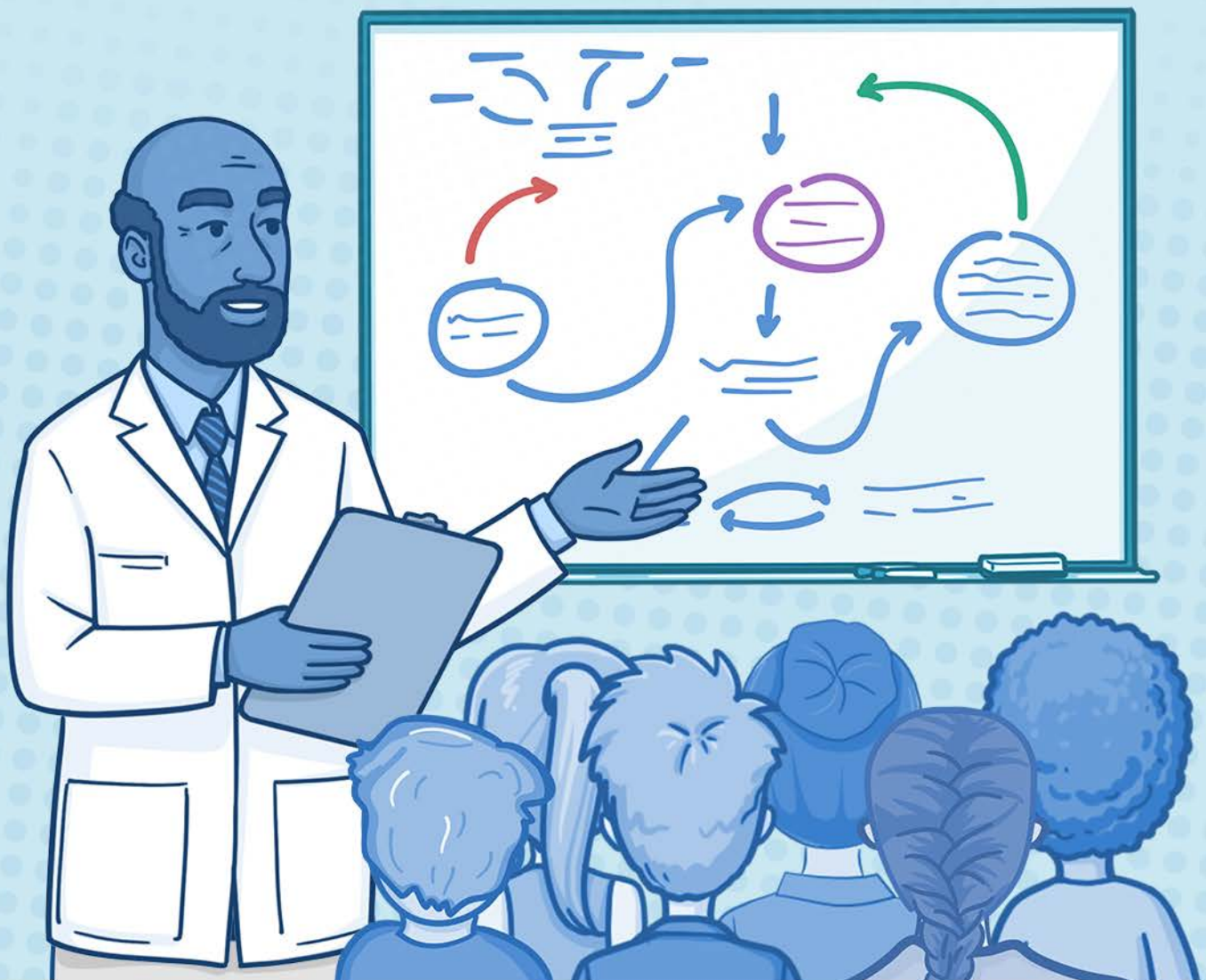


EDUCATORS' Ultimate Guide

Fundamentals of Teaching and Learning in the Health Professions



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Discover all that you need to know about teaching and learning in the health professions, including the basics of learning and teaching, how to enhance student learning, and the ins and outs of teaching online.

If you're looking at this guide, chances are you're preparing to teach a course for health professionals. Whether you are a seasoned educator or new to teaching, guiding future health professionals through their education journey presents challenges.

This ultimate guide equips you with the research-backed knowledge and skills to teach health professionals, whether that be in person, online, or in a hybrid setting.

1. The Basics of Learning

We begin this guide by blending findings from learning science and theory to describe what learning is and how learning works.

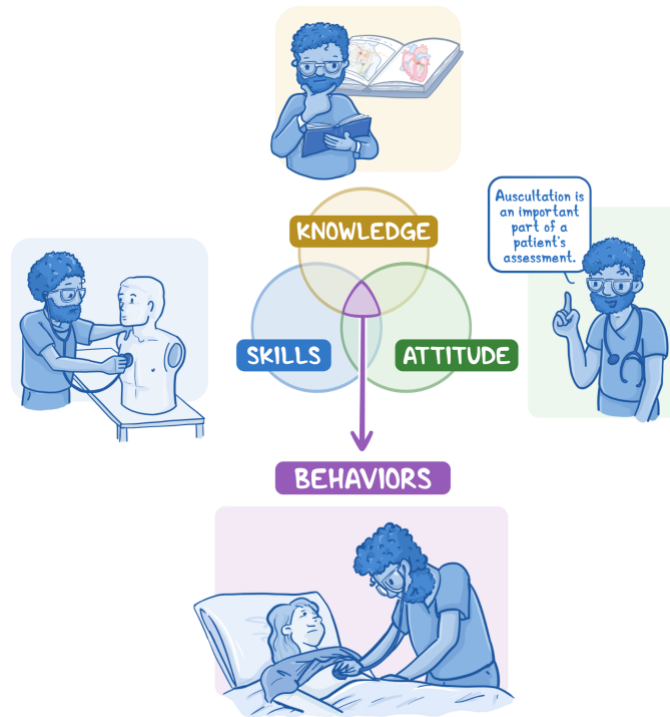
What is learning?

The ultimate goal of learning is to do something better than you could before; in the health professions, that *something* benefits patients. However, learning how to do something has a few requirements. You need:

- Some basic factual or conceptual **knowledge** (also known as declarative knowledge) in order to know what to do and how to do it.
- Physical or cognitive **skills** (or procedural knowledge) so you can act on that knowledge.
- **Attitudes** or beliefs, like the motivation that an action is important and the belief that your action will make a difference.

When combined, these three domains—knowledge, skills, and attitudes—allow for **behaviors** or habits that are beneficial to you and your patients.

