the CBL went forward, we actually ended up teaching them.
 - iv. Only the questions in that topic will be addressed... [So we need to] make sure that all the sub topics are covered. *
 - v. There will be a number of mispoints, so that adds more responsibility on the facilitator. **
- e. *Responsibilities regarding material and time needed for preparation*
- i. No no, [not a stress], it was just like part of our day to day work. It was nice.
 - ii. Either we will be taking classes or we will be discussing in our own sessions, so it was not a burden.
 - iii. It takes a lot of time to prepare, so if students aren't prepared, then it goes to a flop show.
 - iv. I feel it is more when compared to chalk and talk... since we're dealing with small group of students, whatever doubts they have, we have to be able to clarify that... Otherwise for theory, we are preparing from only one textbook. In this CBL... we have to cover clinical, standard, and other relevant articles and textbooks... [This is not a drawback] because we are dealing with bedside teaching also, and with CBL if we are giving more emphasis on the clinical aspect... it will be better for them, but also for us when we take their viva.
 - v. Since it was new experience, I felt I had to be better prepared. **
 - vi. I was less anxious since I had the tutor guide. **
- f. *Thoughts towards the faculty orientation*
- i. Orientation is important so you know what [the new educational method] is and you know your role.
 - ii. I think we could have been shown a video. *
 - iii. [Small-group skills] can be gained by orientation. **
- g. *Personal enjoyment*
- i. I felt very satisf[ied], because it was the first time I saw my students actually thinking.
 - ii. I really enjoyed conducting CBL!

Table 18. Faculty perception: CBL versus other educational methods. * = deviating idea from one participant (non-study faculty team member). ** = different idea from faculty members who were part of the study team.

CBL versus Other Educational Methods

h. CBL is better than the traditional method

- i. Some solutions were totally new... they were innovative... this is what collective thinking can do. In that way, didactic lecture fails.
- ii. [In CBL] we can have small group teaching, and one to one interaction can happen so they can have a better understanding of all the concepts.
- iii. In lecture based method, there is usually not so much students involved, in CBL I can see the students are much more involved and they are very much happy; They were active... and that's better than simply sitting in a classroom listening or not listening.
- iv. [Students] definitely will know more about the topic and they will retain it for a longer duration, rather than them reading the topic or if we take the topic in a standard lecture.
- v. There is 10 people benefitting and one person being left out... but that's okay, because if you take overall benefit, then it is more beneficial than overall classroom lectures.
- vi. If we give important topics with CBL, I think whatever the knowledge gained by the students will be more when compared to standard method.
- vii. In standard lecture, we wouldn't have noticed [the students who are not prepared and/or the students who were not giving any input]. But at least in CBL, with the small group, at least towards the end, they had some input.

*i. PBL is better than CBL **

- i. I think PBL is more fruitful...[because] the students have an hour of brainstorming... and everything is a learning objective... so [the student] covers everything.
 - ii. Leadership aspect will not be emphasized so much [in CBL], like in PBL.
- **

Table 19. Faculty perceptions: Towards the student CBL experience. * = deviating idea from one participant (non-study faculty team member). ** = different idea from faculty members who were part of the study team.

Towards the Student CBL Experience

j. Knowledge acquisition

- i. There is one Chinese proverb, [insert Confucius proverb]... it's the learning by doing principle, and CBL was therefore beneficial.
- ii. It was an active participation, not from all, from few, but still whatever discussion happens, it's beneficial for all the members.
- iii. Yes, students gained knowledge... but we're applying evaluation and application [too], which is higher up in [Bloom's Taxonomy] Pyramid, so it's better for the students.

