2020-2021

Learning Communities

UNIVERSITY OF CINCINNATI COLLEGE OF MEDICINE

Indispensable.

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Section 1. Fundamentals and Overview

In this section, an overview of the Learning Communities course and course goals are presented, along with the context of the broader Cincinnati Medicine curriculum.

1.1 | Overview of the Learning Communities (LC) Program

Goal 1: Introductory Clinical Education

The overall goal of the Learning Communities (LC) program is to provide clinical education that will facilitate integration of all aspects of the curriculum over the first two years of medical school. The cornerstone of LC activities is case discussion. Each week, students are provided patient cases, which provide clinical background and relevance to the foundational sciences they are learning in the integrated science blocks. These case discussions occur in small groups that are facilitated by a practicing clinical faculty member. Through the LC program, students have the opportunity to develop clinical problem-solving and critical thinking skills from the beginning of their medical education.

Goal 2: Relationship Building

Another benefit of the LC program is the opportunity to work in small groups. Relationship building and teamwork is an important part of being a successful and competent health care professional. No single person has all the answers to any given clinical problem, nor does two people have the exact same set of skills; working together to solve problems or complete tasks is an everyday occurrence in medicine.

Goal 3: Competency Building

In addition to clinical problem solving and critical thinking skills, the LC program focuses on teaching the many aspects of not only the science, but art of medicine that does not fall under a particular specialty or domain such as physiology or internal medicine.

In short, the LC experience helps students develop the thought processes and behaviors needed to be a successful and competent physician. Additionally, the LC experience allows students to receive formative feedback on their early clinical reasoning skills to allow them to experience growth before applying these skills during their clerkship years.

1.2 | Student Learning Outcomes

Upon completion of the LC program, students will be able to:

- Demonstrate clinical problem-solving and critical thinking skills
- Recognize and understand the importance of clinical signs and symptoms
- Form a differential diagnosis
- Demonstrate the attitude, behavior and skills of a self-directed learner
- Apply scholarly literature to solve clinical problems
- Demonstrate the qualities of empathy and respect for people who come from different cultures and socio-economic backgrounds

- Demonstrate the ability to have a constructive interaction with others (including, but not limited to, patients and all health care professionals) when resolving a conflict of opinion
- Demonstrate the ability to appropriately consider ethical issues that arise in patient care
- Demonstrate the ability to be a reliable team member by being active in team projects and providing leadership when needed
- Demonstrate skills and strategies to teach peers
- Identify what roles other health care professionals play in providing optimal patient care
- Deliver a well-organized patient presentation

1.3 | What Other Areas Are Covered in Learning Communities?

Learning Communities incorporate content from many other courses in the curriculum and topics that are pertinent to becoming a well-rounded physician. These include:

- **Career Mentoring** – students are given resources to explore information about different specialties and careers in medicine (e.g., characteristics of different specialties and the requirements to match into different residencies) and are given the opportunity to discuss the pros and cons of different fields.
- **Clinical and Translational Research** – students critically evaluate publications and discuss their impact on clinical practice.
- **Human Growth and Development** – students focus on aspects of the human life cycle, including physical, cognitive and emotional development.
- **Interprofessional Experiences** – students discuss their experiences spent with other health care professionals, learning how different members of the health care team improve patient care.
- **Longitudinal Primary Care Clerkship** – students discuss patient evaluation and patient care experiences obtained during their time spent in a primary care physician's office. At the end of the second year, students have the opportunity to practice patient presentations to the group and receive feedback on their performance.
- **Physician and Society** – students explore many topics relating to the practice of being a physician and interaction with patients and the community. These include exploring ethical dilemmas, discussing ways that patients access health care and barriers to receiving health care, discussing how to communicate with patients on a variety of issues such as including delivering bad news, and reviewing literature pertinent to patient care.

Beginning in the second half of the first year, students will also work in pairs to provide additional pharmacology information relevant to some of the first-hour patient cases.

1.4 | Structure of the Learning Communities (LC) Program

Each LC group consists of approximately 12 students and 1 clinical faculty member. This group stays together throughout the first two years of medical school. Each LC group meets on the same day and time each week for two hours. Below is a sample illustration of an LC schedule:

Fall 2019-Spring 2020

	Monday	Tuesday	Wednesday	Thursday	Friday
1-2 pm	**M1 LC**	**M1 LC**			
2-3 pm					
3-4 pm	**M2 LC**	**M2 LC**			
4-5 pm					

Fall 2020-Spring 2021

	Monday	Tuesday	Wednesday	Thursday	Friday
1-2 pm	**M2 LC**	**M2 LC**			
2-3 pm					
3-4 pm	**M1 LC**	**M1 LC**			
4-5 pm					

The first hour of an LC session is dedicated to case discussion. In the M1 year, a clinical faculty facilitator facilitates all cases. Students complete work on the case prior to the session and submit their work to the LC facilitator (this is an exception with "Live Cases"). In the M2 year, student pairs who sign up at the beginning of each term facilitate select cases. The clinical faculty facilitator in these instances is there to provide guidance and feedback (students do NOT facilitate the second hour material).

The second hour of an LC session is focused on the longitudinal curricular threads of the Cincinnati Medicine curriculum. These sessions focus on professional and career development, sociology of medicine, and the nature of interprofessional collaborative practice.

1.5 | Learning Communities Leadership

The LC program is developed, coordinated, and implemented as a course by the Course Director and a Course Coordinator. Their contact information is below. The Education Program Committee (EPC), the centralized body providing oversight of the Cincinnati Medicine curriculum, also regularly reviews the LC course.

