Best practices in course development

Dr. Roy Jensen

While formal instruction has existed for millennia, the academic study of teaching and learning began in the 1950s. It continues to be an active area of research.

My background is in science education, and I have a strong interest in the scholarship of teaching and learning. I have over twenty years of experience with the Center for Teaching and Learning at a few institutions, taking workshops and seminars to improve my instruction, and presenting workshops and seminars to help other instructors. Beyond this, I have engaged in scholarship so that instructors better understand the evolution of learners during the learning process.

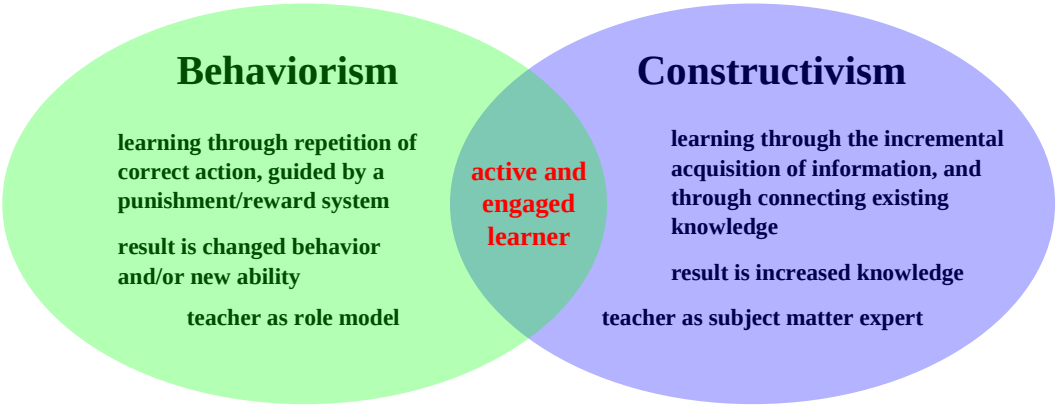
> ***Instructional best practices*** *are efficient and effective* ***instructional material*** *and* ***instructional strategies*** *that convey knowledge/skills in a manner that leads to optimal learning. This guide summarizes the information and steps needed to develop interesting, engaging, and effective courses.*

Contents

Learning theories

To develop an effective course, it is important to understand how people learn. With this understanding, it is possible to collect and arrange information in a way that effectively facilitates learning.

Since the 1950s, educational psychologists have developed and tested many hypotheses on learning. A few theories have emerged. Each theory has an environment where that type of learning dominates.[*,†]



Behaviorism states that a person's understanding and behaviors are learned through observation and interaction with others. A key aspect of behaviorism is the idea of reward or punishment. Reward reinforces and encourages behavior; punishment discourages behavior.

> *Getting a gold star or high grade on an assignment in school rewards the learner for the effort they put into that assignment. Course badges, certificates, and diplomas are proof of successful achievements. They are a reward for completing an activity, course, or program.*
>
> *Beyond formal learning, consider social interactions on school grounds, workplaces, nightclubs, etc. Through observation and experimentation, a person learns that specific behaviors get specific responses. A person can then apply these behaviors to make friends on a school ground, project confidence during a work presentation, reject a person in a nightclub, etc.*
>
> *Nonverbal communication is behavioristic. Throughout life, people learn nonverbal indicators for different emotions and different mental states. When we see a person with a specific set of indicators, we deduce they are in that emotional state.*
>
> *Martial arts, military, and law enforcement training to respond to specific actions is behavioristic.*

[*] Most readers are academic or vocational instructors. To illustrate the utility of the concepts herein, I continue using martial arts as a primary example. I trust you can translate the concept to whatever subject you are teaching, from chemistry to music to auto mechanics.

[†] I have combined cognitivism and constructivism, as they are closely related.

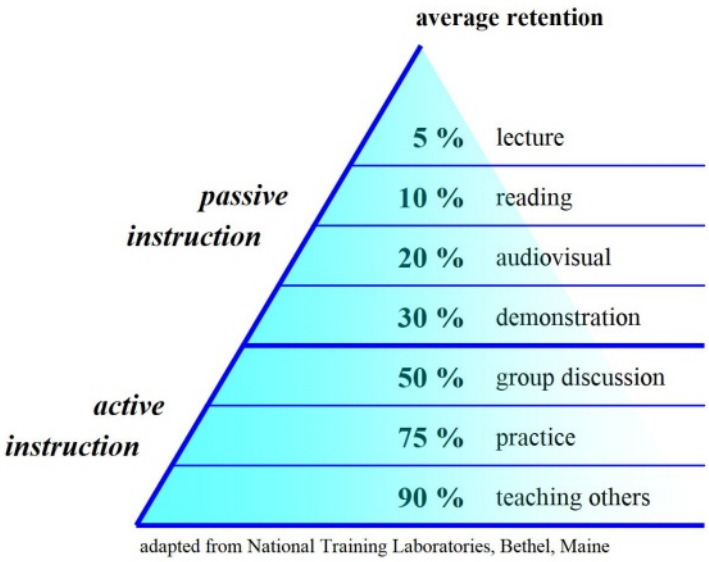
Constructivism states that learners integrate new information with their existing knowledge, and build connections between related knowledge to construct broader and deeper understanding. Constructivism is common in formal learning environments, from academic classrooms to trades schools to martial arts clubs.

> *In mathematics, learners are taught counting, then addition and subtraction, then multiplication and division, then algebra, and then calculus. Each of these aspects of mathematics requires a strong understanding of the previous aspect: you need to understand multiplication and division well to learn algebra; you need to understand algebra well to learn calculus.*
>
> *In auto mechanics, learners learn the basics of engine operation, then learn in detail how each part of the engine functions, then practice taking apart and assembling the engine components, then put all that together to understand how an engine operates, then integrate that with the other components of the vehicle.*
>
> *In martial arts, learners are taught basic kicks, punches, and blocks, then a sequence that forms an attack or defense, then a long sequence that forms a pattern (poomsae, kata). At each belt, more techniques are learned. (The belts in martial arts are behavioristic.)*

Active learning

At right are the results of a study into information retention as a function of instructional strategy. The results are obvious: the more active and engaged a learner is in learning, the more they learn.

Audiovisual and demonstrations have greater retention because the information is received by more senses. Lecture and reading are received by the learners hearing and visual senses, respectfully. Audiovisual and demonstrations are received by both senses. Active instructional strategies add kinesthetic action by the learner, thereby increasing retention.