- iv. It's difficult to judge whether they gained knowledge unless you evaluate... I feel based on discussion point, they have some idea of what has been discussed, so they would have gained some knowledge. *
- k. *Student preparation in regards to material and time*
 - i. Materials were good.
 - ii. We could have given them some national guidelines... which [are] constantly changing. *
 - iii. Had enough time; One week is more than enough.
 - iv. [For lengthy topics], I think at least two weeks [to prepare are needed].
 - v. Since they had sessional [exams] coming up, they didn't have time to prepare for ADD.
 - vi. [Some] students were not prepared at all, because they had vacation.
- l. *Developing the student's clinical approach*
 - i. Here, they would have gotten better at knowledge level, but I don't know how much at application and practice level. *
 - ii. There should be other things to aid [the case study], because if you're just talking - I don't know how much it will improve their clinical skills, I really doubt that. *
 - iii. We are actually giving them a clinical problem with family history and so many things. So this is what they're going to do as doctors... So I think this will influence their clinical approach a lot.
- m. *Developing the student's inquiry-like mindset (ie. critical thinking, independent thinking, curiosity building)*
 - i. Critical thinking has been improved, [but] critical thinking doesn't mean that they have understood the things, but that they have just questioned the things.
 - ii. Curiosity was improved by giving the story in parts... And since we stopped and asked them at each stage what should they think... that helps in their inquisitive thinking; The curiosity aspect I feel were developed more by the discussions... because the student's can get more ideas and build on each other's thinking.
 - iii. [If we used a video], instead of just sitting and talking... they would have developed curiosity. *
 - iv. Critical thinking for sure because they needed the cognitive aspect and understanding of the case in order to apply their knowledge to the case correctly.
 - v. But not totally independent [thinking] because they are still in a group.**
- n. *Importance of the influence of group dynamics and the development of small-group related skills*
 - i. One aspect may be known by one student, which may not be known from another student. So if everyone gives collective input, then all of them will have the knowledge more in depth.

- ii. You can't work in isolation, so it will help in building a teamwork approach... We only had one interaction, so we cannot conclude [CBL] has been helpful [in developing small-group related skills]. *
- iii. No one knows everything, you learn to depend and ask others... which could lead to their combined studying and further bonding. **
- o. *Student enjoyment*
 - i. They really enjoyed it, and they told us to have more CBL sessions for those topics that are on their exam and those topics that they see day to day in patients.
 - ii. They enjoyed it... because this was very few chances where they also were involved and they had to break their monotony from the lecture classes.
 - iii. If they had been prepared... they would have enjoyed more.
- p. *Meaningfulness for students as future physicians*
 - i. Such scenarios are going to become their realities... Rather than the mugging up of 4 or 10 mark questions... in the long run [CBL scenarios] are going to be more useful for them. This is how their clinical thinking is built up.
 - ii. Yeah obviously, it depends on the problems though... [which] should not be entirely theoretical. It should be more clinical focused, where they come up with a diagnosis. Such problems would be better, than [only] ask[ing] what needs to be done.
 - iii. Yes. Definitely it is going to alter their perceptions... they will develop group dynamics, it has the capability to have a team leader... and will definitely improve their communication skills.
 - iv. We only had one session... we have to try it on a long run, and do more experiments, and look at consistency and persistence of students.*

Table 20. Faculty perceptions: Areas for improvement * = deviating idea from one participant (non-study faculty team member). ** = different idea from faculty members who were part of the study team.

Areas of Improvement

- q. *Involvement from non-faculty*
 - i. Only thing is more involvement from all the angles, [from support staff] could have been better. *
 - ii. It would have been better, if [the session] could have been done at a better time... we felt that the whole thing is fruitful only if students read... Everything rests on the students. If they don't read and come, if they don't prepare well, the entire process becomes a waste.
- r. *For faculty as facilitators ***
 - i. I realized that in spite of the orientation, we need a couple of sessions, and perhaps even a mock session.

- ii. The topic requires preparation from the tutor... I also should have read more and gone through the resources more.
 - iii. With experience, the facilitator can overcome the difficulty in [the limited amount of time to think about the mispoints and give an instant response].
 - iv. [Small-group skills can be gained by] repeated practice, and after that, I feel all the faculty should have a discussion talking about everyone's experiences... possibly even some good video resources...[and] a good orientation to brief them well, and then debrief as well.
 - v. [We need to also] convince faculty this is really good and [that] it really works.
- s. *For CBL sessions* **
- i. For the CBL exercises, the processing itself could be improved, like what are the things we need to consider, what the framework should be - for that we need a lot of guidance.
 - ii. Problem is infrastructure and manpower... so scale up slowly.
- t. *Hindrances for student participation*
- i. They had sessional exam coming up, and [ADD] was not in the exam, so they did not prepare.
 - ii. [Students] had just come from vacation, so many influencing factors.
- u. *Solutions to improving student participation*
- i. We need to evaluate them. And that needs to be told to them... I think that will make them come better prepared.... Could be a checklist... needs to be scored and needs to be weighted to the formative exam. *
 - ii. Students [should] choose [some] of the important topics, then it will be more beneficial for them and they will be preparing well... since it is their own topic, they will read and come. *
 - iii. If we can look at the possibility of a protected time to go through the resources... where they can read for themselves for this particular topic... we had not given them scheduled time... they were supposed to do it during their own time. **
 - iv. I gave collective leadership.... we can think of giving it to individual or giving a rotation. **