

Approaching PBL Practically: A Guide for Students by Students

Authored & reviewed by:

**Students Enhancing PBL Tutorial Understanding at McMaster:
The SEPTUM Group***

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preface

In September 2007, the authors of this guide presented a talk to the class of 2010 at McMaster University entitled, “An Approach to PBL.” The goal was to share with incoming students how each of us approached problem-based learning (PBL) through medical foundations 1 through 4, answering the following questions:

- What is the first thing you do after tutorial regarding your learning objectives?
- What resources do you use? Is there an order you follow in using your resources?
- How do you synthesize the information you acquire while tackling the learning objectives?
- What strategies do you employ in making tutorial effective?
- What other tips do you have for making learning effective in general?

All of us are now in clerkship and less than a year from graduation, and as we look back to pre-clerkship, we hope to offer some insight on how to approach PBL. This guide is intended for those studying in PBL settings, as well as those interested in eventually wanting to study in such a setting. (New PBL tutors may benefit from reading this as well!)

SO WE BEGIN...

Imagine or think back to a time when you had to learn a new language. There are several important steps. You begin by finding a resource that has some credibility. You learn how to pronounce and write letters, and then string those letters together into words to give them meaning. The next step is to string those words together to form sentences that make sense. You get feedback from your instructor on whether you’ve put the words together correctly. Often, your instructor might ask a classmate of yours to help you out if you’re having difficulty. Or you yourself might ask a classmate directly to help you out.

You leave your classroom and meet someone who is fluent in the language you are learning, but you find it difficult to converse, because what you know is limited to reading and writing. You still need lots of practice to have a conversation confidently.

Pre-clerkship is like learning a new language, and it comes as no surprise that the units of this phase are referred to as Medical Foundations. The next phase, or clerkship, is where you’ll practice the language. Most of this guide is intended to help you think about pre-clerkship. But remember, PBL will continue through clerkship, through residency, and then life-long in practice.

We should probably start on a note of caution by making it clear that we are not experts in any of these areas. The chapters that follow are informed primarily by our personal experiences in PBL-based learning systems. Though we’re sure you will find more than a few people who agree with our comments, nothing here should be taken as fact... Feel free to use the excellent analytical skills that got you this far and decide for yourself what is useful to you. Proceed with caution!

The SEPTUM Group

chapter 1: what is PBL, a student's perspective

Problem-based learning (PBL) has become a fashionable approach to medical education over the past 40 years. Virtually every medical school in Canada, and many internationally, has introduced some form of "PBL-style" learning into their curriculum. But despite its ubiquity, debate continues on the merits of PBL in comparison to a more "traditional" educational format. Perhaps the most interesting element of these debates is that few people are able to define exactly what PBL is, and how its methodology differs from that of "traditional" medical education. And of course, the real issue at stake is not just how we want to train future doctors, but also *what kind* of doctors we want to train.

Just as important as these weighty issues, and more immediate to you, the student who is in the throes of medical education, is understanding the PBL learning model as it relates to your personal development. While some new medical students will feel right at home immediately in a PBL environment, many will initially feel confused and daunted at making the transition from their undergraduate style of learning to the PBL model. So developing a nuanced sense of what PBL is will make your study more efficient, fun, and rich with meaning. One of the most important elements of PBL is self-reflection – so start learning about the way you learn!

"Problem-based learning is an approach to education in which learning is stimulated and motivated by the learner's encounter with problems"

That vague statement in the box on your left is perhaps the closest we can come to a universal definition of PBL. Every institution that has adopted the PBL learning model has also adapted it to their particular goals. There is no single dominant model of PBL – we

would posit this as one of the main reasons for all of the confusion regarding the role of PBL in medical education. Not all PBL is created equal.

That being said, we have a personal bias (stated right up front!) that McMaster University's model of PBL, being one of the original models, is the best source for exploring the core elements of PBL, their merits, their detriments, and how they can be best used for effective student learning.

THE HISTORY OF PBL AT McMASTER

The medical school at McMaster University in Hamilton, Ontario¹ developed at a unique point in the educational climate of Canada. It was the 1960s, the hair was long, the colours shockingly uncoordinated, and the only thing wilder than the music was the brazen drug use and impulsive promiscuity of people now our parents' age (so we'd rather not think about it).

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¹ ...which is definitely *not* Toronto, but most American writers seem to equate "Canada" with "Toronto." Some Torontonians, too.

Perhaps our understanding of the sixties is a little sketchy– but one of the general sentiments of that time, in education as well as pop culture, was one of change and rebellion. The approach to medical education had not significantly changed since the time of the Flexner Report – Medical Education in the United States and Canada – of 1910. Since that time, North American society had become more urban, educated, and diverse, long-held social values were being questioned, medical science had progressed immeasurably, new specialties had developed, and the role of the physician was in constant flux. Yet, changes in medical education were slow to develop.

When the young John Evans, a University of Toronto graduate, was selected in 1965 as the new dean of the future medical school, he brought with him a desire to challenge the way medicine was being taught and thought that changes could only be wrought in a new school not burdened by years of tradition. He selected four similarly-minded young physicians – Jim Anderson, Fraser Mustard, Bill Spaulding, and Bill Walsh – who together made up the original McMaster Education Committee and defined the original model and goals of what was to become PBL. Together they are known as the “Five Founding Fathers.”

The standard educational practice at that time was one of teaching– the analogy would be of the student as an ‘empty vessel’ which teachers would funnel vast amounts of information into, in the hopes that the student would retain it (although research and common sense show us that the ‘empty vessel’ is more akin to a sieve). The aim of the education committee, however was to facilitate students’ active learning – the ability to solve problems; to gather, evaluate, interpret and apply large amounts of information to better patient care; and to develop the skills which would later allow them to adapt to whatever branch of medicine they chose as a career. Furthermore, the ability to function in a group, to self-evaluate, and reflect upon one’s own learning needs were also considered to be vital goals in the development of a physician who after graduation could further develop to meet the needs of their patients. The learning model that the committee eventually decided would best meet these goals was that of a small group, working together, studying independently, and learning through the lens of a clinical problem– the foundations of PBL.

As is often the case with innovation, the committee’s ideas were not entirely unique. In refining their goals, they traveled extensively to other schools in search of inspiration. One of the learning models that most inspired them was the case-study method of the Harvard Business School, which involved small groups of students working through and discussing practical cases.² Of course students had been using similar strategies well before that in informal study groups, but introducing such experiences formally into a curriculum made good sense– students study in groups and work through problems together because it is an effective and enjoyable method of learning.³

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² What goes around comes around: the Harvard Medical School’s “New Pathway” curriculum would eventually be one of the early adopters of McMaster’s PBL educational model outside of Canada.