For example, if you want to be in the habit of identifying normal and abnormal heart sounds, you need to have the basic knowledge about how blood flows through the heart's chambers and valves, to have practiced the skills of using a stethoscope, and to believe that listening to a patient's heart is important and that you can do it well.



How does learning happen?

There are countless learning theories, and chances are that each person you ask will have their favorites. There is no single “right” way to learn or teach, but prominent models of learning agree that learning follows a series of steps:

- A learner applies effort and focus to a learning activity.
- Their performance is assessed and feedback is given.
- Knowledge, skills, and/or attitudes change as a result of feedback and/or the learner's own reflections on their experiences.
- The cycle of learning repeats.

A learner's **effort** and **focus** can be maximized by creating the right setting (one that's challenging but not stressful), including positive social pressures, like peer learning and friendly competition, and making sure the learning activity is practical and relevant.

Careful planning, goal-setting, and aligning educational strategies to these goals also optimizes the quality of the learning activity. Including **assessment and feedback** within the learning experience makes it possible to learn from mistakes and can motivate future learning.

Reflecting on experiences, independently or in response to direct feedback, also strengthens **metacognition**.



Metacognition is the process of thinking about thinking, like learning to drive your brain (Wilson 2016). You can think about how you thought by **reflecting** on a past activity (reflection-on-action), or can think about how you're thinking in the present moment (reflection-in-action).

When you use metacognition isn't as important as actually using it. If you've got strong metacognitive skills, you're aware of whether and how you are learning during an experience and can identify important learning points after the experience, incorporate them into what you already know, and apply your learning more effectively.

This doesn't mean there aren't benefits from external feedback, but metacognition allows you to become **self-directed** in your learning (Brydges 2012). Effective self-directed learning is especially important in health professional practice. Developing metacognitive skills early in your training and making self-directed learning a habit means that, even when most of the on-the-job pressures focus on applying what you already know, you'll be more likely to keep learning while you practice.

In addition, evidence shows that metacognition is one of the most important habits of outstanding academic achievers (Wilson 2016; Quirk 2014) and that effective self-directed learning improves learning outcomes (Murad 2010).

What learning looks like from beginning to end

Learning is always happening. For example, let's imagine learning as your nervous system taking in information from the environment and then processing and converting it into a new action or behavior.

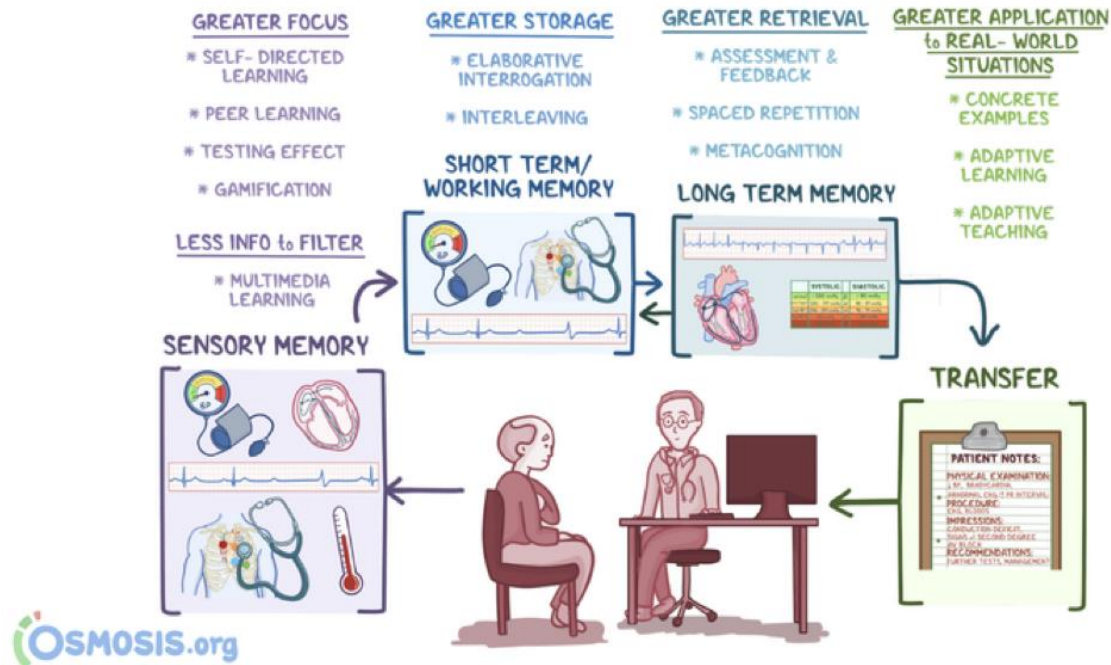
This information processing model of learning begins with the information that constantly bombards your sensory nerve cells. These nerve cells never shut off, but only a tiny fraction of **sensory information** registers into short-term or **working memory**.

Focusing your attention (e.g., by using peer learning or gamification or by practicing with exam-style questions to use the testing effect) helps you filter the right sensory information. Applying multimedia learning principles effectively also helps you filter information efficiently.

There's some debate about the difference between short-term memory and working memory (Cowan 2017; Aben 2012) but you can think of both as having limited capacity, which creates a bottleneck for information processing into **long-term memory**. Using methods that make connections between information in short-term or working memory with information in long-term memory helps more information move into long-term memory.

Once knowledge is in long-term memory, it can stay there for good, because the storage capacity in long-term memory is unlimited. You can become better at recalling information from long-term memory with retrieval practice, that can occur with assessment and feedback in general or when you specifically use spaced repetition. Metacognition further helps you make connections across concepts, and helps to deepen learning.

It's also possible to **transfer** what's in your long-term memory to new situations, like taking information you learned in a classroom and applying it to real life (Schwartz 2005; Kulasegaram 2017). This transfer of knowledge is enhanced when you can match general principles with variations of concrete examples in specific contexts.



Changing behaviors

Sometimes changes in knowledge, attitudes, and/or skills in formal educational settings don't lead to behavioral changes in real life. When you're trying to change behaviors, **attitudes** become especially important because you often need motivation to overcome barriers and the intention to apply knowledge and skills even in difficult situations.

For example, you need to believe:

- You can successfully perform a behavior,
- Your behavior will lead to an important outcome
- It won't violate the norms of the people around you or the culture in general (Cilliers 2015).

The **physical environment** can also influence behaviors. Sometimes you need materials that make a behavior easier to perform, such as checklists, or to remove barriers that make a behavior difficult.

Lastly, existing **habits** also play a role. Habits are routines that are triggered by an environmental cue. Changing behaviors may require breaking old habits and/or identifying cues that can trigger the performance of a new habit (Clear 2018; Duhigg 2012).