M. Stephen Baxter, MD

Course Director

baxterms@ucmail.uc.edu

David Paulik, MA

Course Coordinator

paulikdm@ucmail.uc.edu

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1.6 | Cincinnati Medicine Curriculum Overview

The Cincinnati Medicine curriculum emphasizes vertical and horizontal integration across all years by bringing patient care and clinical cases into the pre-clerkship years and revisiting important aspects of the foundational sciences in the formal clinical training of the clerkship (third) and fourth years. Longitudinal curricular threads include basic science concepts (embryology, gross anatomy, histology, and pharmacology), application-based skills (radiology and imaging, patient safety, and quality improvement) and co-curricular elements (career counseling, lifestyle, and wellness). This curricular structure provides our students with an educational experience that will prepare them to succeed in a variety of career choices—physician, educator, researcher, or agent of change in their communities of practice. The desired traits can be categorized into eight core competencies that align with the standards set by the Accreditation Council for Graduate Medical Education (ACGME). UCCOM has further aligned our program competencies with the AAMC Entrustable Professional Activities (EPAs) and the associated Physician Competency Reference Set (PCRS). The Cincinnati Medicine curriculum uses a competency based assessment strategy that provides students formative feedback on their progressing toward mastering the program competencies and reaching entrustment.

Competency	Competency Description
Patient Care	Provide patient-centered care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health.
Knowledge for Practice	Demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioral sciences, as well as the application of this knowledge to patient care.
Practice-Based Learning and Improvement	Demonstrate the ability to investigate and evaluate one's care of patients, to appraise and assimilate scientific evidence, and to continuously improve patient care based on constant self-evaluation and life-long learning.
Interpersonal and Communication Skills	Demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals.
Professionalism	Demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles.
Systems-Based Practice	Demonstrate an awareness of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.
Interprofessional Collaboration	Demonstrate the ability to engage in an interprofessional team in a manner that optimizes safe, effective patient- and population-centered care.
Personal and Professional Development	Demonstrate the qualities required to sustain lifelong personal and professional growth.

Unique Curricular Elements of Cincinnati Medicine

ACEPA: The Assessment of Core Entrustable Professional Activities (ACEPA) is a comprehensive simulation-based, EPA-aligned OSCE designed to assess the clinical skills and progression towards entrustment of all end-of-year M2 students.

Intersessions: Reinforces the longitudinal components of the curriculum and prepares students for their third year clerkships; also provides space for personal and professional development

Cincinnati Medicine Curriculum and Timeline

In alignment with the AAMC Core Entrustable Professional Activities (EPAs), the Cincinnati Medicine curriculum emphasizes vertical and horizontal integration across all four years bringing patient care and clinical cases into the first two years. Student practice clinical skills starting the first week of medical school, revisit important aspects of the foundational sciences during the clerkship and fourth year where they further hone these skills, and develop strategies to become self-directed life-long learners. Our faculty provide career guidance and mentoring to support the transformation of our students as they progress through our curriculum. Our integrative approach provides a foundation to graduate excellent physicians.

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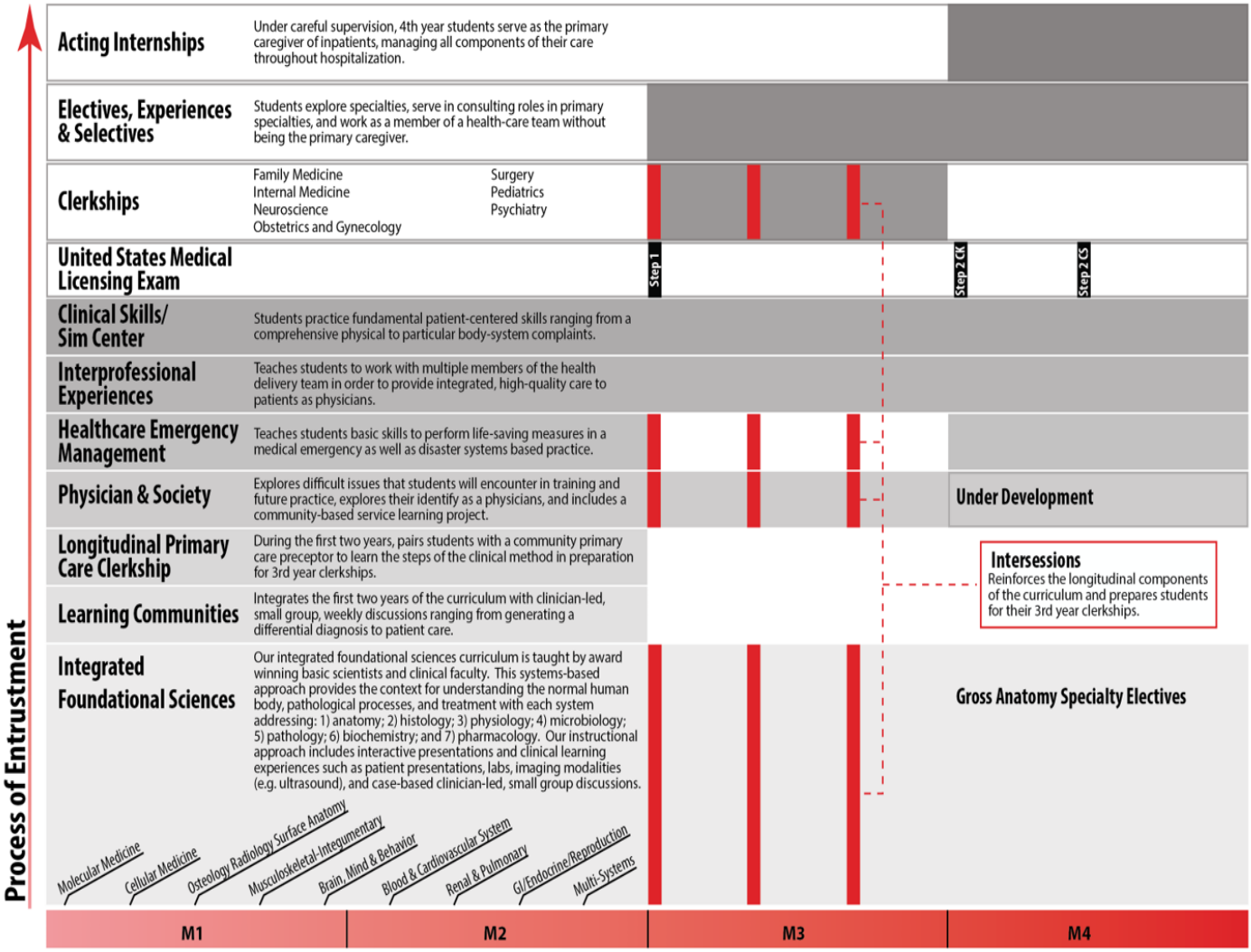