³ ...especially with food and beer.

BASIC STRUCTURE OF PBL

So what made the PBL model different from the case-study method already in use at Harvard? What gives PBL its unique flavour? The breakthrough was surprisingly simple: instead of completing problems after having been passively taught the knowledge and skills needed to understand them, problems were encountered by students before learning took place, and acted as the stimulus and motivation for their learning.

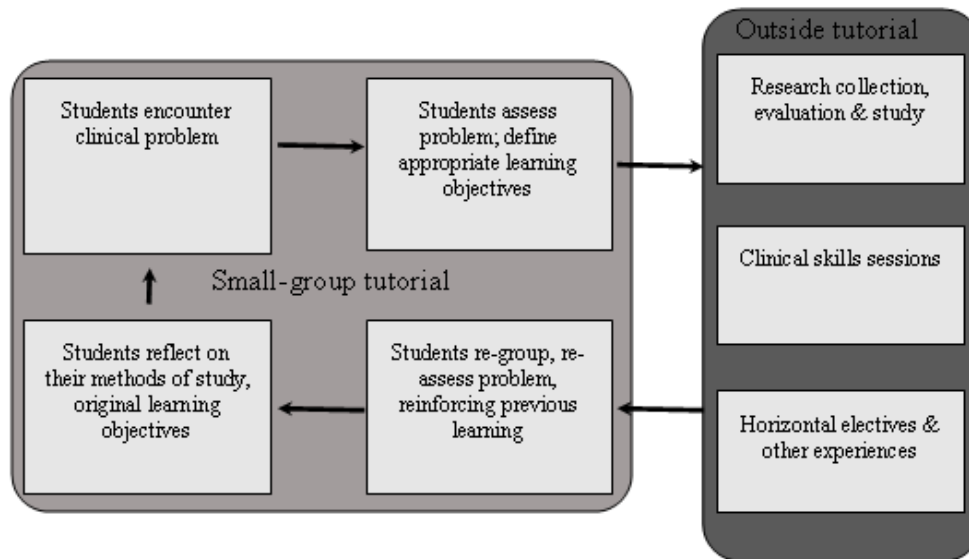


Figure 1: Problem-Based Learning model

This “reversed learning” would facilitate independent thought on the part of the students, who had to extrapolate learning goals based on the clinical problem at hand, find appropriate resources, and integrate that information in the context of the clinical problem. Faculty would no longer try to “fill the empty vessel” but rather function as facilitators, guiding the students, filling in gaps, and providing clinical experience.

This was thought to be an effective learning method for physicians-in-training because it simulated the way that real, practicing doctors usually learned in the real world, and because of the easy transfer of information to practical skills. Even at that time, the amount of medical knowledge available was quickly outstripping the memory capacity of even the most prodigious student. What the education committee realized was that only the basics of medical practice could be taught— one of the fundamental goals of medical school had to be to teach students how to learn.

Though the original form of PBL soon gained popularity throughout Canada and around the world, it was often extensively modified to meet the needs of pre-existing curricula at other medical schools. Howard Barrows, an American neurologist with an intense interest in

medical education, was extensively involved with McMaster in the early days of the medical school, and has written extensively on PBL and its many pedagogical progeny. His 1985 article, “A taxonomy of problem-based learning methods” organizes the many approaches by which PBL has been implemented into curricula, and the strengths and weaknesses of each approach, from case-based learning to full “closed-loop” PBL where students structure their learning around problems as in the McMaster model.

THE ROLE OF THE TUTOR

Also unique in PBL was the role of the tutor – what was their function in a small-group, student-driven learning environment? Should they just mediate and contribute to group dynamics, or should they lecture extensively? Generally, students have found the most effective style of tutoring is somewhere in the middle: as a facilitator of group dynamics and a neutral party, as well as a medical expert who could bring their experience to the table in a way which would not dominate and prohibit student-directed learning.

Of course, every tutorial group develops its own style and group norms, and every tutor has their own style as well. Some tutors are very informal while others are more guarded.⁴ Some talk a lot, others hardly at all. There have of course been many controversies over the years regarding the variability between tutors and their skill in the unique art of small-group PBL. This has remained one of the great challenges of PBL– the art of teaching tutors to teach!

For more information on the role of the tutor in PBL, a great and practical resource is “The Tutor in PBL: A Novice’s Guide” by Allyn Walsh, which can be found at <http://fhs.mcmaster.ca/facdev/tutorPBL.pdf>

And so it goes...

This is of course just a short introduction to a pedagogy that has been in use for over 40 years at McMaster and is now used around the world, and it is hopefully a learning style you will appreciate and enjoy. Our hopes are that you take away from this a basic understanding of what PBL is, what it is meant to accomplish in student learning, and the basic principles behind PBL as it is practiced at Mac. The following chapters of this booklet go over in more detail some of the learning strategies, tips, and tricks we have picked up over the years, and address many of the concerns that students have when making the transition from a “standard” undergraduate degree to the complex and challenging world of problem-based learning.

...after all, isn’t all of medicine problem-based anyway?

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⁴ The first tutorials at McMaster were considered odd because of the equal importance of the teacher and student, often resulting in them knowing one another on a first-name basis, something which was uncommon in medical schools at the time.

chapter 2: setting and tackling your learning objectives

As we mentioned in our preface, pre-clerkship PBL is like learning the alphabet; no one can expect to spell before they learn their letters. To stretch this analogy further, you also must first learn to spell words before you can learn sentences. Good objectives are essential to this exercise. Equally important is experimenting with your group's dynamics to help strengthen or correct your understanding, and getting feedback from your tutor as necessary (discussed in a later chapter).

WHAT IS OBJECTIVE SETTING?

In the PBL model, objective setting is simply the development of a framework by which learners will choose to approach what is unknown about a clinical case. Typically, learners are first provided a clinical vignette and possibly one or two general learning objectives. With this information, objectives are then set so that learners can explore, on their own terms, medical, physiological, anatomical, and basic science concepts that relate to a clinical scenario. Objectives are meant to be a guide that will facilitate students' self-study and provide a basis for later discussion of the clinical case once the self-study is complete. Objectives should not be so specific that they limit students from exploring concepts of interest to themselves nor should they be so broad that students feel unable to complete the self-study in time. The remainder of this chapter will explore the process by which objectives may be set in PBL.