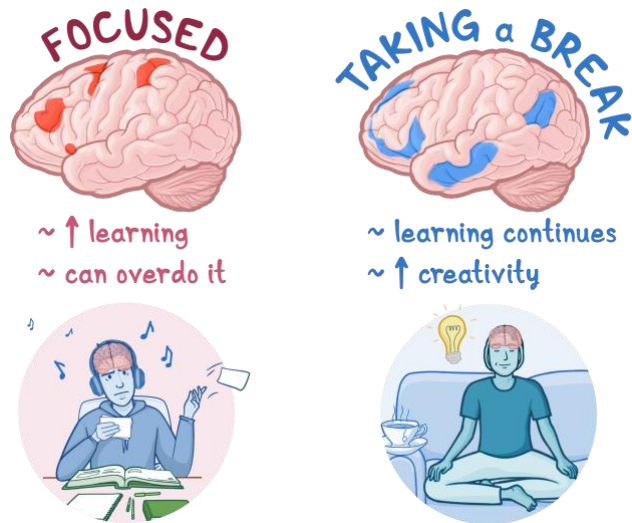
For example, hand hygiene is a behavior that all clinicians need to perform regularly in healthcare settings to prevent infections. Clinicians are taught when and how to clean their hands, but often that's not enough.

Guidelines from the World Health Organization (WHO 2009) go beyond describing what providers need to know and recommend establishing a culture that values hand hygiene and making hand-cleaning products easily accessible in the healthcare environment. Hand-cleaning products next to the door of a patient's room can serve as a cue to trigger the hand hygiene habit.



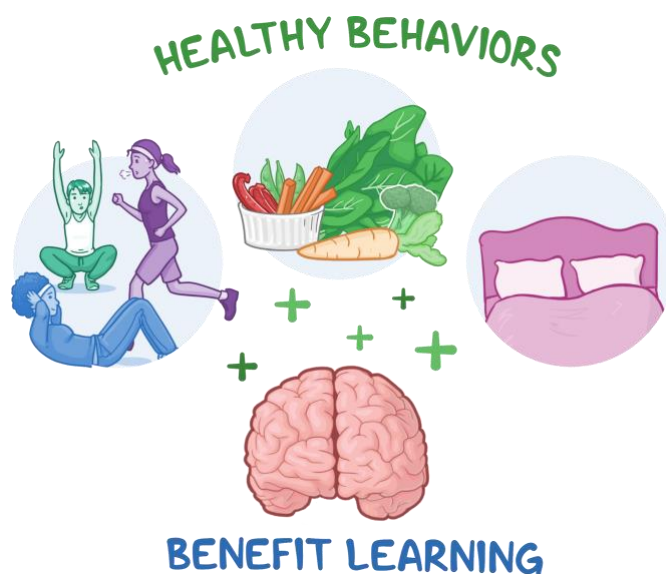
Rest and well-being

While you learn more when you apply focus and effort during learning activities, it's possible to overdo it. **Rest** is essential to improving learning, because when you're awake and your mental energy is not directed to a specific goal, you can have spontaneous thoughts, often described as "daydreaming" or "mind-wandering" (Christoff 2016). During times of rest, learning continues as your brain's "default mode network" is activated and begins making connections between different areas that make you more creative (Immordino-Yang 2012).



When you **sleep**, the patterns of electrical activity in your brain also change in significant ways that enhance your learning, alternating through stages of slow wave sleep and rapid eye movement sleep (Walker 2017). These changes consolidate the declarative, procedural, and emotional memories from your waking hours.

A large body of research has shown sufficient sleep on a regular basis leads to more learning (Diekelmann 2010; Rasch 2013). Sleep is good for all aspects of health, and learning likewise benefits from other generally healthy behaviors. For example, **physical exercise** has been shown to improve cognitive performance in addition to being a great stress reliever (Basso 2017).



2. The Basics of Teaching

In this Section we consider what it means to be a teacher and provide teaching principles that should apply to any teaching scenario.

What is teaching?

If **learning** in health professions education means changing knowledge, attitudes, and skills—to create habits or behaviors that improve health among individuals and populations—then what is teaching?

Teaching is the facilitation of learning. Learning happens within individuals, based on how learning experiences relate to their existing knowledge, attitudes, skills, and behaviors. Even when an educational experience is the same across several learners, each person will probably learn something different. This is especially true of adults, who typically have diverse experiences, perspectives, and preferences.

Since teachers can't force learning to happen, their goal must be to understand and target their learners' needs. Teachers also can't assume that learning happened just because they taught. They must find ways to observe and/or measure what changes took place in the individuals they were trying to teach.



Teaching, educating, coaching, mentoring, sponsoring

Terms in health professions education are often used interchangeably—or completely differently—based on an individual’s preferences or background. For example, the term “teaching” itself has fallen out of favor with some people because it can imply that learners receive knowledge or skills from all-knowing teachers.

David Irby and Patricia O’Sullivan from the University of California, San Francisco traced this shift to the World Conference on Medical Education’s Edinburgh Declaration in 1988 (Irby 2018). One of the Declaration’s 12 recommendations was to “Train teachers as educators, not content experts alone, and reward excellence in this field as fully as excellence in biomedical research or clinical practice.”

On the other hand, in 2000, Ron Harden and Joy Crosby from the University of Dundee published the popular 12 roles of a medical “teacher,” which included roles that extended well beyond being a content expert alone and included facilitator of learning, curriculum planner, assessor, and mentor (Harden 2000). Although the lines between “educator” and “teacher” are blurry, we think it’s ok to use either. Let’s review other terms that are frequently used in health professions education.

Coaching is a term that is becoming popular in health professions education circles (and “coach” is now one of Ron Harden’s updated 8 “roles of a teacher” (Harden 2018)). Three core elements of coaching were recently identified in a study of interviews from self-identified coaches from sports and medicine:

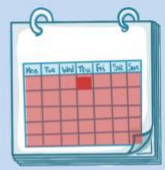
- (1) mutual engagement with a shared orientation toward growth,
- (2) ongoing reflection involving both learners and coaches, and
- (3) an embrace of failure as a catalyst for learning (Watling 2019).

The term **mentorship** has been used in health professions education longer than the term coaching. Healy and Welchert in 1990 suggested that “mentorship is a dynamic, reciprocal relationship in a work environment between an advanced career incumbent (mentor) and beginner (protege) aimed at promoting the career development of both.”

While both coaching and mentoring include longitudinal and reciprocal aspects in the teaching and learning relationship, coaching typically focuses on skills development and performance improvement, while mentoring focuses on personal and professional development.