Section 2: Learning Community Facilitator Responsibilities

In this section, you will find details regarding expectations of LC facilitators, as well as detailed guidelines regarding various programmatic operations.

2.1 | Access to Case Materials

All facilitators will be provided access to the Learning Communities Canvas course to access case materials. To login to Canvas, follow the steps below:

1. Go to https://uc.instructure.com
2. Enter your username (this is your **UCID**, or 6+2) and password and click the **Login** button
3. Click on the Learning Communities "course" tile for your year (e.g., **"M1 Learning Communities Facilitators"**)
4. Once you are in the course, click on **Course Content**
5. Scroll down to the date you are searching and click to open the folder

Once you are in the folder containing the cases, you will see two large headings; one will contain files relevant to the first hour case (clinical application of the concurrent foundational science block) and the other will contain files relevant to the second hour case (practical applications from one of the longitudinal pre-clerkship clinical courses).

2.2 | Overview of Planning and Facilitation of a Successful LC Session

Before the Session

Students access case materials from UCCOM's learning management systems (LMS), **DaVinci Leo**. Students have approximately one week to prepare for a case and are ***required*** to submit their responses to their LC facilitators by **noon Monday** of each week. The **only** exception to this rule is in the event of a **Live Case**, in which students collaboratively complete the case in real-time with the guidance of their facilitator. Students will email their facilitator the case each week; however, facilitators may also choose to review cases in Leo to prevent a flooding of emails. the LC Resource Binder Regardless of how cases are submitted to the facilitator, it is expected that you keep these records consistent with the university's record retention policy.

It is important and expected that you prepare in advance for each session. The amount of time required to prepare for a session is variable. It will usually take 30-60 minutes to prepare for a typical session. This includes reading through the case, and reading any associated readings/articles. Some sessions will require more preparation, such as completion of assessment forms before assessment meetings, or reviewing other assignments submitted by the students. .If you are unclear regarding the objectives for a first or second hour case, module, or learning exercise, please reach out to the course director or course coordinator **prior** to the session to clarify expectations in order to maximize the learning potential for students.

During the Session

During the session, keep notes on the general participation of each student. If you are using a tablet or computer, it might be helpful to have the formative assessment rubric open, so you can keep track of where students are performing well and where improvement might be needed. As a pass/fail component of the curriculum with no numerical contribution to class rank, LC's allow for continuous formative feedback.

Facilitators should not lecture on the case but **should** provide their real-world clinical experience as appropriate for the edification of the students' training. Please refer to Section 3 and 4 for ideas on increasing student participation using collaborative learning techniques (CLT's).

After the Session

Following the session, please return any 2nd Hour assignments that need to be submitted by the student to the course coordinator in the Office of Medical Education. **It is important to note that any assignments that are not submitted as requested by UCCOM faculty will result in zero credit for the student for that component of their grade.** Please note that you do not have to track assignments that are turned in, only provide those assignments to the course coordinator, if stated in the facilitator guide.

If you borrowed any materials to help facilitate your session (e.g., flip charts, markers, etc), please be sure to return those materials to the Office of Medical Education (MSB G453).

2.3 | Assessment Responsibilities

The LC program consists of four courses (LC 101, LC 102, LC 201, and LC 202). The grading convention for each course is pass/fail and has no numerical contribution to a student's class rank.

Formative Assessment

The LCME, recognized by the Department of Education as the sole authority to accredit medical education programs in the United States and Canada, defines formative feedback as follows:

"Information communicated to a medical student in a timely manner that is intended to modify the student's thinking or behavior in order to improve his or her subsequent learning and performance in the medical curriculum."

Formative feedback in the LC program is provided to the student using an objective rubric that evaluates six areas of competency, including: Integration and Approach to Patient Care, Interpersonal and Communication Skills, Participation and Leadership, Practice-Based Learning and Improvement, Preparation, and Professionalism. Facilitators also provide additional qualitative feedback identifying student strengths, as well as opportunities for improvement. The rubric is available in the LC Resource Binder under assessment forms, as well as electronic copies on Blackboard.

Summative Assessment

The LCME defines summative assessment as follows:

"*A criterion-based determination, made as soon as possible after the curricular component (e.g., course/module, clinical clerkship/rotation) by individuals familiar with a medical student's performance, regarding the extent to which he or she has achieved the learning objective(s) for that component such that the student can use the information provided to improve future performance in the medical curriculum.*

A summative assessment will occur at the end of each course, thus allowing the student to progress to the next phase of the LC program. Like the formative assessment tool, the summative assessment tool will evaluate the student's mastery of course outcomes and basic clinical knowledge (e.g., formulating a differential diagnosis, critically evaluating cases, etc).