WHY SET OBJECTIVES?

It may seem obvious that when you are challenged with a problem you cannot solve immediately, you will simply endeavour to solve that problem. As will be discussed in more detail later, it is not so simple in a PBL environment. Objective setting allows you to narrow your goals of study. One cannot expect to learn every nuance of a medical condition based on one case presentation. Also, it is imperative that the big picture not be forgotten. It is very easy to become complacent in objective setting as it can seem more efficient for a tutorial group to agree to go home and read around "the disease of the day", but in the long run it makes it more difficult to put together the big picture. More simply put, there is a constant tug of war between breadth and depth. More traditional medical schools try to achieve both by providing breadth through lectures and expecting depth to be gained during self-study. In PBL objective setting allows groups to assign an appropriate depth to each learning goal to feel they properly understand a concept (be it physiology, anatomy, or diagnosis and treatment, etc...). Breadth in PBL is usually achieved by overlapping clinical scenarios, general learning objectives set by the curriculum planners and most importantly by students keeping the big picture in mind.

Most importantly, however, the reason that you set objectives is so that you care about what you're learning, will pursue the content less superficially, and will have a higher retention

rate of what you are learning.⁵ As well, in the long-term, medical education based on objective setting in a PBL context translates to better life-long learning practices.⁶

A FINE BALANCE

The two biggest pitfalls that many groups encounter are that they quickly deemphasize objective setting and secondly that they over emphasize the clinical context sacrificing the knowledge that needs to be gained in other spheres.⁷ One responsibility of the tutor is to ensure that this does not happen while in tutorial, however the tutor has no control over what happens during the self-study period. It is crucial that a balance be achieved whereby students feel they understand the clinical scenario given to them at an appropriate intensity for their current level of study as well as pick up the relevant knowledge in other spheres at the same time. What this entails is appropriately selecting objectives, keeping in mind that the result is not always diagnosis and treatment.

CONSTRUCTIVISM AND OTHER THEORETICAL BANTER

Our goal is to impress upon you the importance of appropriate objective setting prior to self-study in order to better your understanding (and retention) of material. It is our hope that with a few key educational philosophy notions in mind, you will appreciate why PBL works and why ownership of your learning is crucial. Savery and Duffy (2001), in a technical report for the Center for Research on Learning and Technology at Indiana University, very elegantly expand on a previous article⁸ of theirs where they detail a constructivist approach to learning. They have three propositions that nicely capture how and why group objective setting is necessary:

- What we understand is a function of the content, the context, the activity of the learner, and, perhaps most importantly, the goals of the learner.
- Cognitive conflict or puzzlement is the stimulus for learning and determines the organization and nature of what is learned.
- Knowledge evolves through social negotiation and through the evaluation of the viability of individual understandings. At the individual level, other individuals are a primary mechanism for testing our understanding.

Hopefully, with these in mind, you will not become frustrated that the curriculum planners do not provide you with preset learning objectives and you will not diminish the value of objective setting over the course of your time in PBL. We hope that you will constantly

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⁵ Spencer JA, Jordan RK. Learner centred approaches in medical education. *BMJ*. 1999 May 8; 318:1280-1283.

⁶ Shin JH, Haynes RB, Johnston ME. Effect of problem-based, self-directed undergraduate education on life-long learning. *CMAJ*. 1993 March 15; 148(6): 969-976.

⁷ Spheres refer to the many different contexts in which clinical scenarios need to be understood and usually include the relevant physiology, anatomy, pathophysiology, pathology, pharmacology and basic science concepts.

⁸ Savery JR, Duffy TM. Problem Based Learning: An Instructional Model and Its Constructivist Framework. *Educational Technology*. 1995 October; 35(5): 31-38.

evaluate the quality of your objectives, as your lack of understanding of core concepts may not be due to insufficient self-study but poorly designed or misunderstood learning objectives.

HOW TO SET OBJECTIVES?

Every tutorial group has a different rhythm and there is no cookie-cutter way to set objectives that will work for every case. With some basic principles in mind, such as those discussed above, chances are that your group will be able to set appropriate goals for self-study for each case. When you reconvene as a group after self-study, it is vitally important that you collectively reflect on why your prior learning objectives were or were not appropriate. This will prevent you from making the same mistake twice. We know this seems obvious, but in practice, it isn't uncommon to find groups that repeatedly set objectives that are inappropriate, resulting in inefficient self-study time.

Before we give an over-simplified example of how to set objectives, we want to give a framework of the tutorial process. In the PBL literature, a succinct step-wise approach to how tutorials work is known as the "Maastricht 'seven jump' sequence for problem based learning".⁹ It starts with a clinical scenario being provided and details the steps that should be taken by the learners:

1. Clarify and agree on working definitions and unclear terms and concepts.
2. Define the problems; agree which phenomena need explanation.
3. Analyze the problem (brainstorm)
4. Arrange possible explanations and working hypotheses
5. Generate then prioritize learning objectives
6. Research the learning objectives [self-study]
7. Report back, synthesize explanations, and apply newly acquired information to the problem

An example of objective setting...

With the above in mind, here is a simple case and an example of a process (again only one method) that a group may use to set objectives:

Global Learning Objective:

- At the end of this case students should understand common microbes that cause urinary tract infections, factors that predispose certain individuals to UTIs as well common complications of UTIs.

"Ms. C. is a 25-year-old previously healthy female who presents to the ED after a 2-day history of dysuria and increased frequency of urination. She is on no medications and denies any drug allergies. On physical examination she is afebrile, her other vitals signs are within normal limits and abdominal examination is completely normal. She has no costovertebral angle tenderness. She is in a lot of discomfort and wants to know why this is happening."

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⁹ Spencer JA, Jordan RK. Learner centred approaches in medical education. *BMJ*. 1999 May 8; 318:1280-1283.

With this information, your group can now dissect the case. It is common practice to approach longer cases in chunks and run through steps 1, 2 and possibly 3 of the 'seven jump' then analyze the case as a whole for steps 4 and 5. In this case, your group would likely approach it as a whole. (Be wary to not fall into the trap of just simply going home and answering the general learning objective as while this seems pretty comprehensive, there is *always* more to cases than the global objectives.)