Sponsorship is a term that was defined in business settings as “active support by someone appropriately placed in the organization who has significant influence on decision-making processes or structures and who is advocating for, protecting, and fighting for the career advancement of an individual.”

Recently investigators studied sponsorship in academic medicine. They contrasted sponsorship with mentorship as being more episodic (less longitudinal) and focusing more on career advancement than mentorship (Ayyala 2019).

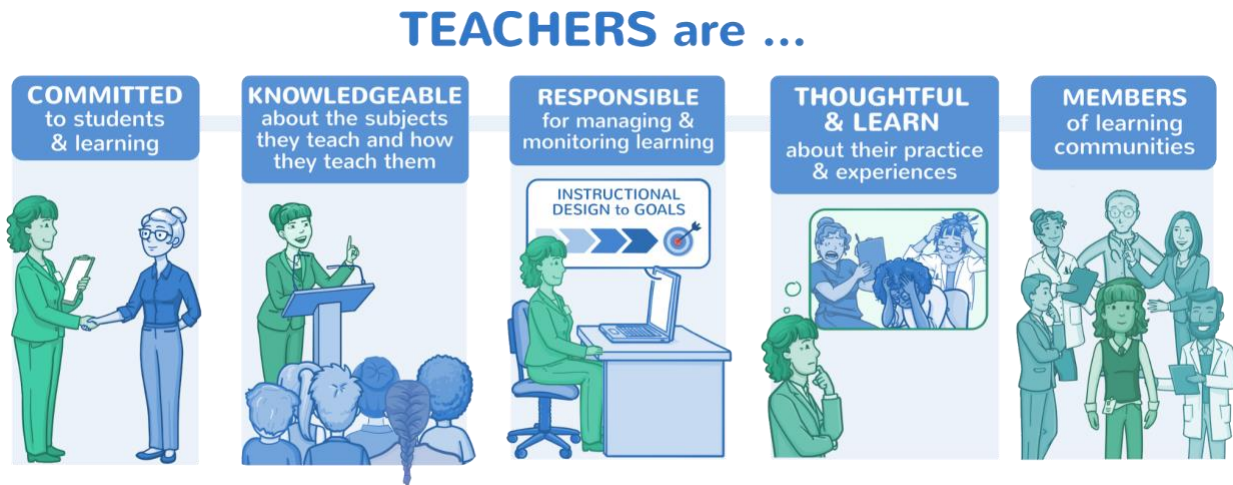
	SPONSORS	COACHES	MENTORS
Primary support	Career advancement	Performance improvement	Professional & personal development
Reciprocal benefit	Some 	Some 	A lot 
Period of relationship	More intermittent 	Episodic or longitudinal 	Longitudinal 
Other distinguishing characteristics	Has position or stature required to promote career advancement	Emphasize mistakes & errors as opportunities for learning	Often engage in coaching & sponsoring

Ultimately, learning can be facilitated by teachers, educators, coaches, mentors, and sponsors. And all of these functions may occur within a teaching and learning relationship between two individuals.

What do teachers do?

Teaching is a complex combination of helping learners develop new knowledge, attitudes, skills, and behaviors. Every teaching experience will be unique because each learner is unique, each group of learners will interact and influence each other in unique ways, and each learning experience will occur in somewhat different circumstances for you and your learners.

However, one constant in teaching is the teacher! Ideally teachers should always be committed to their learners, knowledgeable about their content, responsible for the learning experience, thoughtful about their teaching craft, and members of learning communities.



Frameworks for teaching “competencies” have been proposed for specific health professions (Srinivasan 2011; WHO 2013; WHO 2016) and across health professions (Curran 2014; Harden 2018; Molenaar 2009). Generally, these frameworks group activities into:

- Designing learning experiences,
- Facilitating learning in individuals and/or groups during learning experiences,
- Assessing learning,
- Evaluating curricula or programs,
- Leading and administering curricula or programs,
- Mentoring or advising individuals, and
- Performing educational scholarship or research

In practice, a teacher is likely to require some abilities in each of these domains, although mentoring, program evaluation, program leadership and administration, and educational scholarship can be considered specialized skills that not all teachers need to have (Srinivasan 2011).

Questions to ask when preparing to teach

To facilitate learning you need to apply the principles that we discussed in Section 1 and integrate them with curriculum development and instructional design principles (Branch 2009; Gagne 1985; Thomas 2016).

The approach we describe below does this and aligns with teaching frameworks described for general education (National Board 2020) and health professions education (Bing-You 2009; Hatem 2011; Skeff 1988; Srinivasan 2011). In this approach, teachers are expected to ask themselves 5 questions any time they are preparing for a teaching experience:

- Who am I teaching?
- What do I want to teach?
- How will I teach?
- How will I know learning happened?
- How will I learn from this experience?

1. Who am I teaching?

This question is deceptively simple but extremely important. To know how to facilitate changes in learners, you have to start by knowing what changes they expect, want, and need. Some questions to consider:

- What are your learners' current knowledge, attitudes, skills, and behaviors?
- What are they interested in learning?
- How would they like to learn?
- How much time do they have?
- What other competing demands are they facing?
- How similar and different is each individual learner?
- How can you draw from each learners' own experiences to enrich learning for everyone?

Before the session, you can answer some of these questions by asking the learners themselves or teachers who know them, or reviewing records of their past performance. During the session, you can begin with questions about what the learners expect and what they already know. Relating what you want to teach to what learners want and need will prepare you to select successful teaching methods.

Who am I teaching?



2. What do I want to teach?

Before teaching, clearly understanding what your own objectives (or what the intended outcomes) are will help you prioritize what you teach and how you teach it. Learning objectives will often be predetermined by the course or program in which you're teaching. Knowing where your teaching session fits within the bigger picture will help you make connections to previous and upcoming topics and avoid unhelpful redundancy.

If determining learning objectives is up to you, it helps to write down your objectives in advance. One tip for writing specific, measurable objectives is to make sure they include 5 elements: (1) Who (2) will do (3) how much/how well (4) of what (5) by when (Thomas 2016).

During a teaching session, you may also find that your objectives could be aligned better with those of your learners. In those cases, be open and prepared to adapt to what learners want and need to know. You can try to incorporate their input into setting and revising objectives even after the teaching session begins.

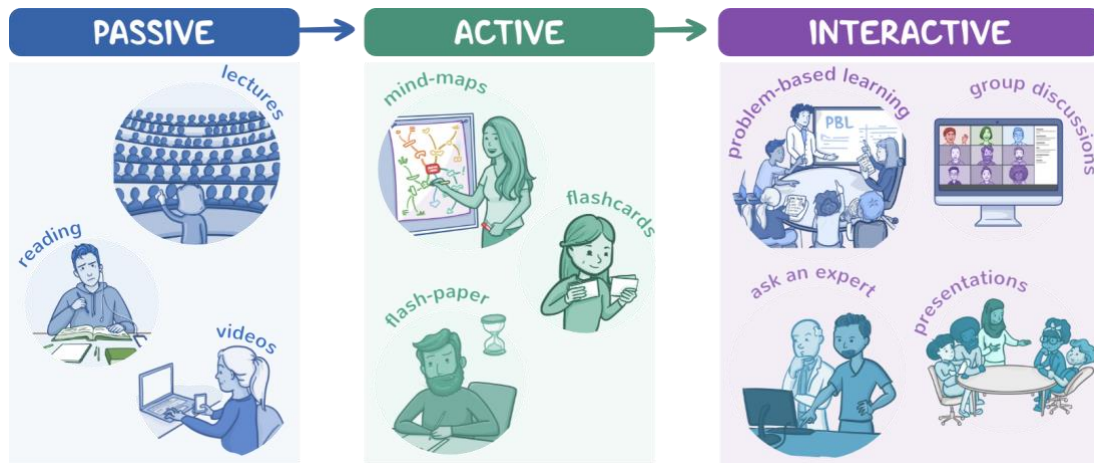
What do I want to teach?



3. How will I teach?

While teachers can't be content experts alone, in the health professions, **content** knowledge is often required. The more organized concepts are for you, the better you can help learners organize concepts for themselves. The specific **methods** you use to teach can vary, but the principles of learning we reviewed in Section 1 can serve as a good guide.

Generally, when you teach, your first job will be to address learner attitudes to make sure they are ready to make an effort to learn. If they are not, then you will need to plan an activity that motivates them. When learners are motivated, learning increases along a continuum from passive to active to constructive to socially interactive (Chi 2009).



During the session, you'll also need to manage the **learning environment**. Learning requires the freedom to try something new and make mistakes. Teachers can foster this environment by:

- 1) making sure everyone tries something new and risks being wrong,
- 2) rewarding those who try, and/or
- 3) sharing stories of their own learning from mistakes or failure.

Being open and embracing relationships with learners can also enhance the learners' commitment to their learning activities, provide a sense of safety in the learning environment, make the teaching and learning experience more fun, and lead to longer relationships where more personal and professional development may occur.

Finally, health professions learners at all stages need to be self-directed. Helping learners identify what they can do to further their learning after your session is an excellent ending to any teaching experience.

How will I teach?

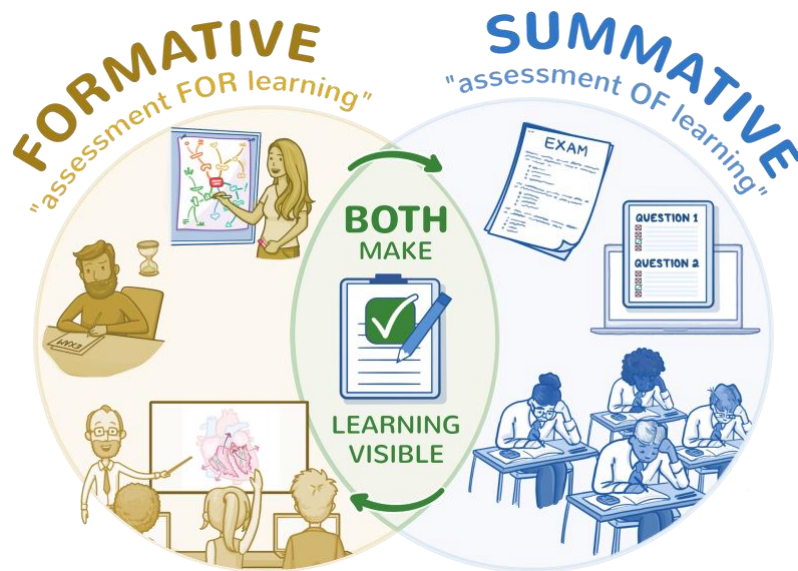


4. How will I know learning happened?

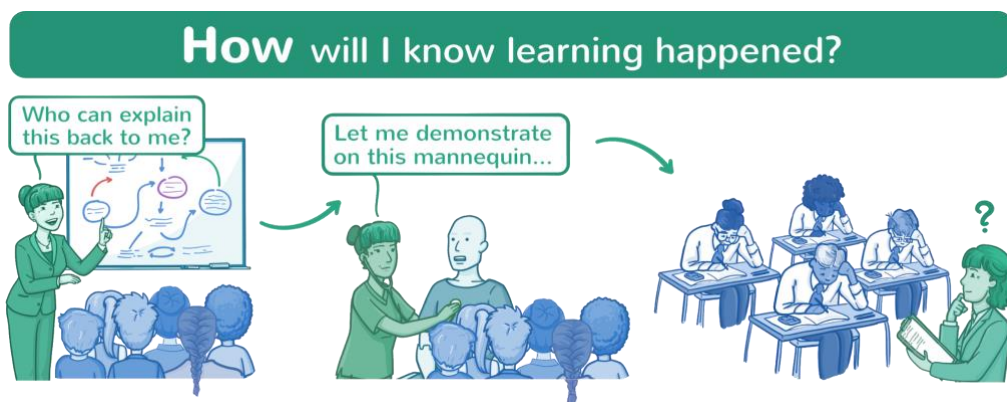
Teachers and learners often overestimate how much learning happens during a teaching session. The only way to know how much learning really happened is by making learning visible.

Typically, you want to assess learning according to your learning objectives. If you are teaching a new concept, ask learners to explain what the concept means to them and how it can be applied in their practice beyond the session. If you are teaching a skill, ask them to demonstrate it, more than once if possible.

Formative assessment, or “assessment for learning,” is great for learning—the more, the better—and many tips in Section 3 can be used for this. **Summative assessment**, often referred to as “assessment of learning,” includes many formal methods such as standardized tests and objective structured clinical examinations (OSCEs), but you will want to be sure to incorporate formative assessment into any teaching session you conduct.



Depending on the importance of the topic and your own interest, and especially if your hope is to change behaviors, you may want to follow up with learners downstream to assess how they've applied their "lessons-learned" from your session.



5. How will I learn from this experience?

Each teaching experience is unique and offers lessons that can improve your teaching in the future. Even the "best" teachers won't be able to make learning happen for everyone all the time, and can find new ways to improve their teaching practices.

Evaluations of teaching, while fairly commonplace, often fail to give teachers actionable feedback. While learners are present, you may want to ask for feedback on your performance. After the session, leave yourself time to reflect on the session and consider what to carry forward and what to change in future teaching sessions.

Teachers benefit from being part of a broader community, especially to develop their professional identities (Steinert 2019), and you can get extremely rich feedback by inviting someone to observe your teaching and debrief with you afterwards.



Feedback and supervision

An aspect of health professions education that distinguishes it from many other types of education is that learning takes place in the care of patients. **Supervision** is a time-honored and vital method to ensure safe learning in patient contexts. Many think effective supervision could be the key to competency-based, time-variable programs that allow learners to progress through training at their own rate.

Often, when we assess what learning has happened, we see opportunities for improvement. While the word **feedback** is used in different ways in different fields, in education the term refers to suggestions for improvement, usually with the mutual goal of achieving the learner's intended outcome (Ramani 2020).

The term "feedback" can be problematic because it might imply that there is positive feedback that reinforces good behavior and negative feedback that punishes or should extinguish bad behavior. The term can also be problematic because it implies that teachers give positive or negative feedback and learners just receive it.

However, in clinical care, learners must be attuned to feedback from multiple sources, not just their teacher. Learners need to be aware of their own thoughts and actions, cues that tell them how others may be thinking or feeling, and what is happening in the physical environment.

The feedback they receive from internal and external sources may be nuanced and not lend itself to simple rules that tell them what to do (or not do) in all situations in the future, so their judgment needs to be sophisticated and adaptable to a variety of contexts.



Supervisors can help learners become more aware of multiple sources of feedback by being careful observers and sharing their observations, interpretations, and suggestions with learners. Consistent with the learning principles in this guide, we recommend that feedback start with learners setting goals and leading their supervisors through the feedback experience as much as possible.

As a supervisor, your role is to carefully observe how well the learner is doing toward achieving their goals and facilitate their reflection and planning for actions that will help them improve efficiently. One stepwise approach to feedback you can try is:

- Ask the learner what they would like feedback on and help them identify learning goals.
- Arrange a time to observe learner performance and debrief on the observation.
- During the debrief:
 - Ask the learner about their observations on their own performance.
 - Ask what they would like to do differently in the future.
 - Describe your own observations and discuss their interpretations.
 - Indicate agreement with the learner where you agree.

- If needed, suggest alternative interpretations and ideas for new things to try.
- Define a plan for specific changes they will make.
- Time-permitting, ask for feedback on how the feedback experience was.
- If possible, offer to observe and provide feedback again in the future.

Thinking of yourself as a facilitator of a learner's goals whose job is to share observations and suggest alternatives allows you to focus on finding the limits of a learner's abilities and guiding them beyond those limits, so they can continue to improve as rapidly as possible.

Interested in learning more?

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[Learn more](#)

3. Evidence-Based Methods to Enhance Learning

The general principles in Sections 1 and 2 are useful when planning learning experiences, but it can also help to have specific tips that can be easily applied in practice. In addition, most learning models have been based on combinations of theory and observations and have many moving parts. In practice, even well-designed experiences grounded in sound educational principles aren't guaranteed to improve learning because of the differences in who participates, educational contexts, and available resources (Norman 2016).

Meanwhile, experimental research has developed robust evidence for small changes in approaches to learning that can make big differences. In an extensive review of the educational literature conducted by the Institute of Educational Sciences (Pashler 2007), six methods stood out as being backed by the best evidence and having the most impact. These are:

1. Testing effect
2. Spaced repetition
3. Interleaving
4. Concrete examples

5. Elaborative interrogation
6. Multimedia learning

These six methods have been featured in prominent books on learning (Brown 2014; Mayer 2014) and recommendations for health professions education (Gooding 2017; Mayer 2010; Sumeracki 2018; Van Hoof 2018). When used in combination, these methods are estimated to improve knowledge retention by 10–25% (Carroll 2017). For each of the following methods, we give a brief summary, how it works, why the method is a good idea, and how to apply it when teaching.

Testing effect

[Testing effect](#) simply means that testing increases learning.

How it works: When you search for answers to assessment items, this activates multiple concepts related to the answer and improves the organization of knowledge once the item is answered. The act of testing without feedback enhances learning in itself, although including high-quality feedback enhances learning even more.

Why it's a good idea: Over 100 years of experimental evidence across a variety of student populations and settings has shown testing significantly increases retention and recall (Dunlosky 2013; Roediger 2011). The same has been found in studies of health professionals (Green 2018).

How to apply it to your teaching: Provide as many assessment opportunities as possible, including before you expose learners to new content. You can encourage use of flashcards and case-based questions as a means of learning and incorporate them into your teaching practice. When teaching large groups, try using audience response systems, Poll Everywhere, or similar technologies for testing and feedback. “Gamify”: gamification typically uses testing and social and competitive aspects to augment focus and effort, leading to greater learning (Hanson 2010; Pitt 2015).

Spaced repetition

[Spaced repetition](#) occurs when you repeat retrieval of knowledge at increasing intervals to reduce forgetting and enhance long-term learning.

How it works: As with the testing effect, the act of retrieving knowledge activates multiple concepts and reorganizes learning. Spacing out retrieval over time causes cumulative gains in retention and ultimately lifelong knowledge. Simply repeating the same things (e.g. rereading) does not improve learning as much as spaced retrieval (Larsen 2009).

Why it's a good idea: Spaced repetition has been shown to increase learning across a range of settings (Benjamin 2010; Dunlosky 2013) including health professions education (Yeh 2015).

How to apply it to your teaching: The perfect interval for spaced repetition isn't known. The interval should be at least long enough that retrieval requires effort, but shouldn't be so long that everything has been forgotten. A good rule of thumb would be to test a few days after a first study session, then space to a few weeks after recall has become easier, with increasing interval lengths after that.

Using spaced repetition also requires planning and prioritization. The most important concepts should be presented early on and repeated throughout the teaching activity. Ideally, repetition will occur even after a course has been completed to reinforce concepts and leverage the effect of interleaving.

Interleaving

[Interleaving](#) is when you mix concepts or topics, rather than studying a “block” of single topics at a time.

How it works: Interleaving concepts allows easier comparisons and the ability to discriminate between concepts and transfer general concepts to specific examples. It also encourages retrieval from long-term memory, in contrast to studying only one concept at a time, where the information can stay in short-term or working memory before being forgotten.

Why it's a good idea: The first studies of interleaved practice examined learning motor skills, and the results showed a robust impact on learning (Brady 1998). The first interleaving experiments for cognitive tasks were carried out more recently but so far have shown similar learning benefits (Brown 2014; Dunlosky 2013), and findings are currently being reproduced in health professions education (Hatala 2003; Kulasegaram 2017).

How to apply it to your teaching: Avoid “blocking” content. Plan to interleave concepts rather than moving from one to the next without revisiting earlier concepts. Encourage learners to

mix problem types and occasionally revisit old material. Also, when advising learners, be sure to let them know that the payoff from interleaving comes in the long-term.

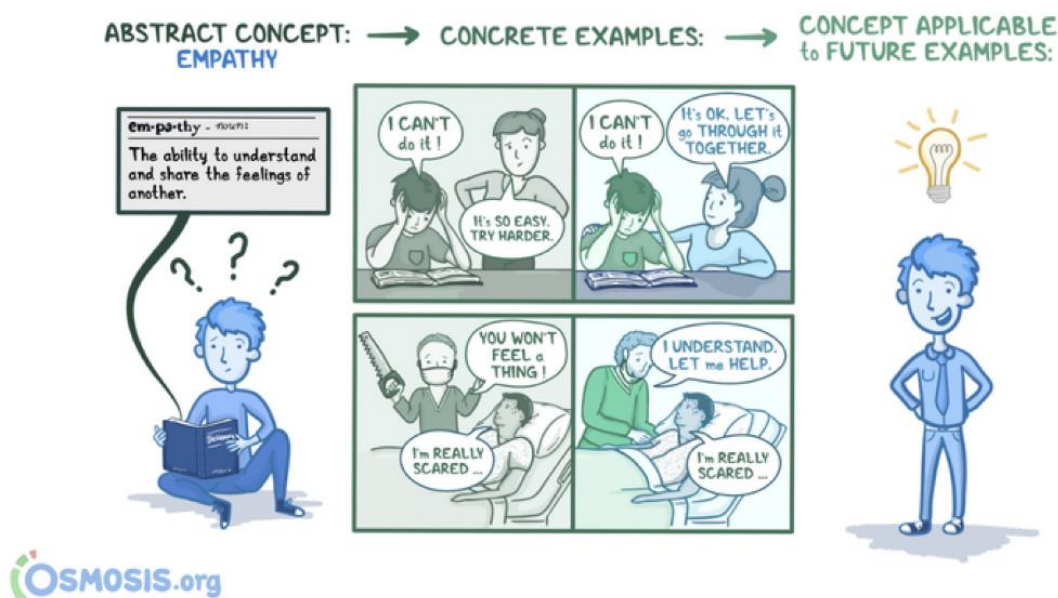
Concrete examples

The concept of concrete examples refers to when both illustrative examples and general principles are presented to enhance learning—especially the ability to transfer something learned in one situation to new situations.

How it works: By linking abstract concepts to real examples, you become more capable of applying those concepts to future examples.

Why it's a good idea: Decades of research in math and sciences (Goldwater 2016; Pashler 2007) and more recent research with declarative conceptual knowledge (Rawson 2015) have shown that blending abstract ideas and examples leads to a greater ability to apply general principles to new problems.

How to apply it to your teaching: Provide examples (e.g., clinical cases) that illustrate concepts. The more learners see variations of a general principle, the better they can transfer to new settings. Model positive behaviors that can serve as examples of how to apply abstract concepts. In clinical settings, logging patient cases can record examples that illustrate general clinical concepts and be referred to for later use.



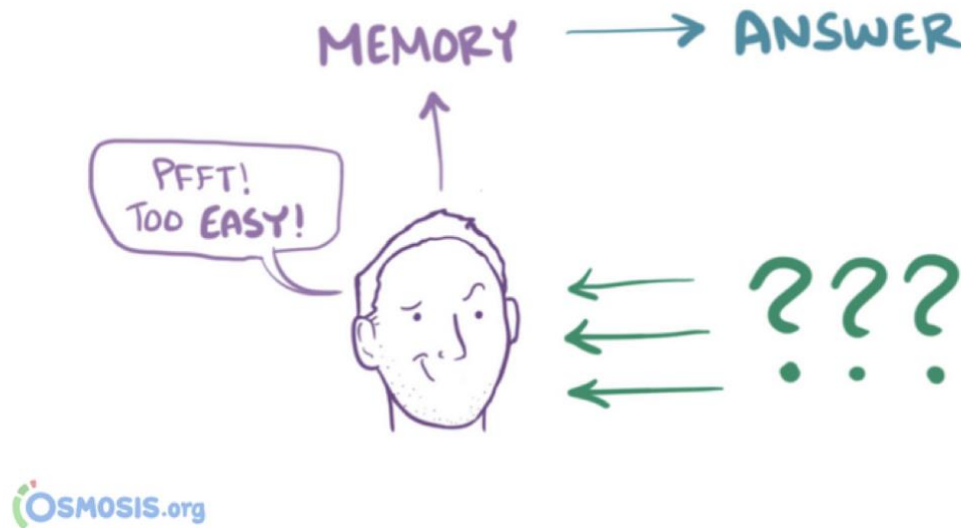
Elaborative interrogation

Elaborative interrogation is the concept that attempting to explain something yourself increases learning more than receiving an explanation from someone else.

How it works: By providing your own explanation, your current knowledge is activated and new knowledge can link with it.

Why it's a good idea: Studies show that prompting learners to explain similarities, differences, or reasons for a given phenomenon enhances learning compared to when they are given a readymade explanation or asked to memorize a fact (Dunlosky 2013).

How to apply it to your teaching: Before providing an answer or explanation, ask learners for their answers, explanations, or reasoning. Ask a lot of “why” and “how” questions. For example, if you were to teach someone about the association between smoking and cardiovascular disease, ask learners to explain why this happens and how do we know that it's true. Consider asking learners to generate “concept maps” that show how ideas relate to one another visually (Daley 2016).



Multimedia learning

[Multimedia learning](#) theory asserts that combining words and pictures (in the right ways) enhances learning better than using words or pictures alone.

How it works: Multimedia learning emphasizes two main channels for processing information, one for verbal information and one for visual material (Mayer 2010). Sensory information is processed in small bits into working memory, which processes and integrates concepts so that they can be encoded into long-term memory. Combining words and pictures, so that working memory can process them together as integrated “chunks,” moves the concepts into long-term memory more efficiently and better links them with existing knowledge.

Why it’s a good idea: A rapidly growing body of research on multimedia has found that using evidence-based multimedia principles consistently improves learning (Mayer 2014).

How to apply it to your teaching: Include both words and visuals in your teaching and apply the following multimedia principles:

- Remove extraneous material (which allows the right sensory information to move to working memory),
- Organize words and visuals so that they complement each other (which makes it easier for working memory to process them as chunks), and
- Break down complex topics into their building blocks (to help working memory process chunks sequentially and have chunks build upon each other in long-term memory).