The LCME requires course grades to be submitted within 6 weeks, so facilitators are expected to submit their assessments within 4 weeks of the meeting date.

Assessment Procedure

1. Students will sign up for a 10 minute timeslot with their LC facilitator using a Google Spreadsheet and complete an identical self-assessment form to bring to the meeting.

2. Facilitators should view the sign-up sheet via the link on Blackboard Canopy, so they know the order of the students they will be meeting with at a particular time.

3. Following the assessment meeting, LC facilitators will submit their formative and summative assessments of students to the course coordinator in the Office of Medical Education.

   a. Facilitators may complete either an electronic or a hard copy of the assessment for submission.

   b. Students do NOT have to submit their self-assessment forms as part of the assessment process.

4. Please refer to the LC Facilitator Job Description and the LC Syllabus for further information on the grading process.

2.4 | Formative Feedback/Exemplary Feedback Forms

Formative Feedback (formerly Professionalism) Form

Not to be confused with formative feedback as defined above, this formative feedback form is an opportunity for the Performance and Advancement Committees (PAC) to be aware of habitual patterns of behavior over the course of the student's enrollment in the curriculum.

The Formative Feedback Form is available on MedOneStop and is used in instances of a lapse in professional and/or academic judgment. Examples of behaviors/instances that should result in completing a Formative Feedback Form:

- Turning in assignments late
- Behaving in a rude manner to instructors/peers
- Disengaging from group projects/discussions

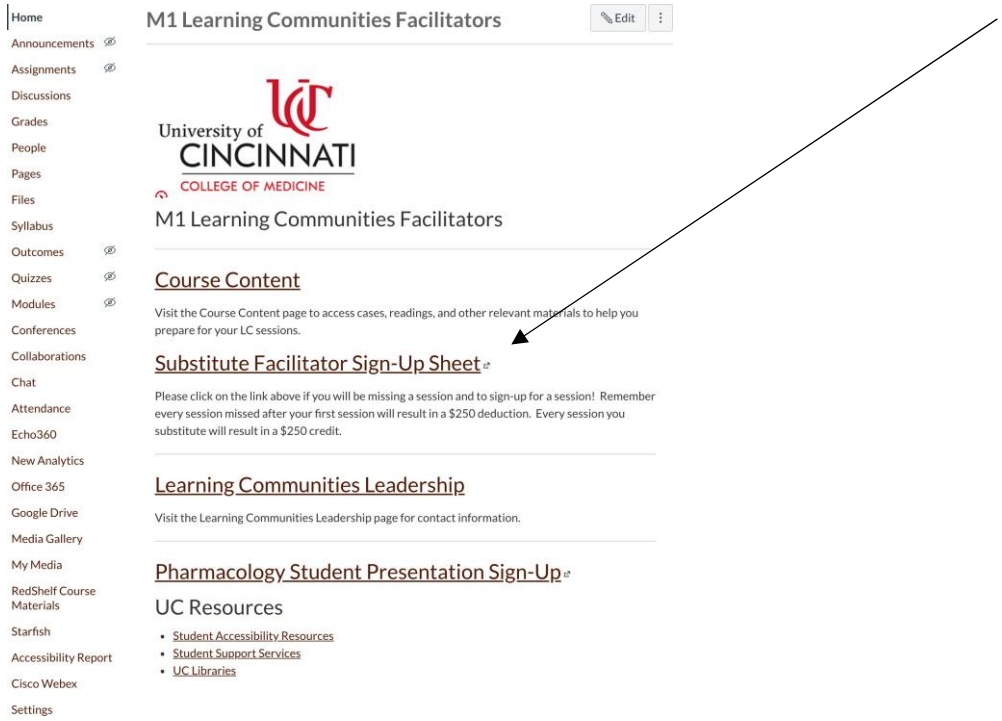
While this is not an inclusive list, behaviors of the like should be made known so that if patterns emerge in other areas of the curriculum, interventions can be made to address the issue to help promote the success of the student. Please note: A single submission of a Formative Feedback Form rarely makes the agenda of a PAC meeting unless it is of significant concern.

Exemplary Feedback Forms

The Exemplary Feedback Form is a mechanism UCCOM has to acknowledge behaviors of a student that model the professional values of a future physician. This form, compared to the Formative Feedback Form, is underutilized. LC facilitators are encouraged to identify students who show exceptional initiative to be sure to encourage those behaviors amongst the student body. Like with Formative Feedback Form, the Exemplary Feedback Form is available on MedOneStop.

2.5 | Calling Off Procedure

If you must miss an LC session, please notify the course coordinator in the Office of Medical Education as soon as possible, and indicate the date of the session you will be missing on the LC Substitute List spreadsheet available on Canvas (see image below).



All M1 and M2 LC facilitators have access to the LC Substitute Facilitators list and are encouraged to sign up for sessions that they can cover. Substitute facilitators are compensated an addition $250 per session for each substitution. Facilitators who call off more than one session will have a pay reduction of $250 per session missed. Every effort to ensure that students will have a substitute in the event their facilitator must call off is made; however, when this is not

possible students, will be divided into alternative groups and sent to the other LC groups. Therefore, on occasion, you may have a few extra students in your group.

2.6 | Remittance Policy

LC facilitators are compensated an annual $8,700 for their time in preparing and facilitating sessions, as well as meeting with students. Funds are disbursed biannually at $4,350 following the academic year (once in June and once in December of each year).

LC facilitators who are active physicians and residents within UC Health are paid through their respective department. This means that facilitators should not expect to receive a check from the LC program, but rather their department business office. Please see the table on the next page for a contact list of business officers for each department who should be contacted for questions regarding payment.

LC facilitators who are not affiliated with a UC Health department, or are retired, must have a Personal Services Contract (PSC) established. Those with active, approved PSC's will receive a check directly from the University of Cincinnati Payroll Office.

Business Contacts by Department			
Department	**Name**	**Email**	**Phone**
Internal Medicine	Teresa Larkin	larkint@ucmail.uc.edu	513-558-3551
CCHMC	Lori Ahlert	ahlertli@ucmail.uc.edu	513-558-2433
Family Medicine	Kim Kues	kueska@ucmail.uc.edu	513-558-5078
Orthopaedic Surgery			
Obstetrics-Gynecology			
Ophthalmology			
Otolaryngology			
Psychiatry	Patty Gilbert	gilberpj@ucmail.uc.edu	
Anesthesiology	Timothy Hafley	hafleyty@ucmail.uc.edu	513-558-3926
Dermatology	Sara Deem	Sara.deem@uc.edu	513-558-6310
Pathology	Michelle Cooper	michelle.cooper@uc.edu	513-558-4534
Radiology	Joe Hudepohl	joseph.hudepohl@uc.edu	513-584-0431
Surgery	Tal Richards	tal.richards@uc.edu	513-558-8997
Emergency Medicine	Steven Petrovic	steven.petrovic@uc.edu	513-558-8423

Section 3: Facilitation Skills and Strategies

In this section, you will find useful strategies to help engage students regardless of content knowledge and to encourage effective collaborative learning.

3.1 | Wait Time

Definition:

Wait-time refers to the time that elapses between instructor- or facilitator- initiated questions and their next behavior (e.g., student response or the facilitator talking again).

There are two kinds of wait-time:

- **Wait-Time 1:** *The time the facilitator waits after asking a question*
- **Wait-Time 2:** *The time the facilitator waits after a response is provided, regardless of accuracy*

Background:

Wait-time is an important factor in successful collaborative learning sessions. Research has demonstrated that the quality and quantity of students' verbal responses increases significantly if facilitators regularly utilize at least 15-20 seconds of wait-time.

As an LC facilitator and medical expert, it is automatic to jump into a conversation too quickly to answer or rephrase a student's response. However, allowing wait-time provides opportunity for students to consolidate information, which allows for deeper processing of information.

Research Findings:

According to a study conducted by Tobin in 1987[1], wait-time has been found to positively influence student learning in the following ways:

- More students participate
- More accurate responses
- Answers are more robust, reasoned, and supported
- Students listen to each other
- More speculative responses
- Increases frequency of asking questions
- Increase in use of logical consistency in responses

[1] Tobin, K. (1987). The role of wait-time in higher cognitive level learning. *Review of Educational research, 57*(1), 69-95

What if Students Don't Respond?

Effective facilitation requires persistent attempts to engage students in the educational experience. After waiting 15-20 seconds with no responses, try one of the following techniques:

- Repeat the question
- Rephrase the question
- Simplify the question
- Ask a student to attempt to rephrase the question
- Break down the question or prompt into its component parts
- Make the question more specific
- Ask students what they specifically don't understand about the question/prompt

3.2 | Redirecting Questions

Description:

Redirecting questions is considered the process most central to collaborative learning[2]. The process itself is simple to understand, but difficult to practice without a context in which to do so. The goal of this process is to encourage more, and better, student-to-student interaction in sessions. It is based on the concepts that students learn better when they have to explain something to someone else. The natural tendency for facilitators is to answer questions that are asked; this process requires the facilitator to suppress that tendency and redirect questions back to the group.

Sample Interactions

Student to Facilitator	Facilitator to Group	Suggestions
What is the derivative of a constant?	Can anyone find an answer to that in your notes/text/UpToDate?	• ***Use resources that students have***
I don't understand how temperature affects a chemical reaction.	I'm glad you brought that up! Why don't we analyze #5 on the handout to see if we can understand how temperature affects different reactions?	• ***Use responses that offer positive reinforcement***
I don't know how to do this problem.	What part(s) of the problem do you understand?	• ***This will help narrow the question and divide it into more useful parts***
I understand how to get the derivative, but I don't know what to do next.	Would someone please go to the board and scribe as we work it together?	• ***This interaction demonstrates that there may be a two or three phase process***

[2] Bolhuis, S. & Voeten, M.J. (2011). Toward self-directed learning in secondary schools: What do teachers do?. *Teaching and Teacher education, 17*(7), 837-855.

TRAINING QUESTIONS: Activity 1—Facilitating Discussions

- *What is the role of the LC facilitator in leading discussions?*
- *What is the role of the student(s) in participating in the discussions?*
- *What are some of the challenges leading discussions? What are some strategies for addressing these challenges?*

3.3 | Collaborative Learning

Intentional consideration to how you group students an interactive learning session is important to facilitating a successful learning experience.

Collaborative learning is built on the following ideas:

- Active interaction with others
- Accountable to others
- Responsible to the group
- Heterogeneous grouping
- Positive interdependency
- Development of social skills

Bruce Tuckman, a psychologist who studied group process, developed the model pictured below. Each group progresses through various stages over the course of its interaction between constitutive members. As an LC facilitator, you play a key role in guiding the group through the transitions of each stage and encouraging thorough development throughout the process.