Your group decides that they are clear on all terms and concepts in the case based on prior knowledge but are unsure what "dysuria" means. For step 2, you believe that the problem is some sort of urinary tract infection (based perhaps on activation of prior knowledge of one of the group members, assistance from the tutor or, as commonly occurs, from the general learning objective) and that you need to explain why the patient, a healthy 25 year old, developed one. Next you go around the table and analyze the problem by developing a series of questions (the list need not be exhaustive) based on curiosities of the group members as well as the general goals of the current unit. This case for example would be approached differently if it were in a renal unit or an infectious diseases unit.

Some questions that may be asked include:

- What is the urinary tract?
- What part does the urinary tract play in fluid homeostasis?
- What is a normal frequency of voiding?
- What causes UTIs?
- What if she was febrile? How do you define febrile/afebrile?
- How do you diagnosis/treat UTIs?
- How does the body fight infections?
- What are other diseases of the urinary tract?
- What causes the symptoms of pain and increased frequency?
- What are the normal microbes that live in the urinary tract?

There are countless possible questions but we just gave a few for the purposes of discussion (N.B. make sure that in tutorial your questions are focused or your colleagues will quickly deemphasize the brainstorming process).

Now to transition from brainstorming to objective setting you need to revisit the questions you have asked. First, try to eliminate questions that are out of place in that unit (i.e. if this is an infectious disease unit you may not be concerned about other diseases of the urinary tract or its role in fluid homeostasis) or that have been or will be addressed elsewhere (this likely includes things you might cover in anatomy, clinical skills sessions or lecture).

Next, determine if the questions that you have asked meet the general objectives of the case. If not, you can supplement a question you asked or make the general objective one of your objectives or a few smaller objectives as required. Alternatively, do any questions stray far from the general objectives? In this example someone may have wanted to cover antibiotics and their pharmacology, however, in this case that would be a very large objective that does not fit with the global objective.

With a more refined set of questions that your group would like answered, you need to focus your questions and make some assumptions about what is prudent to learn now for this case, keeping in mind all the spheres that were talked about earlier. If you are so inclined you can even keep tabs of each sphere concurrently, formally or informally, for each case as it would be relevant to that unit (i.e. anatomy = urinary tract; physiology = urinary tract immune defences, etc...). With this in mind and with the tutor's assistance, you can turn your remaining brainstorming questions into a manageable set of objectives. What is manageable in the time you have to self-study will come with experience.

One last suggestion is that you might also want to jot down a few personal objectives. For instance, if your group decided that the anatomy of the urinary tract was covered in the renal unit but you think you did not do a good job of it then you could make a personal objective to review it. Now that you have both your group and personal objectives, it is time to do self-study. By far the most important is selecting good resources, not taking a long time to choose which resources you are going to use and using as few as possible per case.

TACKLING YOUR OBJECTIVES

Remember that before you start critiquing how someone else speaks a language, you have to understand the language yourself. Medicine is no different. In pre-clerkship, as a medical student, you have to take the time to learn normal first, before you can appreciate abnormal. Here at McMaster, your learning is problem-based, and not course-based, so you will have to learn normal and abnormal together in order to understand the problem.

The objectives you set will have divided your learning for you into normal and abnormal. Having said that, when you start tackling your objectives, the first book you pick up shouldn't have "patho" in it (i.e. pathophysiology, pathology). You want to use a resource that will develop your understanding of normal anatomy, physiology and biochemistry, in addition to others. Even if you think you are familiar with the normal from previous experiences, it isn't a bad idea to review them first. You can then move on to a resource that explains the abnormal.¹⁰

START BASIC, THEN BUILD

Your previous exposure to health sciences and any courses you might have taken will dictate how you progress through resources when tackling your objectives. Part of this will require experimenting with different resources, but you will soon realize whether what you are reading is too simple or complex for your stage. Some people in your class will start with more basic and simpler resources to grasp a broad concept, and then progress to a more detailed resource for more detail. Some of those with backgrounds in the health sciences will jump right to complex resources. And there will always be some who stick to simple resources during the pre-clerkship curriculum. That's okay! Everyone will progress in more depth during their clerkship rotations.

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¹⁰ The mnemonic "DEEPICT" can be a useful way to remember the important components of the abnormal: *Definition, Epidemiology, Etiology, Prognosis, Investigations, Clinical presentations, Treatment*

It's also important to remember that your goal is to develop an understanding of medical terminology and how different terms are linked conceptually, which will help you in explaining specific scenarios. Make sure you understand the basics before you move on. For example, every time you come across a word or phrase that you do not understand (and believe us, there will be many), look it up! Don't move on without doing so.

READING AND NOTE-TAKING

Everyone has a different learning style. Some people like to read and process. Others like to read, process, and write down. Still, others like to read, process, write, and process again. The idea is to develop an understanding of the core concepts, and here at McMaster, the more you understand, the less you have to memorize. Once you start clerkship, you'll realize that a lot of the minutia of details you focused on during your medical foundations will need to be reviewed or re-learned (i.e. cytokines involved in the inflammatory pathway, or the interconnections between the components of the basal ganglia). And that shouldn't be the focus of pre-clerkship (although it will be for some in the class!). Instead, as you will repeatedly be told, the focus is on understanding the concepts and principles that will help you to explain what is going wrong in the problem you are working on. As you're reading about the abnormal, repeatedly ask yourself WHY, WHY, and WHY and this will help you to reflect on your normal understanding. If you can't explain WHY something is going wrong, you need to go back and review your normal.

Whatever your style, you need to learn to manage your time, so that you spend an appropriate amount of time for each of your objectives. The last thing you want to happen is going to tutorial with the expectation of learning everything about objectives you never got to. This may work sometimes for objectives lower on the "significance" scale, but you will soon be noticed if you do not share your thoughts. Remember, tutorial is not a medium to review everything – it is primarily about sharing and discussing ideas. Some students get tangled up by thinking that tutorial is a place where they are going to "get information" and then are frustrated with the "inefficiency" of it.

IDENTIFY YOUR GAPS

As you do your reading, there will undoubtedly be times when you just don't understand a concept. You will identify many such gaps, and it is your responsibility to make note of these, and bring them to tutorial. Your tutor and your group will help you in filling your gaps. Take advantage of you group members in tutorial to suggest new ideas and issues you may not have thought of nor had time to research. In addition, share your own ideas and discoveries (without bragging too much ☺).

THE BOTTOM LINE

If you keep the above in mind, you will never spend too much time thinking to yourself "have I learned enough?" when tackling your objectives. The truth is that you'll never feel that you've learned "enough" in a problem-based setting. What you need to do is read, watch,

and listen to string together concepts into schemas, much like stringing together words into sentence.