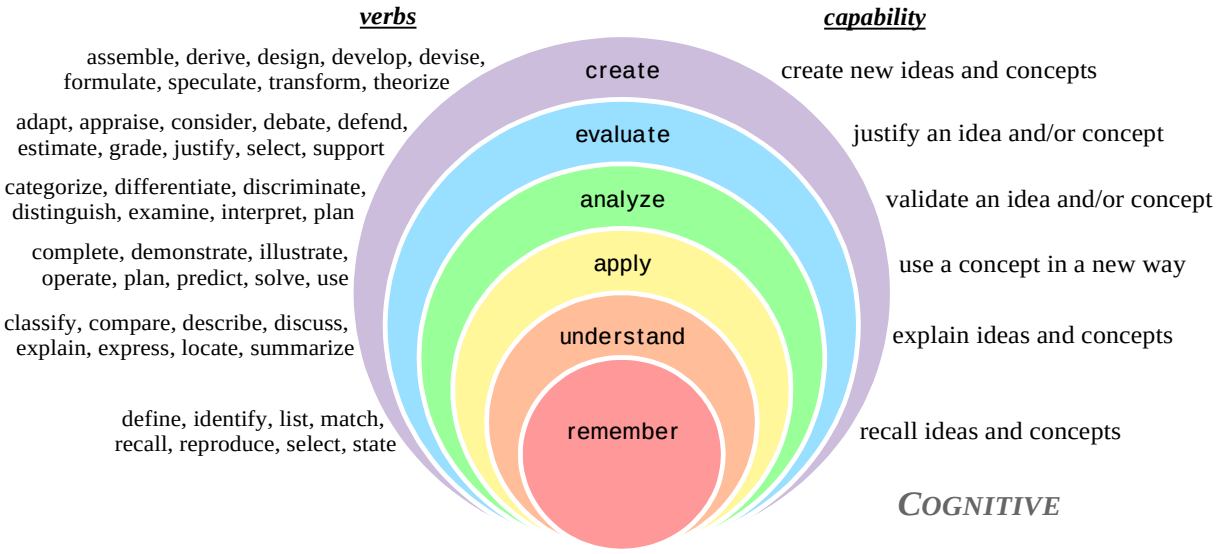


Bloom's taxonomies

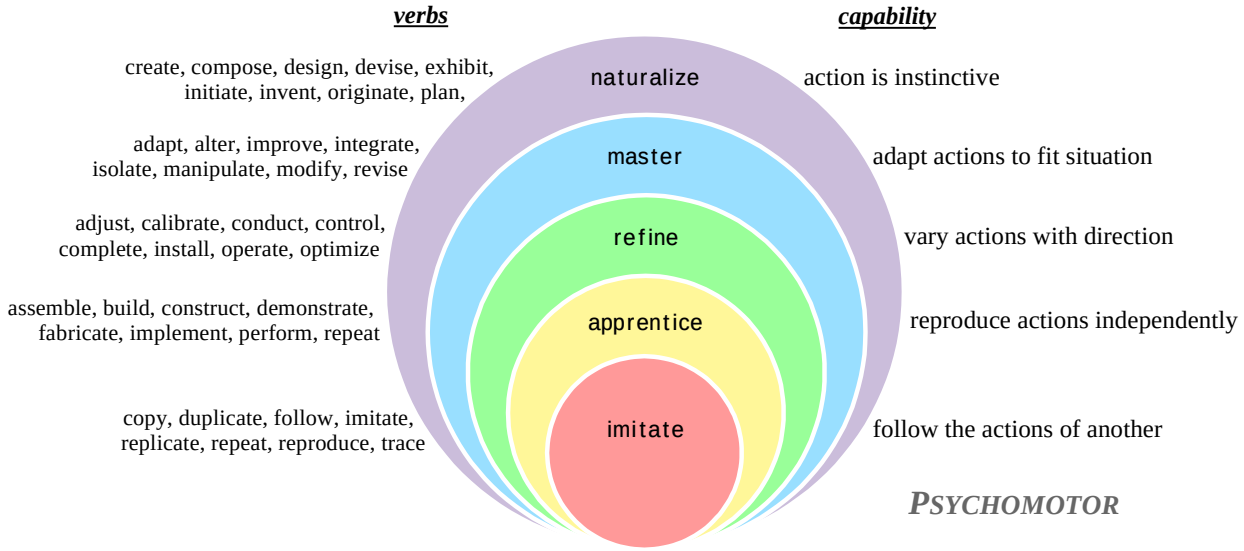
Bloom created frameworks for categorizing learning assessment. Below are Bloom's frameworks for acquiring knowledge (cognition), and developing skills (psychomotor).* A learner progresses up the framework as their understanding of the topic increases.

On the left are verbs that can be used to describe what a learner at that level of Bloom's taxonomy can accomplish. On the right are examples thereof.

Knowledge acquisition



Skill acquisition

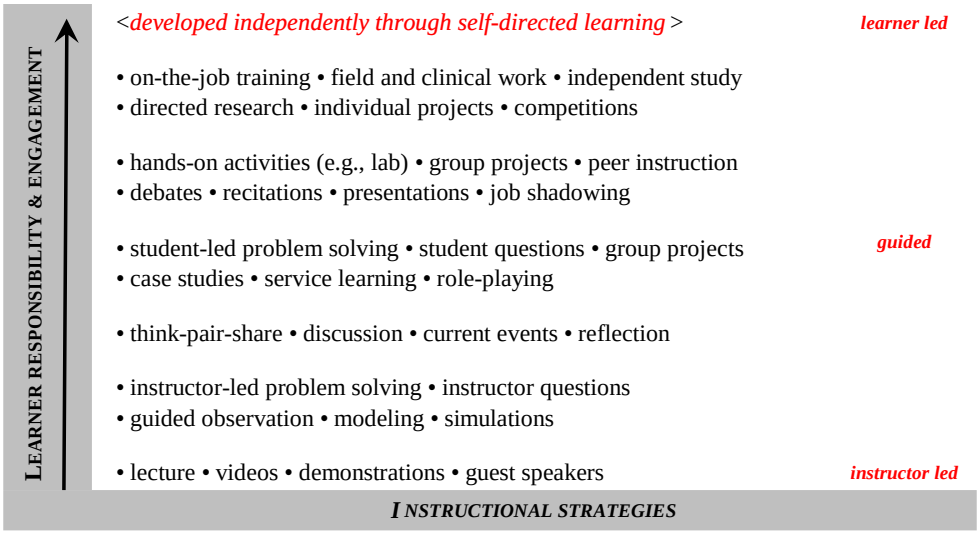


* Not included in this document is the emotional (affective) framework.

Building on the success of Bloom's taxonomy, Clark applied the same idea to instructional strategies, categorizing them from instructor-led to learner-led. At the bottom — the instructor-led strategies — are also the passive instructional strategies listed on page 3.