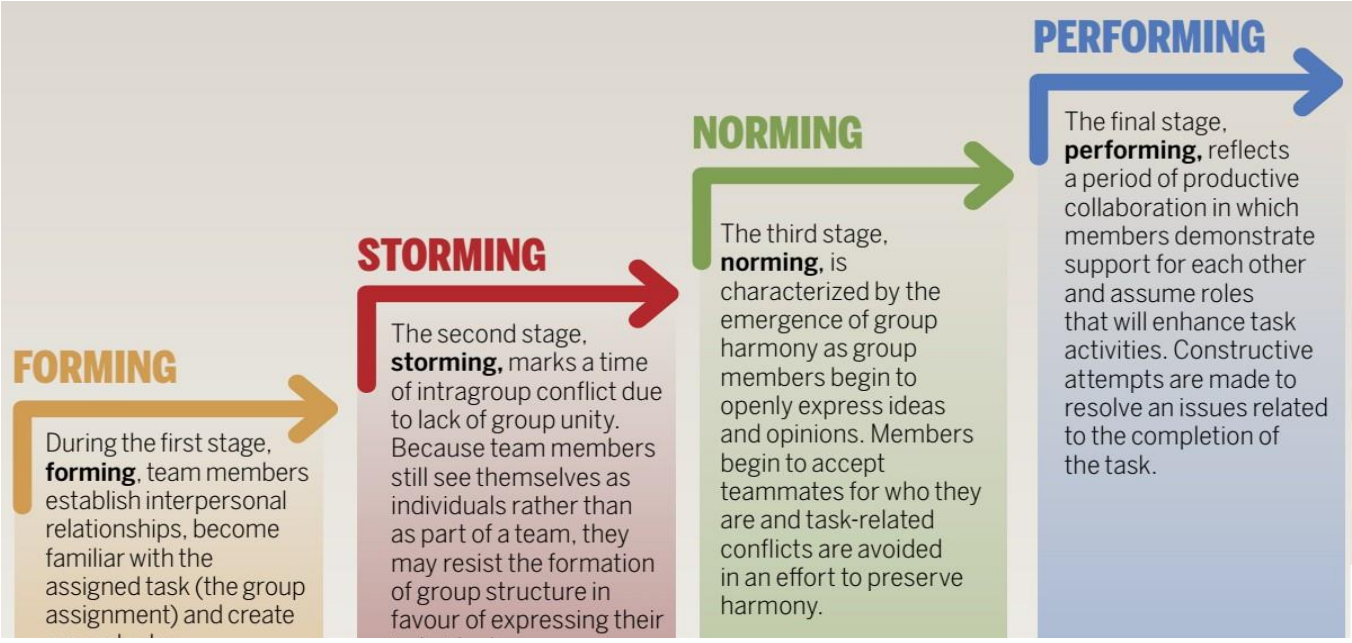


Figure 1 Taken from: http://pmpopwp.blogspot.com/2017/11/w1thuraiyaleadership-styles-analysis.html

Section 4: Adult Learning

As a facilitator, you fulfill not only a role in the classroom, but also a role in advising. In this section, you will find information to help you advise students on learning strategies that are rooted in evidence-based literature.

4.1 | Basic Principles of Adult Learning

Adult learners acquire, process, and construct knowledge differently from primary learners due to an enhanced self-awareness and more life experience. As an LC facilitator, it is important for you to understand basic principles of adult learning in order to effectively plan, develop, and execute a successful learning experience for your students.

Educational psychologists and learning science experts have found that most adults, adolescents, and children learn best by experiencing a blend of activities that promote three learning domains, including: cognitive (refers to knowledge or a body of subject matter), affective (refers to attitudes and beliefs), and behavior (refers to practical application). The table below shows examples of common instructional activities for each of these domains.

Cognitive	Affective	Behavioral
Lecture	Values clarification exercises	Role plays
Discussion	Nominal group process	Simulations
	Consensus-seeking activities	Peer teaching

Particular focus in this section is paid to cognitive and behavioral principles of learning.

4.2 |Cognitive Evidence-Based Learning Strategies

As education becomes more sophisticated, there is a strong push to study how students learn best. This research paradigm is an interdisciplinary endeavor involving educators, cognitive psychologists, neuroscientists, and administrators alike. An extensive study conducted by Dunlosky et al., 2013, analyzed a variety of learning strategies used by undergraduate college students[3]. Self-report data from students shown that the highest frequently used learning strategies (i.e., re-reading and highlighting) had the lowest utility, and the higher efficacious the learning strategy (i.e., practice testing and distributed practice) were not used as frequently. These data are further corroborated in the medical education community (Fowler et al., 2017)[4]) where students are expected to apply and manipulate a large volume of knowledge rather than undergo rote memorization.

[3] Dunlosky, J., Rawson, K.A., Marsh, E. J. Nathan, M.J., & Willingham, D.T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest, 14*(1), 4-58.

[4] Fowler, A., Whitehurst, K., Orman, A., Rajmohan, S., Udeaja, Y. Koshy, K., Gundogan, B. (2017). How to study effectively. *International Journal of Surgery, Oncology.* (31)

4.2a Bloom's Taxonomy

Bloom's Taxonomy was developed in 1956 by educational psychologist Dr. Benjamin Bloom in an effort to promote higher forms of critical thinking in education. Bloom's taxonomy is divided into the domains listed in Section 2.1 cognitive, affective, and psychomotor, or behavioral. Attention to Bloom's Taxonomy here is limited to the cognitive domain.

Cognitive Domain

The cognitive domain of Bloom's taxonomy is primarily concerned with the development of knowledge, particularly with regard to recall and recognition of concepts. This includes recall and recognition of facts, procedural patterns, and underlying concepts. The graphic below provides a pictorial representation of the cognitive domain with the more basic cognitive processes on the bottom and moving upwards towards higher-order thinking.