Remember, you cannot understand how a disease process affects an organ before you understand the normal anatomy and physiology of that organ. Once you understand these concepts, you can begin to understand how then a particular disease might affect other systems. Depending on your level, it may be completely appropriate to understand how a disease affects only one system until you later expand your breadth to comprehend multiple systems and how they interact. Always remember that your job is to build up a framework of concepts slowly so that when presented with a new clinical scenario, you first activate this prior knowledge and then search for knowledge gaps. When you learned how to drive, you had to learn how to accelerate before you could learn to brake.

chapter 3: making tutorial worthwhile and effective

We all enjoy great quotes, so here we share a few with you to emphasize seven pearls we've discovered from our own MF experiences for how to make tutorial worthwhile and effective.

Pearl #1:

"The true teacher defends his pupils against his own personal influence."
~ Amos Bronson Alcott

Don't let the tutor run the show. One of the best ways to solidify knowledge is to struggle with it as a group, sort through the ambiguities and lingering questions amongst each other, and try to piece things together as a team. The tutor is not a lecturer, but in fact a guide, intervening only when necessary to steer the discussion back on course.

Pearl #2:

"It is possible to store the mind with a million facts and still be entirely uneducated."
~ Alec Bourne

Talk and discuss ideas rather than read and regurgitate facts. Recreating lists that need to be individually memorized is generally not a useful exercise. Although bringing books and notes to tutorial can be useful, try not to rely on them as a crutch. A good way to test your understanding of the material is to see whether you can carry an educated conversation or debate about it without referring to your notes.

Pearl #3:

"Un bon croquis vaut mieux qu'un long discours." ("A good sketch is better than a long speech.")
~ Napoleon Bonaparte

Visual aids can be very helpful tools for working through concepts, summarizing information, and serving as a focus for discussion. Try going through the process of drawing your own diagrams or flow charts as a group to challenge your understanding of what you read. Not every idea will be best explained by a diagram, but often physiology, pathophysiology, and treatment algorithms lend themselves nicely to visual aids.

Pearl #4:

"You can know the name of a bird in all the languages of the world, but when you're finished, you'll know absolutely nothing whatever about the bird...So let's look at the bird and see what it's doing - that's what counts. I learned very early the difference between knowing the name of something and knowing something."
~ Richard Feynman

Relate the tutorial discussion back to the actual cases. Your knowledge of anatomy, physiology, pathophysiology, pharmacology, and clinical trials is only as useful as your ability to apply it to patient care. The MF cases give you opportunities to develop this important skill. Putting the focus of learning on the patient is what PBL is about and it defines McMaster's unique medical curriculum.

Pearl #5:

"Unus pro omnibus, omnes pro uno." ("One for all, all for one.")
~ Traditional motto of Switzerland

See your tutorial group as a team composed of students from different age groups, educational backgrounds, and geographical areas. By utilizing each member's strengths (which every student has) and helping each member overcome their individual weaknesses (again, every student has them), you'll learn much more as a team than each student could have learned on his or her own. Learn to share (resources, tips, etc) rather than compete with each other. Remember – you're all in it together. Even more brilliantly, you are only competing against yourself, marks are for Bachelor's degrees.

Pearl #6:

"Always laugh when you can. It is cheap medicine."
~ Lord Byron

It's okay not to be serious during tutorial all the time. In fact, it's healthy. There will be many opportunities to be stressed out in the future so take advantage of those moments when you don't have to be. Learning medicine is hard work, but try to have fun with it.

Pearl #7:

"Never seem more learned than the people you are with. Wear your learning like a pocket watch and keep it hidden. Do not pull it out to count the hours, but give the time when you are asked."
~ Lord Chesterfield

The quote speaks for itself. Take it to heart and you'll go a long way not only in tutorial, but in clerkship, residency, and beyond.

As you fly through the MFs, you'll quickly realize that there is an enormous fund of knowledge to grasp in medicine. If by the end of an MF you feel like you've forgotten everything from the previous one, don't worry. No one is expecting that you'll learn everything there is to learn in medicine after the first time around or even after the hundredth time around. In fact, the most important thing you'll learn by the end of your tutorials is how to learn. After all, medical school is just the first step in a career of lifelong learning.

"Education is what survives when what has been learned has been forgotten."
~ B. F. Skinner

chapter 4: troubleshooting through pre-clerkship PBL

NEW GROUP, NEW CHALLENGES

So, once you have finished MF1 (the learning curve of which will appear to go on forever), you will be given a list of your new tutor, new group members, and a new time and location for tutorial. It is normal to be anxious about how your new group will function in comparison to your MF1 group. There are, however, some key principles you should think about before you start dreading your first meeting with your new peers and tutor.

First, think about the common experiences and different situations before each medical foundation. MF1 is a different time and place in your journey through medical school than MF2. You may have experienced the same anxiety about starting out, you may have been overwhelmed with scheduling, or you may have just settled into to your new apartment, with the boxes still unpacked. No matter where you were then, think about some common feelings that you may have had and what you did about them. Most of the time, these anxious thoughts about the unknown subside during the first hour of your new tutorial group.

Second, recall your experiences from your previous tutorial group. There have likely been times of conflict, laughter and learning. Each of these can contain valuable information that can be taken with you to contribute to the next tutorial group, or left behind in the previous tutorial group. Think about what worked for you, what didn't work for you, and what didn't work for others. It is amazing how many common things you will discover work in tutorials!

Finally, remember the feedback you received during informal and formal evaluation. Take the positive attributes you have and pay them forward. The challenges and areas to improve on should be brought forward to the next tutorial group as well. Don't be afraid to identify these during the first few tutorials as a "new" goal for yourself. It will demonstrate your commitment to your own learning and this involves the group and your tutor as observers.

Remember, in a few short weeks, you will feel increasingly comfortable with your new setting. The stages of group process take time. Being negative about previous experiences and criticisms can bring a bad taste to the group right away. Start off on the right foot by filtering out lessons learned from each MF and taking what is valuable to you forward.

"I DON'T LIKE MY TUTOR!"

This can be a common fear of many students about their tutor in each MF. There are many different types of tutors. Tutors have different leadership skills, teaching styles, educational backgrounds, and clinical experiences to offer to each group. Although they are a heterogeneous group of individuals, they are committed to providing a learning environment for medical students. Just like each medical student, each tutor has their strengths and

challenges to offer to the group. The important thing to remember is your tutor's role in the group, and your responsibility to help with this role.