Clark's work also showed that the learner's responsibility and engagement increase as the instruction transitions from *instructor-led → guided → learner-led*

Instructional strategies

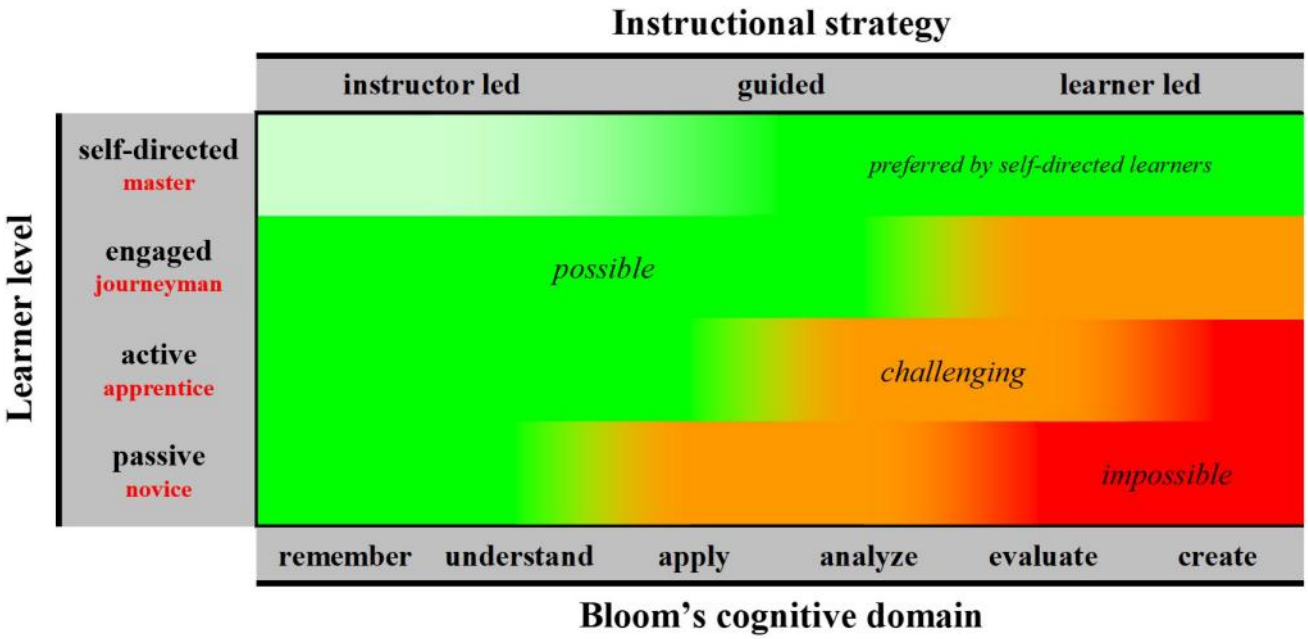


For example,

> *When a person starts martial arts training, they are taught basic stances and motions, and do so by following an instructor.* *(instructor-led; imitation)*
>
> *As the learner progresses, they are taught more complex moves, and told to practice them on their own. Learners work together to improve their techniques, with the instructor assisting occasionally and upon request.* *(guided instruction; refinement)*
>
> *As the learner progresses, they are supervised teaching new members. This forces them to master their own skills, and increases their confidence.* *(guided instruction; master)*
>
> *Eventually the learner advances to a level where the skills are second nature. The learner alone decides how far they advance in the martial art.* *(learner-led; naturalization)*

Learner development

This work looks at the learner during the learning process, and how that effects instructional strategies and learner capabilities. The following figure consolidates these aspects of teaching and learning.



Select any subject, from mathematics to music to martial arts to plumbing. Learners new to a subject are passive and dependent on the instructor. As the learner's knowledge/skill increases, they become more active and engaged in the learning, and ultimately begin learning independently for personal interest.

This work explains why different instructional strategies must be used with learners at different levels.

Additionally, it takes years for a learner to progress from passive to active to engaged. In academia, most learners enter post-secondary as ***passive*** learners. By the time they graduate with an undergraduate degree, they have advanced to being ***engaged*** learners in their major and ***active*** or ***engaged*** learners in their minor. Those who pursue a graduate degree will become ***self-directed*** in their major. In vocational training, the terms commonly used are novice, apprentice, journeyman, and master. Most stop at journeyman. In sport, those who advance to self-directed become high-performing athletes.

For example,

> *It would be challenging for a new martial artist to apply their newly-learned skills in a tournament or real fight, and it is impossible for them to evaluate the performance of another martial artist or to create new techniques.*
>
> *When the martial artist reaches blue belt (about two years of regular training), they will be asked to teach the basics to new learners: how to stand, punch, kick, etc.*
>
> *It takes four to six years of regular training to reach black belt. At this point, they can be considered an engaged learner. Choosing to pursue second, third, and higher degree black belts will transition them to a self-directed learner in that martial art.*

Course development

Two factors establish how good a course can be:

- the quality of the instructional material
- the quality of the instruction

You never want the quality of a course to be limited by the instructional material.

Your experience as a learner (when you were a student)

This may surprise you: *much of the instruction you received was not optimal.*

Poor instructors do not care about quality instruction. They use old notes that do not follow the newer textbook. They read directly off the slides. They use the same instructional strategies in all classes, often with the instructor as the center of attention. They dismiss questions and ridicule learners asking them. They go on tangents about their personal accomplishments. Etc.

Good instructors regularly try new instructional strategies. They talk with other instructors, get ideas, and try them in their class. The first time something is attempted, it is not perfect. Some ideas fail. Others are tweaked to be more effective. What was effective with one class of learners might not work as well with another class. Even the time of day affects instruction: teaching the first class in the morning, immediately after lunch, and the last class of the day requires different instructional strategies to keep learners engaged and focused.

New instructors often teach using a limited number of instructional strategies — often the instructional strategies that they themself found effective. New instructors also prefer to maintain control of the classroom, so primarily use instructor-led strategies. These are not optimal for all learners and all levels of learner.

Quality courses use a diverse array of instructional strategies targeted to the learner level.

The realities of course development

The first reality is that developing a new course or making major modifications to an existing course is rare. Revising a course because of a new textbook or new information is common, but few people have created a course from scratch. Realize that,

- In K-12, teachers are provided with course outlines and instructional material, and they teach using that material. This ensures consistency across classes and schools.
- In post-secondary, 100 and 200-level courses are similar to K-12: they are fixed. 300 and 400-level courses are more variable, but once an instructor creates a course, changes are infrequent.
- Vocational training is similar to K-12: prepared instructional material is provided to instructors.

University education programs and vocational “train the trainer” courses train people to be effective instructors. They do not train people to develop courses.

This Course Development section presents a proven method for creating quality courses.

Course design teams

Often, a course is part of a broader diploma or degree program. Before courses are developed, the department meets to determine what information needs to be learned during the program. The department organizes the information into logical progressions from entry to graduation, and to further distribute the information into courses that build on each other.

Once the course content is determined, the courses are assigned to subject-matter experts to develop the course. A small development team is formed of one or two subject-matter experts and a course design specialist. The course design specialist guides the subject-matter experts in organizing the course content into a logical progression and assists in creating instructional material that logically presents the content.

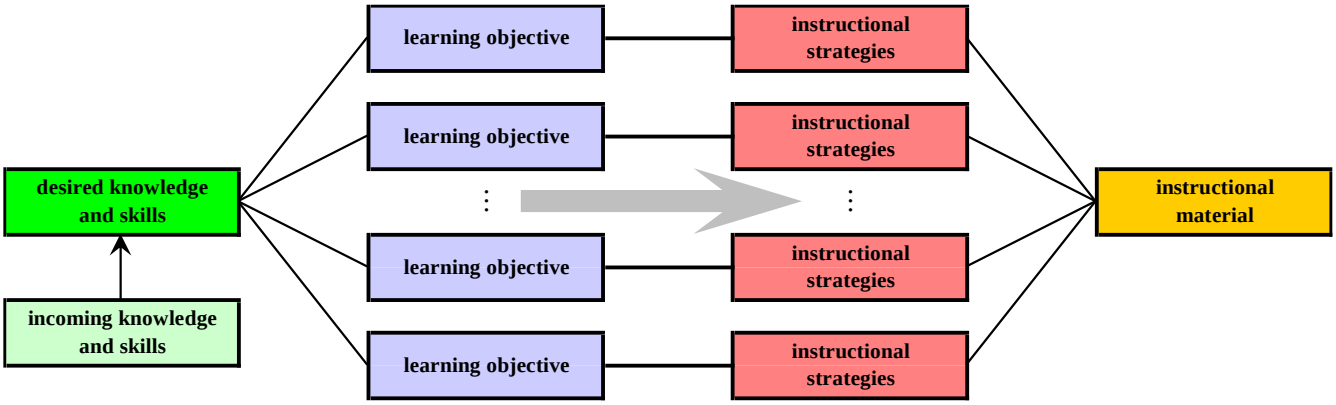
> ***Best practices in course design involves a team consisting of subject-matter experts, instructors, and a course design specialist, with additional experts and instructors available as reviewers.***

During various developments, I have been a subject-matter expert, a curriculum design specialist, and a course design specialist. I was on a six-year provincial working group that completely redesigned the K-12 program, on a faculty of science degree development committee that oversaw the creation of several science degrees for a new university, and on several course development teams creating courses for a chemistry degree.

Conversely, I have seen subject-matter experts reject outside assistance when developing courses. They explain that “they are the expert and know best.” Common flaws in the resulting courses include (1) not connecting with the learners existing knowledge, (2) conveying information too quickly, (3) conveying too much information, and (4) not linking information together. These occur because the subject-matter expert knows the information so well that they forget how little learners know. For them, everything is intuitively obvious, and they fail to connect with the learner. They also often only use one instructional strategy: lecture. Simply, a person with a strong understanding of the subject-matter is often not the best person to translate that understanding into an effective course. They need the expertise of course designers and instructors, who provide knowledge on instructional material development and instructional strategies.

Backwards design

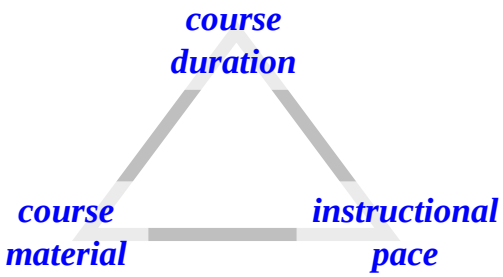
Backwards Design is a common course design model used to develop interesting, engaging, and effective courses and programs.



To start, the development team needs to know the average *incoming knowledge/skills* of the learners.

- for introductory courses, this can be assumed to be zero
- for advanced courses, the incoming knowledge/skills can be assumed to be the desired knowledge/skills of the pre-requisite course(s)
    - the review component of advanced courses should take no more than 20 % of the overall course duration and should focus on the challenging aspects of the pre-requisite course(s)
- the learner level can also be estimated based on their incoming knowledge/skills

Three factors are connected: the course material that must be taught, the instructional pace to effectively teach the material, and the course duration.



The difference between the *incoming* and *desired* knowledge/skills is the course material that must be taught.

Experienced instructors can estimate how long it takes to present the material. This sets the instructional pace.

For academic programs, semester courses are approximately 45 hours, with 40 hours of instruction and 5 hours of assessment. The desired knowledge/skills are revised to achieve this course duration.

For vocational programs, the courses can be of any length. Common course lengths range from half-day to one week (4 hours to 40 hours).

Determining the desired knowledge/skills also prevents “course creep”, where more material is added during development.

This may sound complicated, but there is an easy way to apply the Backwards Design model.

To apply the Backward Design model, start by preparing the course outline.

The course outline sets the learning objectives and the course topics. Together, these contain the desired knowledge/skills of the course. Below is a course outline template.

COURSE TITLE

A brief description that concisely states the nature and content of the course. The description is often the only information prospective learners have when deciding whether to enroll in the course.

(Duration: ?? hours)

Instructor: ???

Learning objectives

Upon completion of this course, learners will be able to:

-
- *<quantifiable statements of what a learner is expected to know*
- *or do after completing the course; based on Bloom's taxonomy>*
-

Course topics

Introduction (duration)

Topic 1 (duration)
- subtopic a
- subtopic b

Topic 2 (duration)
- subtopic a
- subtopic b
- subtopic c

Topic 3 (duration)
- subtopic a
- subtopic b

<add topics as necessary>

Conclusion (duration)

Assessment (duration)

Learning objectives

From the figure on page 6, the learner level determines the *possible*, *challenging*, and *impossible* categories of Bloom's taxonomies, and the preferred instructional strategies.

Learning objectives are statements that describe what the learner is expected to be able to do at the completion of the course. They are written as action statements using the verbs in Bloom's taxonomies (page 4).

The learning objectives should target the possible and challenging categories of the learner level.

- objectives in the *possible* categories boost the confidence of the learner
- objectives in the *challenging* categories challenge and differentiate learners, and advance them to the next learner level

For example, consider a knowledge/skill presented to a passive learner. The learner could be asked to

- *describe* the knowledge/skill (possible)
- *list* the steps of the knowledge/skill (possible)
- *apply* the knowledge/demonstrate the skill (challenging)
- *distinguish* between related knowledge/skills (challenging)

Learning objectives must be specific about the desired changes, and those changes need to be observable and quantifiable.

objective	+	**level on Bloom's taxonomy**	=	**measurable learning objective: *The learner will be able to …***
tenets of taekwondo		*state*		*… state the tenets of taekwondo.*
forward roll (×5)		*demonstrate*		*… demonstrate five forward rolls in a row.*
taegeuk 2		*demonstrate*		*… demonstrate taegeuk 2 without error.*

Assessment questions

The creation of assessment questions occurs throughout the course development process. I recommend having another file open to write down possible assessment questions.

From determining the desired knowledge/skills, writing the learning objectives, and identifying preferred instructional strategies, it is natural to ask, "how could we test this?" When an assessment question pops into your mind, write it down.

Artificial intelligence

Artificial intelligence (AI)* is advancing rapidly, but has limitations. These limitations result from the parameterization of the AI model. It is trained on publicly available information and searches the internet when prompted. It does not have or can find the advanced information that are the topics of courses.

Given this, ***AI cannot create courses!*** AI thinks it can, but the resulting courses are superficial.

AI can draft learning objectives for most courses. Consider the following prompts:

- "Create learning objectives for an introductory course in _____."
- "Create learning objectives for an advanced course in _____ that focuses on _____, _____, and _____."

You must still review and revise the learning objectives to ensure they are consistent with the course you are developing.

AI can create assessment questions but only on a chapter-by-chapter basis. You need to provide the AI with the textbook chapter or slides for a given module, then prompt the AI with the following:

- "Create 30 multiple choice questions, with up to six possible responses each, that assess student understanding of the following instructional material.", or, "... of the following slides."

You must still review and revise the questions to ensure they are consistent with the course you are developing.

Instructional material

To engage and excite learners, instructional material must be selected so that it links to their interests, links to their existing knowledge/skills, and is relevant to their future needs. Realistic and real-world examples are best for this.

Recall the learner development figure on page 6: for every learner level, different Bloom's categories are possible, challenging, and impossible. The instructional material and assessments must be from the possible and challenging categories of Bloom's taxonomies.

- material in the *possible* categories boost learner confidence
- material in the *challenging* categories challenge and differentiate learners
- assessments must also be a mix of questions that assess learner understanding in the possible and challenging categories

The relative amount of *possible* and *challenging* course material and relative number of *possible* and *challenging* assessment questions determines the difficulty of the course and of the assessments.

* AI cannot create courses! AI thinks it can, but the resulting courses are superficial.

Teaching using slides

The use of slides to present instructional material started in the 1980s. However, the use of slides is only one instructional strategy, and purely instructor-led. The use of slides must be augmented by other instructional strategies, and must be relied on less at higher learner levels.

Slides ***can*** be used to present conceptual (theoretical) information, subject to the considerations below.

Slides ***cannot*** be used for any practical activity. If an instructor wants to solve a problem in physics or demonstrate a skill, those must be done live by the instructor (in person preferred; on video otherwise). This demonstrates for the learners the steps to organize and set up the problem, talk it out, and troubleshoot issues. Indeed, learners report that they learn better if the instructor sometimes struggles with a problem than by doing it perfectly every time. The learners are learning to identify issues and troubleshoot them by watching the instructor — learners do exactly that when they attempt the practical activity. Doing this also introduces other instructional activities.

> ***These recommendations integrate other instructional strategies into slide presentations, making them more interactive and improving learning.***

Numerous programs exist that create quality slides: Microsoft PowerPoint, OpenOffice Impress, Google Slides, and others.

Presenting information

The course outline organized the topics. The slides present the information of each topic in a logical progress from the learners existing to the desired knowledge level.

There are many online resources that give tips for creating quality slides. However, pay attention to the audience. There is a difference between slides for presentations and slides for teaching.

- ***presentations***: the audience is knowledgeable, interested, and engaged
- ***teaching***: the audience is receiving new information, and has varying interest and engagement

In general, slides for teaching have more text and the presentation of information is slower. Slides also vary as a function of the learner level, as illustrated in the following table. These changes are because the preferred instruction transitions from instructor-led to learner-led, and because the knowledge and interest level of the learner increases. Self-directed learners are the scientists, researchers, business leaders, etc.

Instructional slides characteristics			
LEARNER: passive	**active**	**engaged**	**self-directed**
• more slides per hour (≈ 15)	⇒	• fewer slides per hour (≈ 5)	<*presentation-style slides*>
• more text	⇒	• less text	
• more information explicitly on slide	⇒	• more information presented orally	
• information more itemized	⇒	• information woven together	
• focus on simple examples	⇒	• focus on complex examples	

As noted above, you have probably experience less-than-ideal instruction. This includes less-than-ideal slides. The table below lists dos and don’ts when creating slides. It is very likely that your instructors may have used some of the “practices to avoid”.*

Creating instructional slides	
practices to apply	**practices to avoid**
Layout	
• have two or three templates for consistency	• every slide having a different layout
◦ 80 % of slide for information; 20 % for navigation	
◦ it's okay to occasionally deviate from the template	• breaking the template every third slide
• have a consistent backdrop or color scheme	• every slide having a different color scheme
◦ ensure high contrast between background and text	• colors that blend into the image
• use common, easy to read, fonts	• using fancy fonts to add style
• one font size for each heading; one for body	• changing the font size to fit the page
◦ heading: 28 to 36 pt	◦ font size below 18 pt (references, etc.)
◦ body: 20 to 28 pt	
• limit animations and special effects (to zero!)	• animations and special effects on every slide
Content	
• one concept per slide, or over many slides	• filling the slide with information to get everything on one slide
◦ white space is important	
• maximum of 50 words per slide (including headings)	• paragraphs of text
◦ bullet points preferred	• full sentences
• images *must* relate to the information	• clipart just to have an image on the slide
◦ images can be pictures, graphs, tables	• slides filled with only text
◦ should have images on at least half the slides	
◦ get as high resolution as possible (no pixilation)	

Slide layouts

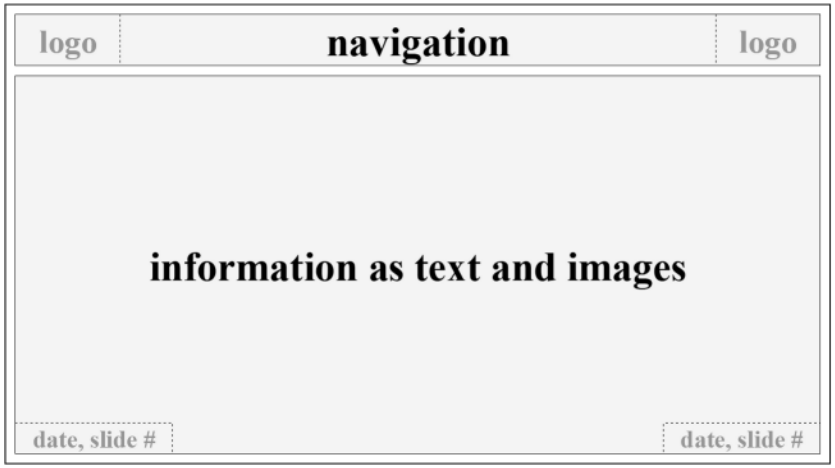
The title slide is freeform — do whatever.

Below are block-form templates of some common content slides. The navigation section reminds the learner what section they are in. The logo, date, and slide # are optional, and can go in various locations.

After the block-form templates are examples that use these or related layouts.

In your presentation program, I strongly encourage you to create master templates for the layouts you like. Templates allow for slide consistency. If you need to make a change to the layout, changing the master template changes all the slides in your presentation, provided you have not manually modified the slides. YouTube has numerous videos on creating master slides for common programs.

* This resource does not explain the entries in the dos and don’ts columns for brevity. Detailed explanations are online.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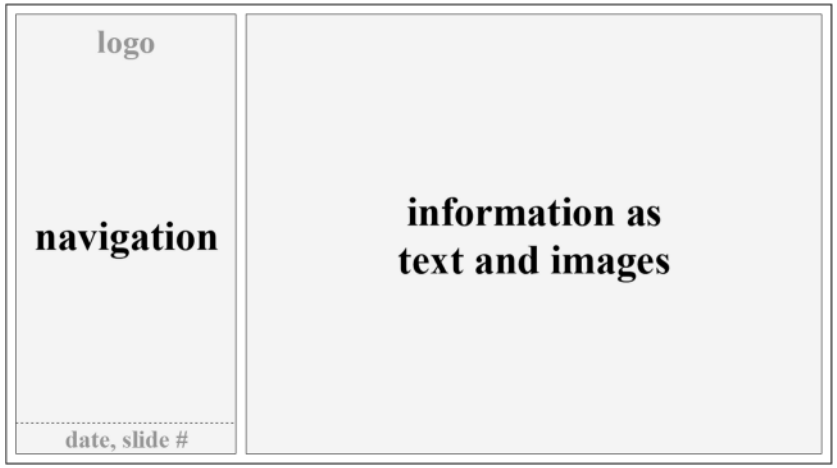
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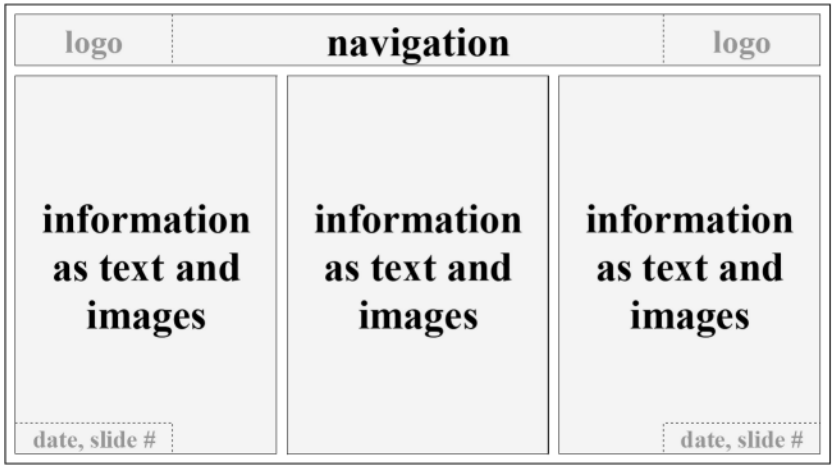
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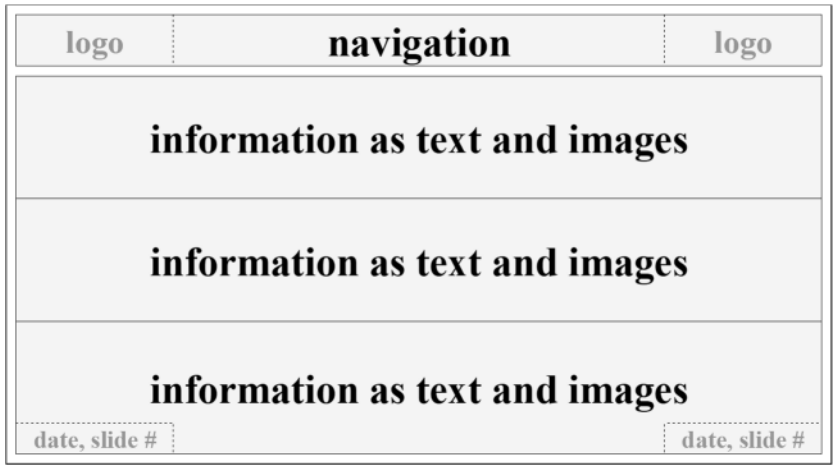
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Introduction

Managing SNS activation

- *BREATHE!*
- *continuous scanning*: prevents tunnel vision; complete picture of situation
- *tactical positioning*: be in a safe position
- *interview/ready stances*: ready to act/react

Tactical breathing (during the situation)

12

IMPORTANT CULTURAL ELEMENTS

Traditional practices
- ceremonies
- rituals
- festivals

vary between peoples

Languages

70* distinct indigenous languages spoken in Canada

Community structures

complex social organization

traditional community structures

Psychiatric Patients

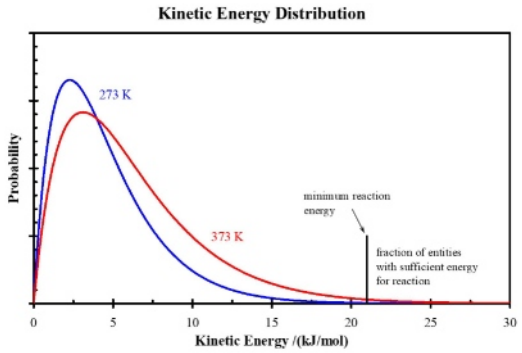
Mental health disorders that significantly impair thinking, mood, or behavior.

Challenges

- **Agitation and aggression:** unpredictable behavior, verbal and physical aggression
- **Self-harm and suicide risk:** more prevalent during acute phases of illness
- **Elopement:** leaving without authorization
- **Medication administration:** administering medication without consent

Factors affecting the rate constant

Collision theory: kinetics of cooking



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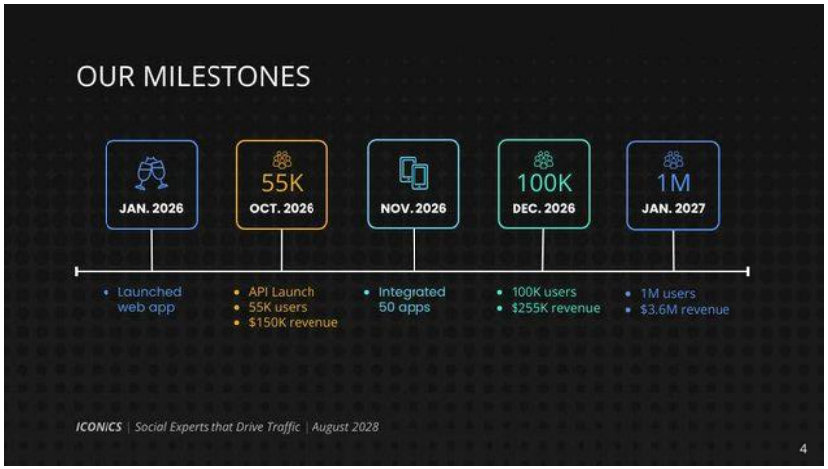


This slide deviates from the template, for a reasonable reason.

Presenting skills

Skills must be presented in person.

From machining to music to martial arts, skills must be taught in person. Skills are generally taught after the conceptual component of the skill is taught. That is, the instructor may describe the procedure in a classroom environment prior to demonstrating the skill.

When teaching, individual steps are taught and practiced, then the steps combined into the complete skill, which is also then practiced to gain proficiency. (See Bloom's skill acquisition taxonomy on page 4.)

Using commercial media

Video clips (news reports, movie clips, YouTube videos, etc.) should be between 20 seconds and 5 minutes, and should immediately be followed by questions on or discussion of the video.

The use of short excerpts of a video, including TV shows and movies, for educational purposes is permitted under the "fair dealing" provisions of the Canadian Copyright Act and the "fair use" provisions of the US Copyright Act.

Assessment

It is estimated that

- 10 – 20 % of learners regularly attempt to cheat
- 60 – 80 % of learners will attempt to cheat if they perceive monitoring is lax and they know others are cheating and not getting caught
- 10 – 20 % of learners will never cheat

Assessments are any form of individual or group exercise where the learner presents their understanding of the course material. Common assessments include assignments, essays, reports, quizzes, and exams.

Assessment is critical for deep learning and information retention.

Historically, it was common to award substantial grades for essays and reports. However, modern technology has invalidated take-home activities. There are entire industries set up to help disreputable learners avoid learning. That said, these activities are still valuable for learning, but the percentage of the overall grade should be minimal. Additionally, an instructor should use plagiarism detection tools to identify those attempting to get an unfair academic advantage.

This work focuses on creating fair quizzes and exams.

Quizzes provide an incentive for learners to maintain currency with the current course material. They are conducted after every unit, chapter, or module. Quizzes are typically 5 to 10 questions covering the information in the unit, chapter, or module, and generally take up to ten minutes to complete.