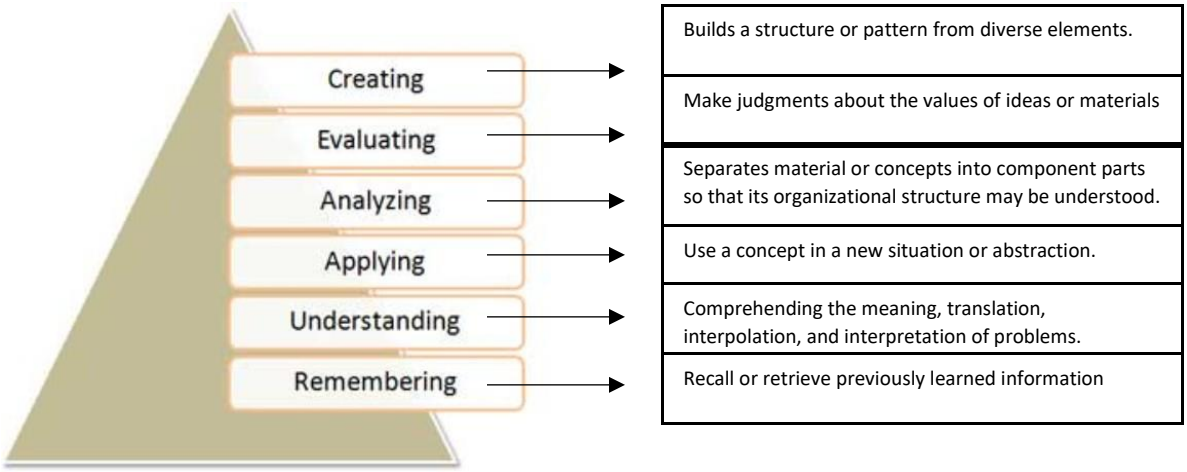


Figure 2 Taken from http://www.nwlink.com/~donclark/hrd/bloom.html

4.3 | Critical Thinking

Becoming a competent physician requires developing the ability to think critically and efficiently with the fast-paced data that is presented in health care settings.

Critical thinking involves a series of steps:

1. Gather information from all senses, verbal and/or written, reflection, observation, experience and reasoning
2. Raise vital, clearly defined questions and problems
3. Assess relevant information
4. Use abstract ideas that are interpreted and used effectively
5. Reach well-reasoned conclusions and solutions
6. Test outcomes against relevant criteria and standards
7. Use alternative thought strategies according to task/needs

8. Evaluate all assumptions, implications, and practical consequences
9. Communicate effectively with others in generating solutions to complex problems

Critical thinking is an essential skill because it helps:

- Avoid medical/clinical errors
- Identify better alternative options for diagnosis and treatment
- Increases productivity
- Better clinical decision making
- Work in resource limited settings
- Quality thinking and quality work output
- Brings innovation through creativity
- Develops confidence
- Establish life-long learning

4.4 | Differential Diagnosis as Critical Thinking

A central goal of the LC program is to build the student's confidence and abilities to construct a differential diagnosis, which requires the development of precise critical thinking skills.

The ability of a physician to take data and develop a differential diagnosis is essential to ensuring patient safety and providing quality care. In each LC case, students are asked to develop an early differential diagnosis and continuously modify their differential diagnosis with emerging data points. As an LC facilitator, you are encouraged to push this skill development by asking probing questions as to how students arrived at certain decisions throughout the case.

Cognitive psychology has identified a number of mental shortcuts, called heuristics, that people take to save mental resources. Physicians and other healthcare professionals are not exempt from this tendency and must develop awareness of how these mental shortcuts impact the quality and safety of patient care.

Cognitive Functioning and Differential Diagnosis		
Representative Heuristic	Leads clinicians to judge the probability of a disease by how closely a patient presentation matches a prototypical case without considering the prevalence of a disease.	For example, clinicians may strongly suspect that a patient with hypertension, headache, diaphoresis, and palpitations has a pheochromocytoma, given the match with the textbook description. However, each individual symptom is very commonly encountered in clinical practice, and the true likelihood of the unifying of pheochromocytoma is vanishingly low.
Availability Heuristic	Leads the clinician to judge the probability of a disease on the basis of how easily that disease is recalled, which	For example, a physician who arrives at an accurate diagnosis of constrictive pericarditis after examining a patient with edema may overestimate the likelihood of that diagnosis for other patients who present with lower-extremity edema. This effect sometimes colors judgment

	is often skewed by recent and memorable cases.	for weeks to months, but frequently it modifies clinicians' judgment for their entire career (e.g., "One time in fellowship I saw X, so I *always* do Y").
Anchoring Heuristic	Leads clinicians to cling to their initial diagnostic hypotheses even as contradictory evidence accumulates.	For example, a patient with stage 5 chronic kidney disease was admitted with altered mental status and myoclonus of the left arm attributed to uremia (the anchor). However, as the patient's condition failed to improve with dialysis (contradictory evidence), the clinicians had a difficult time revising the formulation to the eventual diagnosis of status epilepticus.
Premature Closure	Describes settling on a diagnosis without sufficient evidence or without seeking or carefully considering contradictory information. requested bronchoscopy, which revealed *Pneumocystis jiroveci* pneumonia.	For example, a patient with rheumatoid arthritis who was taking immunosuppressive medication presented with shortness of breath and was found to have a small distal pulmonary embolus. A consulting physician was not satisfied with this explanation in light of the diffuse fine infiltrates on the chest radiograph and
Confirmation Bias	Tendency to look for evidence to support a working hypothesis, ignore contradictory evidence, and misinterpret ambiguous evidence.	For example, for a patient with symptomatic anemia with a nearly absence reticulocyte count, there was an incidental finding of potentially full mediastinum on a screening chest radiograph. The reticulocyte count was considered to support the diagnosis of iron deficiency anemia and the radiograph finding was discounted, although the patient was later found to have aplastic anemia from a thymoma.
The contents in this table have been taken and adapted from: Rojkomar, A., Dhaliwal, G. Improving Diagnostic Reasoning to Improve Patient Safety. Perm J. 2011 Summer; 15(3): 68-73.		

TRAINING QUESTIONS: Activity 2—Critical Thinking

- *How can the facilitator help students in developing a differential diagnosis?*
- *How can the facilitator help the students in making decisions on which tests to order?*

4.5 | Self-Directed Learning

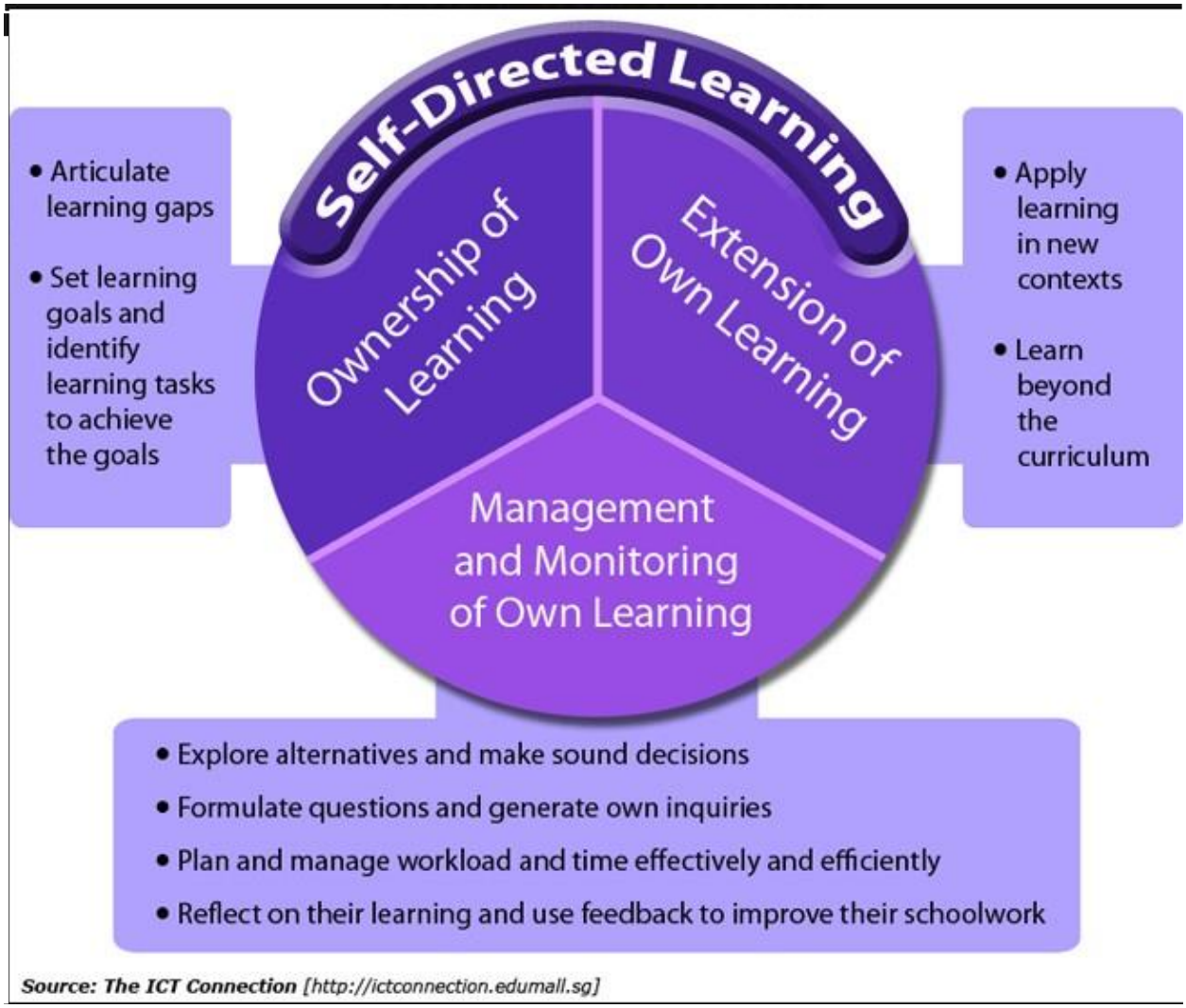
The LCME specifies that self-directed learning is an integral element of medical education programs and, future practice.

Self-direct learning (SDL) includes all of the following components as a single unified sequence that occurs over a relatively short time:

1. The medical student's self-assessment of his/her learning needs;
2. The medical student's independent identification, analysis, and synthesis of relevant information;
3. The medical student's appraisal of the credibility of information sources;
4. The medical student receives feedback on their information-seeking skills

As an LC facilitator, you play a critical role in step four of the SDL process. In each LC case, students are to consult the literature and clinical resources (e.g., Up-

to-Date) to substantiate their clinical decision-making. During the session, it is important to include sources and the reliability of sources in the discussion.



Source: The ICT Connection *[http://ictconnection.edumall.sg]*

TRAINING QUESTIONS: Activity 3—Self-Directed Learning

- *What does it mean to be a self-directed learner?*
- *How do we teach our students to become self-directed learners?*

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