"Not liking your tutor" may be based on one or several situations you may have experienced in your group. But this can be a valuable opportunity to problem solve and to provide constructive feedback to your tutor. In the "real" world, few people "love" their supervisors or colleagues; many of your peers may like them, many peers may dislike them. The important thing to remember is no matter where you are, where you are working, there WILL be someone who may disagree with your principles and who is difficult to get along with.

Providing constructive feedback, avoid gossiping with others, and being proactive about this unfortunate situation is the way to go. Bullying up on your tutor with your group members may not be the solution to your problems. Wouldn't you be defensive if seven people ganged up on you all at once too? There are other ways to go about this: send them an e-mail stating your concerns, ask for a few minutes at the end of tutorial to discuss the issue, or meet with them following tutorial to make them aware of the issues.

If you are ever concerned, and you have tried any of the above unsuccessfully, speak to administration immediately. It is better to identify and address the issue in a timely professional manner. If things aren't getting better, DO SOMETHING ABOUT THEM! It is easier to criticize and complain about an issue than it is to problem solve and seek out resources to resolve the issue.

Don't forget to fill out the final evaluation of your tutor in an honest and constructive manner. This is not the time to get revenge. How would you feel if your tutor used your evaluation in a vengeful manner?

A useful resource which all tutors should be familiar with is "The Tutor in PBL: A Novice's Guide," courtesy of the McMaster Program for Faculty Development. It's also an interesting read for students, and can be downloaded at <http://fhs.mcmaster.ca/facdev/tutorPBL.pdf>.

"I DON'T LIKE MY GROUP!"

Not liking your tutor is similar to not liking your group. Again, you will not always get along with everyone and everyone might not get along with you! The important thing to remember is the task and goal of the tutorial group is to create and provide a learning environment. Becoming best friends and putting your photos on each other's Facebook page is not the primary goal of a tutorial group.

There will be times when you may disagree with another member of your group about a scientific explanation, a comment made, or a leadership style/discussion method. This is why time for evaluation should be set-aside at each and every tutorial. Even if you believe the tutorial went amazingly well (perhaps you are proud that you drew the mannin-binding-lectin pathway from memory), there may be some people who would not share this opinion. Giving everyone an opportunity each and every tutorial helps to identify problems and methods that can be applied for the next tutorial. It is very difficult to want to come to a tutorial group where there is tension and/or serious unresolved issues. Being proactive,

allow for a consistent block of time where people know issues can be discussed will help to avoid problems. It will also encourage quieter, more reserved group members to feel that their voices are respected, too.

It is OK to disagree with someone, but it is never OK to gossip about him or her to others. Bringing an incident that occurred in tutorial to light allows for discussion is a professional way to solve problems – and as the medical profession itself is self-regulating, this is a vital professional skill to develop. Your tutor should help out when necessary to help to facilitate discussion around issues in the group. Even if you are not involved, it is important to listen and to provide feedback and support as necessary.

Remember, each MF doesn't guarantee the perfect group. There may be ups and downs with each group in each MF. The time for each Medical Foundation is limited, so try to use strong communication skills to solve problems and to make the best of the situation. You can always use lessons learned in a negative situation to make a positive one.

EVALUATIONS – I THOUGHT AT MAC WE DON'T OFFICIALLY EVALUATE?

As a doctor, you will be entrusted with many responsibilities – and make almost as many mistakes. The difference between a poor doctor and a great doctor is the struggle for constant improvement. In any work situation, or patient encounter, it is always imperative to view it as a learning lesson and think about how or what you could do better next time. Evaluation is a critical process to life long learning, because if you cannot take criticism to improve yourself, your relationships, and your knowledge, this may develop into a lifelong negative struggle of resistance to important change. One of the most important goals of evaluation is to provide a feedback mechanism to help guide a student's learning. In fact, this is what is involved in accurate self-assessment - gathering data from external sources and determining what is needed to improved one's own performance. (Self-assessment is NOT simply reflecting on how one thinks one is performing – all evidence suggests that everyone is very inaccurate at gauging their own level of achievement).

The Concept Application Exercise (CAE) is just that! It provides an opportunity to evaluate how well you know the concepts and can apply them in different situations. Some people study very hard for this, but given the pressures of tutorials, electives, and personal commitments, it is not possible to study for the CAE as if it were a full-blown exam. Knowing the broad principles and being able to integrate them into clinical situations is what being a physician is all about. With each CAE, take a moment to reflect on what you did to prepare for it, the time required (whether it was the night before or you gave a consistent effort to prepare for each tutorial). This exercise was designed to help in evaluating your own learning and to bring to light things you may want to improve on! Going back to review the CAE is a valuable learning experience. The CAE is not about learning how well you can study for a test (as you likely are already quite good at that) it is a test of your ability to learn, synthesize and apply concepts that you learned on your own terms.

The Personal Progress Index (PPI) is another tool, similar to the CAE. It is designed as a check-in system to make sure you are on the right track for the LMCC (Part 1). Don't freak out if you find yourself in the red zone: many of us will be there at some point (the red zone is defined to include a certain percentage of the class). Think of it as a time to readjust your learning, refine your goals, and take advantage of the resources available to you. Keep track of your scores to see how far you have come! It is a great feeling to know you have actually learned something!

chapter 5: myths, anatomy, clinical skills and electives

MYTHS ABOUT MCMASTER: TRUE OR UNTRUE?

There are a lot of myths and misconceptions amongst students about PBL. These can sometimes cause a lot of frustration for Mac students who are told (usually untrue) rumours about their education. We conducted an informal survey of McMaster's Internal Medicine residents – some were McMaster graduates, others were not – to find out what myths surround the McMaster curriculum. We've listed the top five responses we received, along with our honest reactions.

1. McMaster students don't "learn enough" in a three-year program

Untrue. First, McMaster is a year-long curriculum and the actual time spent in school is comparable to any other four-year program. As you will soon find out, we work just as hard as anyone else, if not harder. Second, you will learn plenty of concepts and usable concrete medical information just like the rest of our colleagues across the country, albeit by a different method. But, as mentioned ad nauseam in previous chapters, McMaster trains physicians who are lifelong learners, meaning that you will learn how to add to your knowledge base continually. This is the single most important learning that you will do at Mac. Besides, it's impossible to know everything no matter where you train; the day a physician knows "enough" is the day s/he should retire.