4. Teaching Online

There’s no question that online education is here to stay. Being comfortable teaching online is likely to become a core role of a teacher in the health professions (Simpson 2018). In this section, we’ll cover the basics of designing and facilitating learning experiences in the online environment.

Theory and principles for online learning

Learning online has much in common with learning in-person and many of the principles we covered in Sections 1, 2, and 3 apply to online learning.

But teaching and learning online is inherently more complex than teaching and learning in-person. One key reason for this difference is the technology that mediates our online interactions. No matter how good an educational technology is, it can’t perfectly replicate live interactions.

Theories of **sociomateriality** have been proposed to explain how technology influences online learning (MacLeod 2015) and go beyond the theories rooted in psychology, sociology, and cognitive sciences that we summarized in Section 1.

In sociomaterialism, the social world and material world depend on one another and are inseparable. Material objects (e.g., laptops) or software (e.g., videoconferencing technologies) actively influence human social interactions and influence how learning occurs.



For example, video conferencing software literally flattens human beings into two dimensions and screens can render them as very small, larger than life, or invisible. Because we may not be aware of what is in our field of view or who is just outside of it, people can easily be exposed to sights and sounds that were not intended for them (MacLeod 2019).

Research is still exploring how technologies act on our human social relationships to influence learning, but if you feel like technology itself has changed how we teach and learn, there are theories and evidence to support your intuition.



Teachers may also face different challenges and require different strategies when moving from in-person to online settings based on their dominant **teaching perspective**. Research suggests that there are five types of perspectives that teachers may use in different settings:

- **Transmission:** when they want to present content accurately and efficiently,
- **Apprenticeship:** when they focus on engaging learners in authentic tasks in the workplace,
- **Developmental:** when they help learners' develop more complex thought processes,

- **Nurturing:** when they want to cultivate a trusting learner-teacher relationship, and
- **Social reform:** when they want to use education to challenge the status quo (Maggio 2018).



Finally, **logistical factors**—such as working with information technology support, audiovisual specialists, or instructional designers—also make online learning more complex for teachers and can compete with the time they usually take to prepare and reflect. Decisions about online course design also influence learning.

Designing online learning experiences

There is an incredible spectrum of online learning experiences (Chen 2019). The two major differentiating factors are:

- 1) how much content will be accessed online vs. in-person and
- 2) how much will be accessed synchronously (at the same time) vs. asynchronously (at different times).

	SYNCHRONOUS	ASYNCHRONOUS
IN-PERSON 	• All traditional instructional activities: - small-group - large-group - classroom - lab - simulation, etc.	• Office hours • Sequential groups of students engaged in identical activities - OSCE's - repeated cycles of simulations
ONLINE 	• Video-conferencing • Real-time chat blogs • Texting	• Pre-recorded materials (e.g. videos) • Recordings of prior in-person instruction

You could argue that something can't be both asynchronous and in-person since when a teacher and learner gather in person their interactions will be synchronous. The examples we provide are times when groups of learners are not having a fully synchronous in-person experience.

Some online curricula are entirely asynchronous and involve no direct teacher involvement, such as **self-paced modules** and **Massive Open Online Courses (MOOCs)**. These curriculum formats often require a lot of time and effort to design to make sure that learners anywhere can access and benefit from them.

If you are interested in these formats, we'd recommend participating as a learner in several courses so you can identify strengths and weaknesses for each course and platform. We also recommend contacting someone at your institution to see what support is available for creating self-paced modules or MOOCs.

Online learning that has synchronous aspects can be **fully online** or "**blended**," which has online and in-person aspects. Fully online and blended learning can each have asynchronous and synchronous elements.

An advantage of [blended learning](#) is that it includes time for students to complete individual work where and when it's most convenient, thereby creating class time that's dedicated to group work. Teachers can tailor questions and feedback to individuals or small groups, which makes their teaching more effective. Blended learning also supports the effortful, active-learning methods that make learning more efficient.

The simplest versions of blended learning ask students to complete readings or review recorded lectures before a class session, then have a discussion or another activity based on those lectures or readings. Reusable learning objects (Ruiz 2006; Wiley 2008), such as short videos, can be easily integrated into blended learning by asking students to preview them prior to interactive experiences.

You can find a general approach to online curriculum development that includes ways to convert traditional methods to online in the article by Chen and colleagues (Chen 2019).

Tips for teaching online

An awareness of the principles we've described will get you on your way to teaching effectively online. Here we want to share practical tips for a few commonly-encountered situations: creating an instructional video and increasing social engagement online.

Creating an instructional video

[Flipping the classroom](#) can be done by using existing educational resources, like readings or videos, but commonly teachers prefer to record their usual in-person lecture so it can be accessed prior to the live session. The actual recording can be made with a variety of existing software and often for free.

For example, PowerPoint allows recording a voiceover presentation. Richard Mayer, who led the development of multimedia learning theory, recently co-authored an article that recommended these five tips for creating effective instructional videos (Mayer 2020):

1. Draw graphics on the board while lecturing.
2. Shift eye gaze between the audience and the board while lecturing.
3. Prompt learners to engage in summarizing or explaining the material.
4. Film demonstrations from a first-person perspective.
5. Add subtitles if the video contains speech in the learner's second language.

Educators recently published 12 tips to present an effective webinar, which they defined as "live virtual events such as presentations, workshops, and seminars that allow participants to attend and participate using their computer or mobile device." (Topor 2020).

These tips included advice we've already given, such as knowing your learners, setting objectives, assessing learners, and learning from your own experience. They also recommended attending webinars, practicing with the technology before you present, and providing feedback to those who sponsored the webinar afterward to facilitate their own improvement.

For more advice on how to flip your classroom, you can also review the following articles from the Osmosis blog series:

- [Introduction to the flipped classroom](#)
- [Tips for piloting the flipped classroom in your course or program](#)
- [How to gain administrator and faculty support for flipped classrooms](#)
- [How to evaluate innovative online teaching methods](#)
- [How to manage small group learning via video conference](#)
- [Using Osmosis to support distance learning](#)

Increasing social engagement

Increasing social engagement has many benefits to learning but is often difficult to accomplish online. Research identified five factors that increase social presence online and tips to enhance each factor (Sung 2012):

FACTORS	TIPS	
SOCIAL RESPECT		Respond in a timely manner, show appreciation
SOCIAL SHARING		Share information, express beliefs
OPEN-MIND		Express agreement & disagreement, expose emotions or opinions
SOCIAL IDENTITY		Use greetings, address individuals by name
INTIMACY		Share personal stories

Interested in learning more?

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