Exams provide an incentive for learners to maintain currency with the entire course material. Longer courses often have a midterm exam and a final exam. Shorter courses only have a final exam. Exams range in duration from one to three hours.

The distribution of grades between quizzes, exams, and other assessment activities varies from course to course. For most academic programs, at least 80 % of a learner's grade should be based on quizzes and assessments. This number diminishes as the learner level increases.

Hindering cheating in in-class quizzes and exams

Positive aspects of in-class assessments include all learners taking the assessment at the same time and in the same space. This makes it easy to monitor the learners, which hinders cheating. Negative aspects of in-class assessments include the assessment taking up class time, having to grade the assessment by hand, and the learners are sitting next to each other.

To mitigate learners cheating off the person next to them, instructors should create two or three versions of the assessment, and interleave them throughout the class. Making the versions different colors emphasizes to learners that the assessment is different and helps instructors survey the room and identify learners who have the same exam side-by-side.

Other strategies to hinder cheating include assigning seating and leaving empty rows so monitors can easily access the entire classroom. (Contact me for details, if interested.)

Hindering cheating in online quizzes and exams

Positive aspects of online assessments include the assessment not taking class time, and learners working in private (hypothetically). Testing software can dynamically create unique versions of an exam for every learner. Envision an instructor with a ten question multiple choice quiz. The testing software can randomize the order of the questions, and can randomize the order of the options. Every learner gets a different version of the same quiz.

This can be expanded upon by creating a database of questions. The course developer creates at least 15 questions for every learning objective. Then in creating the assessment, the testing software is told to select a specific number of questions for each learning objective. Every assessment is dynamically generated, and every learner gets different questions that test the same learning objective. This may sound complicated, but it is not.

Several types of questions can be graded automatically: multiple choice, numerical calculations, short answer, drag and drop, and others. Paragraph and essay response questions can be asked, but must be manually graded by the instructor. (This is changing with AI, but is still experimental and prone to error.)

For the automatically graded questions, the testing software prepares statistics that assess the quality of the question and the match between the course material and the assessment questions.

To prevent cheating, testing software can lock down the browser. This means that only the exam page is displayed, and many functions are disabled. This prevents the learner from searching for answers and

copying questions. More robust monitoring is possible using AI, where AI monitors the learner's actions via the webcam, and flags suspicious behaviour for human review.

For greater security, learners can be required to take the assessment in the presence of a proctor. Many schools, libraries, and government offices will proctor exams for a fee. These proctored exams could be paper, or could be online.

A proctored online exam results in the greatest security and greatest hindering of cheating.

Practical assessments

For skills assessments, the assessment environment must be as realistic as possible.

The learner is assessed in their ability to complete the task in accordance with the procedure taught. Other aspects are often assessed at the same time: quality of work, time to complete, plus an understanding of the purpose of each step.

Review and revision

Every course should go through at least three review cycles before being considered "done". A review cycle involves (1) teaching the course to identify ways to streamline information and presentation, (2) getting feedback from learners, and (3) getting feedback from other subject-matter experts. This feedback guides the revision of the instructional material.

Many instructors never consider their course "done", and update and tweak the course every time they teach it.

Development timeline

Numerous sources say that it takes between 20 and 50 hours to develop one hour of training. Variables that affect the development time include the type of delivery (in-person, hybrid, online); the technicality of the content; the requirement for handouts, workbooks, etc.; and the experience of the developer. There are economies of scale, but expect the development of a 4 hour course to take a minimum of several weeks to develop, and a 40 hour course a minimum of several months to develop.

Course instruction

Many books are written on effective instruction. *They detail everything from classroom management to effective instructional strategies to fair assessment. Below is a brief overview of instructional best practices.*

There are three common instructional modalities:

- ***in-person***: where the instructor and learners are in the same location
- ***online synchronous***: where the instructor and learners are in different locations, and meet in an online virtual classroom
- ***online asynchronous***: where the learner goes through the instructional material at their own pace and on their own time; an instructor may be available via email, but is generally not available to actively engage with the learner (formerly called *distance education*)

This section presents the commonalities of effective instruction, and then presents nuances to effectively instruct in the different modalities.

Effective instruction

Effective instruction infers that knowledge/skills are conveyed to the learner in a mode that facilitates learning. As noted above, the more active a learner is in learning, the more information they will retain. However, the learner level dictates which instructional activities will be possible, challenging, and impossible. The instructor must select instructional activities that are possible and challenging for the learner levels in their class. The wrong instructional strategies will alienate learners, resulting in fear, confusion, and resentment towards the instructor. The wrong instructional strategies will reduce learning.

Preconditions for effective instruction are instructional material conducive to learning, and learners that have the prerequisite(s). With these, an instructor can effectively teach.

Learner responsibilities

The learner has some important responsibilities for learning. The learner must approach the course with an open mind to learning and a willingness to participate in the learning activities. Without these, no amount of instruction can convey information to the learner.

That said, the more the course links to the learner's interests, and the more engaging the instructor, the more likely it is that a learner will be interested and learn.

Instructional environment

The instructor is responsible for creating and maintaining an instructional environment conducive to learning. The instructional environment has three components: *physical*, *psychological*, and *pedagogical*.

The ***physical environment*** includes the classroom and online environments. They must be safe, free from distractions, and with the appropriate resources to allow for effective instruction. Depending on the subject, this could be a classroom with whiteboards, a data projector, and educational posters; an auto shop with tools, damaged vehicles, and repair manuals; or a room with sponge flooring and mirrors.

The ***psychological environment*** refers to the relationship between the instructor and learners, and between learners. The learners must feel safe, respected, and encouraged to participate in the instructional activities. The foundation of the psychological environment is established on the first day of class by the instructor. Learners have some responsibility in maintaining the psychological environment: they cannot refuse to participate or be derogatory towards the instructor and other learners.

The ***pedagogical environment*** includes the instructional material, instructional strategies, and assessment strategies. They must be appropriate for the learner level, organized in a logical manner, and used effectively.

Instructional strategies

The table on page 5 ranks instructional strategies from *instructor-led → guided → learner-led.*

The learner level determines which instructional strategies best convey information. Most classes will have learners at a range of levels, but concentrated at one or two. An instructor should select instructional strategies at the dominant learner level, and a few at other levels. The table below shows recommended time allocation to the type of instruction as a function of dominant learner level.

Type of instruction	Proportion of class time /%			
	passive	active	engaged	self-directed
pre/post-testing	10	10	5	0
instructor-led	40 – 60	30 – 50	20 – 40	0
guided	20 – 40	30 – 50	30 – 50	10 – 30
learner-led	0 – 20	10 – 30	20 – 40	70 – 90

For example, learners new to a topic are passive or active learners. They prefer and do better in instructor-led and guided environments. (The guided environment is challenging for passive learners.) Learners with experience in the topic are active or engaged learners. They prefer and do better in guided and learner-led environments. (The learner-led environment is challenging for active learners.) Conversely, passive learners cannot function in learner-led environments, and engaged learners feel constrained in instructor-led environments.

During instruction, the *instructional strategies* should be varied, both in type and level, to keep the learners interested and engaged. Slides are a common instructional strategy used with lecture instruction, but the learner is passive during lecture. Lectures must be interspersed with other — preferably active — instructional strategies.

You have probably experience less-than-ideal instruction. Many novice instructors think that all they need to do is display the slide, read the slide, and move on to the next slide. Effective instruction goes beyond this. The table below lists dos and don't when using slides.

Teaching with instructional slides	
practices to apply	**practices to avoid**
• provide learners with a PDF copy of the slides	
• put the slide on the screen, then pause for several seconds while learners skim it	• reading the slide to the learners
• talk to the learners, not to the slides	• talking towards the screen
• talk expands on the information on the slides	• repeating only the information on the slide
• present information as a story; link the information to the learner's existing knowledge; make it real and relevant	• presenting only facts, with minimal context
• give learners time to write notes and your added info	• not giving learners time to reflect on the info
• integrate other instructional strategies	• using only one instructional strategy
◦ videos, demonstrations	
◦ question opportunities	• dismissing questions without answering them
◦ instructor-led and learner-led examples	• belittling learners for not understanding
◦ discussions	• cold-calling learners

more on page 5

Providing a PDF copy of the slides allows learners to make notes on them. They can print them out and write notes on them, or write notes electronically. You do not need to provide all slides, such as slides that answer discussion questions, summarize key points, etc. This forces the learner to write down this information — writing notes is a form of active learning, and results in greater retention.

> ***One of the hardest things for an instructor to do, and one of the most critical things an instructor must do, is to increasingly turn over control to the learners.***

A document for learners is available that provides effective learning strategies, effective studying strategies, and effective test-taking strategies. (Contact me for this document.)

In-person instruction

The best instructional environment is in-person and learner-centered. The dynamic interaction between the instructor and learners, and between learners, creates an optimal learning environment.

Online instruction (synchronous)

Synchronous online instruction requires the instructor and learners be connected in a virtual classroom at the same time (Teams, WebEx, Zoom, etc.).

The main drawback to synchronous online instruction is the lack of a learning environment. Because the instructor and learners are engaging through webcams and computer monitors, there is not the same connectedness. The interactions do not feel as real as being in a classroom. (In research, this is called the *transaction distance*.[*]) The learner could be at home, at their workplace, or anywhere. The learner could have other obligations and not be in the same headspace as they would be if together with other learners in a physical classroom.

Despite the lack of a learning environment, it is possible for the instructor to use the same instructional strategies in a virtual classroom as in an in-person classroom.

Online instruction (asynchronous)

Asynchronous online instruction requires the instructor to have all the learning and assessment material available, and allows the learners to go through the course at times of their convenience and at their own pace. The development team should add a video editor, who is responsible for creating the instructional videos. One person on the development team must have significant experience with the learning management system (LMS), as they will need to create the online lessons.

Asynchronous instruction has the benefit of allowing learners to learn at their own pace and to rewatch lessons to improve their understanding. Conversely, the learner is much less connected to the instructor and to other learners. Since there are no scheduled class times, the learner must be a self-starter and must make time to complete the course.

A benefit of asynchronous instruction is that the lessons can be of varying length. It is recommended that lessons be between 5 and 30 minutes, and should present a single concept. If it takes longer to present a concept, it should be presented over two or more lessons.

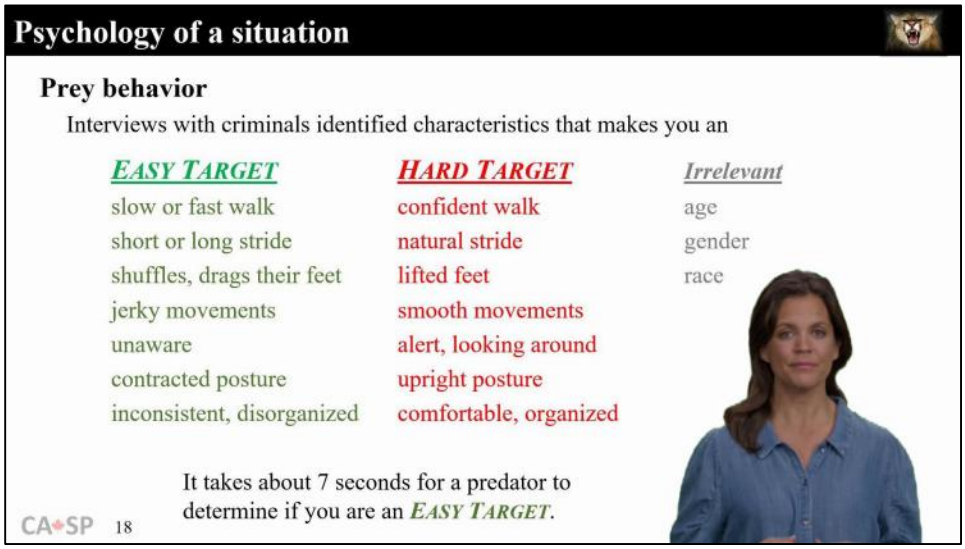
> ***An asynchronous "course" that simply displays slides and expects learners to read them is a failure. It is forced reading, NOT teaching.***
>
> ***This section presents best practices in asynchronous online instruction.***

[*] An example of transactional distance is in television and movies. We see graphic car crashes, explosions, gun fights, and injuries/killing on screen, and think little of it. Yet if we were to witness any of these in real life, we would suffer significant psychological trauma. Our desensitization to what we see on screen translates to online courses: we are not a part of it; it is not as relevant because the instruction is on screen, not in real life.

Additional course development requirements

Creating an asynchronous course is challenging and time consuming.

Best practices in asynchronous instruction are to make the course as close to an in-person course as possible. That is, have an avatar teach the course, and have activities that engage the learner.



The best starting point for developing an asynchronous course is to have a well-developed in-person course. Beyond the in-person course, the steps to developing an asynchronous course include

1. creating, reviewing, and revising a script of the instructor teaching the course
2. refining the script to include pauses that an instructor would normally have
3. creating the avatar speaking the course
4. synchronizing the avatar and instructional material
5. creating the online lessons, and adding the learning activities
6. testing the course

These steps add around 20 hours of time for every hour of instruction. Reviewing this list, I trust you can see why a video editor and LMS expert are needed. It should also be obvious that, once created, a course is difficult and time consuming to revise. As such, the course and script need to be reviewed several times by several people before being considered “final” and used to create an asynchronous course.

Like learners cheating on exams, some learners will strive to skip the course material and go straight to the assessment. The LMS expert needs to use technology that ensures learners cannot bypass lessons and learning activities. (How this is done depends on the LMS.) There should also be control over the order in which the learner accesses the lessons.

The learning activities are akin to the teacher asking a question of the class about what was just presented. This could be a multiple choice or short-answer question, or it could be a longer answer that is shared with other learners. There should be an activity every five minutes, on average.

Other features of asynchronous courses that are possible include

- closed captioning
- online discussion groups
- quizzes at the end of each module and a comprehensive final exam

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Much of the information in this article is common knowledge within the educational community. A few sources are still recognized for their advancements. Innumerable books, articles, and websites explain these concepts.

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