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A review by RE Thomas (1997) found that while "PBL students usually pursue fewer questions than those identified by the staff who planned the problem" (again, the importance of setting good objectives!), they also

performed slightly better on paper-and-pencil clinical examinations and slightly worse on basic science examinations than those trained by conventional curricular methods; consult more journal articles and books, undertake more computer searches, and are more likely to understand material compared to conventional curriculum students.¹¹

2. The absence of a comprehensive anatomy curriculum puts students at a disadvantage in clinical settings and on evaluative exercises

Mostly untrue. Although in comparison with other medical curricula, McMaster has the smallest amount (proportionally) of didactic teaching, the COMPASS curriculum is certainly not a complete free for all. The COMPASS curriculum is tailored to a variety of learning styles. Concerning anatomy, each student may rely on tutorials and anatomy sessions alone

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¹¹ Thomas, RE. Problem-based learning: Measurable Outcomes. *Medical Education* 1997 (31), 320-329.

to suffice their learning, whereas others may choose to have additional sessions or maintain a greater focus with self study. Instead, we tend learn clinically relevant anatomy in our tutorials and clinical skills sessions.

The only exception (and the reason for the “mostly” qualifier at the beginning of this response) is for those who wish to pursue surgical specialties, which constituted 16% (23 students) from the Class of 2008. These students sometimes get concerned that they might be at a disadvantage in relation to their peers across the country. Then again, surgically-inclined students learn to use their newly acquired self-directed learning skills and the various resources offered at the anatomy lab to shine in the operating room. Are you sensing the theme starting to develop here?

Further, a recent study of 411 students comparing perceived knowledge and anatomy test scores (clinical anatomy and non-clinical anatomy) showed that differences between PBL and non-PBL students by the time of graduation were not statistically significant.¹² While “all PBL is not created equal”, it seems that a PBL curriculum is not inherently weak in anatomy, especially *clinically-relevant* anatomy.

3. There is a complete lack of structured teaching

Untrue. It is true that in comparison with other medical curricula, McMaster has the least amount of didactic teaching (i.e. “lectures” or large-group sessions) and it certainly has the least amount of mandatory didactic teaching. Nonetheless, one of the biggest changes in the COMPASS curriculum is the recognition that some students prefer to learn in structured contexts.

PBL tutorials are not complete free-for-alls. Problems are structured to ensure that they cover the foundations of medical practice and are ordered in a way that leads a student from general to more advanced principles. Tutors are given objectives that must be covered for each tutorial, and while the group may choose to stray from the topic, the tutor will ensure that the mandatory objectives are understood. This has the effect of standardizing the curriculum across groups to some extent.

In addition, there are supplemental twice-weekly large-group sessions (lectures) in most of the pre-clerkship foundations, where attendance is definitely expected but not enforced. Most of the class finds these large-group sessions to be quite helpful in integrating new information. During clerkship, most rotations have some component of mandatory didactic teaching. Therefore, there is a structured curriculum with clearly defined objectives, but you can be as unstructured as you like in meeting them.

4. It’s possible to fall through the cracks

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¹² Prince KJ, vanMameren H. et al. Does problem-based learning lead to deficiencies in basic science knowledge? An empirical case on anatomy. *Medical Education*. 2003;37:15-21

True, but this is a debatable point. Despite multiple check points throughout our training (i.e. tutorial evaluations, PPIs, OSCEs, CAEs/exams) the lack of a clear pass/fail system might make it easier to slip by unnoticed when you haven't quite met expectations. The goal of these evaluations is to identify at-risk students and to help them improve their learning- to that extent they have been successful. The scores of McMaster students on the LMCC Part 1 at McMaster have consistently been high since these feedback systems were introduced.¹³ It really is up to you to make sure that you're on the right track in your learning, so don't let yourself fall through the cracks!

5. All of the students and faculty are hippies

Untrue, though perhaps this was true when the program was conceived back in the 1960s. The only requirement of being a student or faculty at McMaster is an open mind. Coincidentally, open-mindedness seems to be a trait that most good physicians possess. If that makes us all "hippies", so be it! There are students of all kinds in this program, which is one of the many things that make it so exciting to go to Mac. You don't have to eat granola, although that might be exciting too.

HOW CAN I LEARN ANATOMY EFFECTIVELY?

As mentioned earlier, we have limited exposure to structured anatomy teaching. Some people love this aspect of the curriculum while others hate it. Some of the authors did full human anatomy courses in our undergraduate studies, and we can definitively say that there are few people outside of surgical specialties who will need to know minute anatomical details found in traditional courses. For instance, if you ask a physician other than an orthopedic surgeon which three muscles insert onto the tibial tuberosity¹⁴, we assure you that the vast majority will stare at you with blank looks on their faces.

At the same time, almost everyone will need to know at least some anatomy as a physician. It is up to you to decide how much you will learn based on your learning needs (our theme is popping up again!). We also think that knowing some anatomy will help you understand the physiology you learn in the pre-clerkship curriculum.

To help you with anatomy, there are several resources you can consult. First and foremost is the anatomy department in the hospital (a great place if you're a visual/tactile learner). You can book private sessions as an MF group with one of the anatomists in the department and you can set your own objectives for the sessions. If you want to be completely self-directed, you can always go to the lab on your own time and spend as much time as you want learning at your own pace. Other resources include textbooks; Tortora is the favourite at Mac and has an appropriate level of detail. There also some online resources available through the library. And some of the best anatomy you'll ever learn is being a surgical assistant in the OR during an elective! Find what works and stick with it.

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¹³ Cunnington, J. Evolution of student assessment in McMaster University's MD Programme. *Medical Teacher*, Vol.24, No.3, 2002, pp.254-260

¹⁴ It's semitendinosus, gracilis, and sartorius in case you were wondering...

WHAT DO I MAKE OF CLINICAL SKILLS?

Take your clinical skills sessions seriously! This is the opportunity to learn how to do something right the first time. Taking shortcuts by not preparing for each session can result in a lack of knowledge when it comes to physical findings. These findings are vital to painting the “clinical picture” of a patient in clerkship and residency.

Learning to take a good history is fundamental. Most of the diagnostic information comes from the patient history, so make this a primary goal for each clinical opportunity. For clinical presentations, try to develop a system to cover all your question bases. This is a work in progress and only gets better with time and experience! See the appendix for a template on organizing your clinical presentation.

As you proceed through each MF, you will develop a toolbox full of resources available to use in PBL. Don't forget to take advantage of horizontal electives in order to consolidate your learning, where you will work on improving and practicing your clinical skills.

HOW DO I GET THE MOST OUT OF MY ELECTIVES?

This section applies to both horizontal electives and block electives. By the way, let's dispel another myth right off the bat: No, you do not need to do a lot of horizontal electives in first year. Use your self-evaluation and PBL skills to do as much (or as little) as you need... see, there's that theme again.

In terms of optimizing your elective experiences, we have devised some “clear” recommendations for electives based on our own experiences:

1. Clear learning objectives for your electives

There is an old PBL saying that bad objectives equal bad learning. An elective is the most self-directed that self-directed learning can get. You set your own objectives and usually no one will ensure that you're achieving them but you. Take the time to make clear, achievable objectives that you think are useful. Try to identify and fill in knowledge gaps wherever you can. This is what self-directed learning is all about.

2. Clear communication

Be clear with your supervisor about your objectives so that s/he can help you achieve them. Also, be upfront with your clinical experience to date. If you did some horizontal electives and you're comfortable in an area, tell your supervisor – you won't want to be babied. At the same time, if you are in an unfamiliar environment, don't hesitate to let your supervisor know that it's your first time doing something. There's nothing worse than feeling overwhelmed in an unfamiliar environment.

You should continue to communicate with your supervisor throughout your elective. It is a good idea to sit down with him/her halfway through for an informal feedback session so that you can use the second half of the elective to work on areas needing attention. You can even use the final evaluation form provided by the program to inform the discussion.

3. Clear timeline

Be clear with your supervisor regarding which dates and times you will join them. This will help you become more accountable and is good practice for when you will actually have responsibilities (i.e. clerkship and beyond). Try to set time-oriented goals if you need them to stay on track. For example, one of the authors of this guide did a two-week block elective in Anaesthesia after first year. His specific independent learning goals were to learn about intraoperative fluid management in week one and the management of the difficulty airway in week two.

4. Clear evaluation

At some point before or during your elective, you should let your supervisor know that an evaluation will be required at the end of your time together. Set a clear time and place to do the evaluation as this is probably the single most useful thing you can get from any elective. As a side note, many supervisors (especially those who aren't in teaching centres) hesitate to provide constructive feedback and choose to focus exclusively on your positive attributes. Though it sounds nice at the time, this type of evaluation isn't always helpful in our development- you're only getting half the feedback you deserve. Try to seek constructive comments actively whenever you can. It will only help you become a better physician.

5. Other potentially helpful electives tips

Professionalism is absolutely required at all times. There is no excuse for not being on time or not dressing appropriately while you're on elective. Remember that electives are not vacation time. Although there will be a lot less structure than our core learning, you should try to take advantage of being in a clinical environment as much as possible, especially in first year. That said, don't forget that you should relax and have fun as much as you can during your electives because our core learning time is certainly intense.

Don't feel obligated to travel overseas for an elective after first-year. There are many advantages and disadvantages to travelling abroad for an elective, and it's up to you to decide what you want to do with your summer. If you are considering international electives, there will be formal sessions organized early in the year to help you with the decision.

Use your classmates' experiences to help you with your decisions. Check out the online evaluations (done by students) to get ideas for electives and to see whether they had a good experience. Similarly, help your classmates by filling out the online evaluation form soon after you complete an elective. Also, Maria and Deb (our electives coordinators) in the MD office are extraordinary resources who can help you with almost anything electives-related. The electives reps on the student council are excellent resource people as well.

chapter 6: a guide to resources

With each MF, helpful resources are indicated for each case and subject. At times, frustration can be felt by some individuals that these resources are “not right” for them. So, what can you do if you do not like the resources provided?

Learn to use other helpful tools available on line and in the library. Many of the resources libraries are located via the McMaster Library Home Page, such as Up to Date, Textbooks on Line, and links to on-line journals (with no subscription required!)*

If you like, you can try to ask second year students which resources worked best for them in a certain MF. But remember, everyone has his or her own style of learning in PBL. Some suggested resources might be great for others, while others may not work for you.

***NB: A session on online resources will be organized. Details to follow.**

THE LAST WORD

Your own learning, your own time

Medical school has similarities to undergraduate learning, but also many important differences. The big difference is “lifelong learning”. Cramming for an exam in undergrad may have worked and served your purpose then. You probably thought to yourself, “thank goodness – after the exam I never have to look at this stuff again”.

As a student physician, you are no longer learning to treat a piece of paper, rather you are learning to treat and support real human beings and the communities in which you work. This takes time, patience, and adjustment to a new environment of learning.

In lifelong learning, you have to continually adjust how, what and when you are learning. When you start out with a blank slate, it is easy to fill it up with information, but as you progress through medical school, different situations and application of knowledge will evolve. Understanding core concepts and broad situations is a key skill that should remain on your knowledge slate. But keep in mind, this slate is constantly changing and you may not be able to recall things learned in previous MFs instantly. This may be frustrating at times. Even Dr. Osler was aware of lifelong learning. We would like to feel that eventually one day we will know everything there is to know about medicine. But this would make medicine boring and monotonous – the real fun is the continual challenge!

Having a realistic attitude is a great start to your learning. Remember that you made it into medical school, so you have already proven your ability to learn. This is just another step on life’s journey, so take it slowly and enjoy your time here at McMaster!

Despite all the group work that goes into it, PBL is ultimately an individual experience. At the end of the day, you will find what works best for you – be it large-group sessions, textbooks, or internet videos. In your own way, you will learn to set good objectives, find appropriate and useful resources, integrate your resources, make tutorials good learning exercises, learn how to troubleshoot if necessary, use your elective time well, and understand that there are many false rumours flying around about our unique school.

To that end, we hope that this handbook has given you some ideas on how to make PBL work for you. The six of us have provided perspectives based on our experiences to help you understand why we think PBL is the most effective way to learn about medicine. At the very least, we hope you are reassured that PBL worked for us and that it can certainly work for you as well. Once you get the hang of it, you will find that it is also the most fun way to learn!

Enjoy the program!

The SEPTUM Group

appendix

History and Physical Sheet



TOPIC: _____ MF: _____

Mechanism:
(Pathophysiology)

Patient History	History of Presenting Illness	Physical Symptoms/Physical Examination (subjective)
Lab Values/Objective Information	Investigations (relevancy)	Pharmacology

- Suggested topics:
- A) Differential Diagnosis,
 - B) Consultations Additional Information,
 - C) Related Research/Evidenced Based Medicine

Summary:

Follow-up: