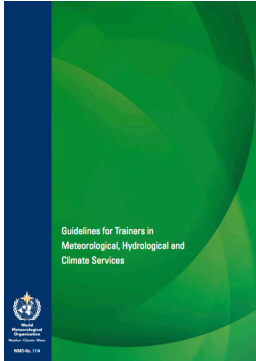


## Chapter 6: Learning Activities and Resources



NOTE: This is an extract of the document “Guidelines for Trainers in Meteorological, Hydrological and Climate Services” (WMO-No. 1114).

To read the full document, please access:

[WMO-No 1114](#)

[http://www.wmo.int/pages/prog/dra/documents/wmo\\_1114\\_en.pdf](http://www.wmo.int/pages/prog/dra/documents/wmo_1114_en.pdf)

## 6. LEARNING ACTIVITIES AND RESOURCES

### Competence IV: Design and develop learning activities and resources

#### Competency description

The design and development of learning activities and resources are grounded in evidence-based learning theory, support the learning process and address the specified learning outcomes.

#### Performance criteria

- Design learning activities based on established instructional theory and the characteristics of learners in the workplace;
- Take account of the strengths and limitations of the learning activities that could be part of the learning experience;
- Use learning activities that include authentic tasks, build upon the prior knowledge of learners and provide opportunities for practising the required skills;
- Prepare presentations and learning resources;
- Choose the technology and software required for learning solutions;
- Follow a structured development process when preparing learning resources.

#### Knowledge requirements

To be able to understand, explain and/or critically evaluate:

- Characteristics of learners in the workplace and various categorizations of learning styles;
- Characteristics of trainer-centred and learner-centred instruction;
- How to plan a learning session and the sequencing of learning;
- Instructional strategies and applications of instructional theory;
- Strengths and limitations of various learning methods;
- How to design presentations, slides and other learning material;
- How to develop self-paced learning resources;
- Development processes for instructional resources;
- Use of software packages and technology;
- How people acquire knowledge and build skills.

#### Personnel who should demonstrate this competency

- Senior trainers who lead the design process;
- Instructional designers or other education specialists;
- Trainers who would benefit from an awareness of the issues related to instructional design.

### 6.1 Introduction

Once an organization has decided the best solutions for addressing learning needs, the next step is to design the components that make up the learning solution, the smallest of which are the individual learning activities. A solution might involve running a course one or more times, providing stand-alone learning resources, or running a learning programme made up of several different kinds of solutions. For example, a programme to enhance management skills could involve a set of courses or smaller-scale learning activities dealing with communication, negotiation and strategic planning skills. No matter what the nature of the learning solution is, it will be made up of one more learning activities for which the design considerations are similar.

The design of learning activities needs to take into account current knowledge about how people learn. Learning activities also have to suit the type of learner – that is, a novice or someone experienced in the subject matter – and what needs to be changed, whether it is knowledge, skills or behaviour.

In some cases, once the design of the learning activity has started, there may be a need to review the learning solution that has been chosen based on the considerations discussed in chapter 5. Do not be reluctant to modify previous decisions based on valid information gathered during follow-on phases.

This chapter will discuss a variety of basic concepts about learners and learning, learning design procedures and considerations, and recommendations for developing learning resources.

## 6.2 Workplace learners

Learners in the workplace are motivated when they know the reason for learning and when the subject relates to their learning needs and jobs. A lot of training literature refers to “adult learners” but, since adult learning interests and needs vary greatly, it is more useful here to consider workplace learners. Like all learners, they like to be actively involved in the learning process, have some control over it, and feel that it uses or relates to their experience. As adults, workplace learners in particular have come to expect that their contribution to the learning process is acknowledged and respected. In any group of learners, there will be differences in intellectual ability and pace of learning, which must also be given consideration.

A workplace learning activity should be designed so that it:

- Uses the experience and expertise of the learners, and encourages cooperation and participation;
- Has clearly defined learning outcomes that are shared with the learners;
- Focuses on how new knowledge and skills can be used, emphasizing application rather than theory;
- Uses a variety of learning materials and methods, lets learners have some control over the pace of learning and provides prompt feedback and opportunities for reflection.

Adults, in particular, can be anxious about their learning, because working adults want to appear already competent. Children are more likely to accept their limitations, are more open-minded and indeed sometimes learn more quickly as a result. On the other hand, adults might feel uncomfortable with new technology, might have concerns about whether they will be able to contribute meaningfully, or feel uneasy about assessment. They might also have difficulty adapting to a non-traditional approach, or simply be out of practice as learners. The design needs to take these issues into account.

The Universal Design for Learning provides an insight into how to design learning activities that help people become better learners (see Box 6.1).

### Box 6.1. Universal Design for Learning

The Universal Design for Learning has been developed by the National Center on Universal Design for Learning. It provides a set of principles that form the blueprint for creating instructional goals, methods, materials and assessments to foster expert learners. The intention is to offer a flexible approach that can be customized and adjusted to individual needs, building confidence and allowing learners to develop their own learning strategies.

<i>Expert learners are</i>	<i>Foster expert learners through</i>
<ul style="list-style-type: none"> <li>– Resourceful and knowledgeable</li> <li>– Strategic and goal-directed</li> <li>– Purposeful and motivated</li> </ul>	<ul style="list-style-type: none"> <li>– Multiple means of representation (different ways of presenting content)</li> <li>– Multiple means of action and expression (different types of learning activities)</li> <li>– Multiple means of engagement (different ways of interacting with the trainer, fellow learners and the learning formats)</li> </ul>

For more information about Universal Design for Learning go to <http://www.udcenter.org/aboutudl>.

### 6.3 Learning styles

Much has been written about the variety of ways in which a person can learn and the possibility that people have inherent strengths and weaknesses that lead them to prefer one style of learning over another. Some authors argue that because people often have a preferred way of learning, the design of activities should accommodate different learning styles so that everyone benefits from the activities.

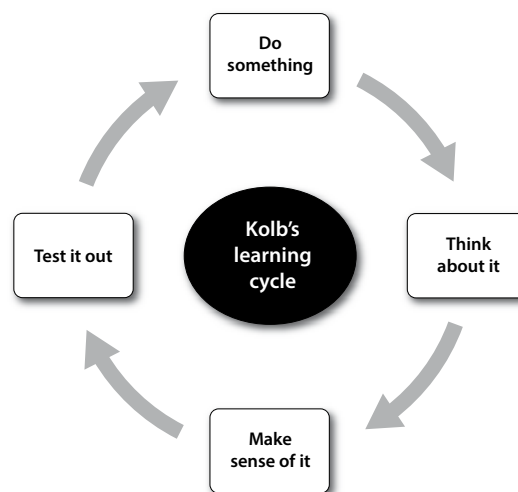
There are a variety of models to describe learning styles. One of the simplest classifies learners according to a sensory preference, differentiating between visual, auditory and tactile learners:

- *Visual learners* learn best from visual material such as illustrations, diagrams, charts, graphs, photos, animations and demonstrations. Reading is sometimes included here;
- *Auditory learners* learn best from spoken explanations and discussion and, to some extent, reading;
- *Tactile (kinaesthetic) learners* learn best by doing a hands-on task. Even taking notes or doodling sketches related to the content is a form of tactile learning.

Another approach differentiates between the types of experiences learners prefer:

- *Sensing learners* like learning facts, having clear guidance and acquiring knowledge that is logical and useful (they may be further divided into those that prefer doing well-defined tasks, and those that like to actively experiment);
- *Intuitive learners* like discovering relationships, being innovative in solving problems and grasping new concepts.

**Box 6.2. Kolb's learning cycle**



<i>Do something</i>	Participate in activities	"Activists" get involved in new experiences
<i>Think about it</i>	Review and summarize what has taken place	"Reflectors" observe experiences from different perspectives
<i>Make sense of it</i>	Link and connect with previous knowledge	"Theorists" want to understand models and principles
<i>Test it out</i>	Use what has been learnt to make improvements	"Pragmatists" like to try things out

There are many other ways of categorizing learning styles including identifying learners as “activists”, “reflectors”, “theorists” and “pragmatists”. This categorization was developed by Peter Honey and Alan Mumford<sup>4</sup> and builds upon the conceptual model of how people learn through experience, developed by David Kolb<sup>5</sup> (see Box 6.2). The assumption is that learners may have a preference for one phase of the experiential learning cycle.

Ruth Colvin Clark<sup>6</sup> and others have reviewed the evidence of a possible association between learning style and success with particular instructional methods, and found little to support the need for significant efforts to accommodate measured learning styles. The emphasis should, therefore, be on using learning styles that offer a variety of engaging experiences and suit the subject matter. When learners seem to be struggling, consideration of learning styles can be useful for choosing alternative methods of explanation or alternative learning activities, rather than repeatedly using activities that call for the same learning style.

#### 6.4 Instructional strategies

Many authors and theorists have proposed systems for connecting instructional activities to learning outcomes. For example, Ruth Colvin Clark identifies a hierarchy of learning goals with a related set of instructional strategies which she calls “architectures”. The hierarchy of learning goals is a reflection of the distinction cognitive psychologists make between declarative knowledge (knowing what) and procedural knowledge (knowing how):

- *Acquire knowledge*: access and understand declarative knowledge about work-related concepts, facts and processes;
- *Build procedural skills*: perform step-by-step routine tasks (procedural knowledge);
- *Build strategic skills*: apply guidelines to a diverse set of procedural tasks that engage critical and creative thinking and decision-making.

This hierarchy of goals leads Colvin Clark to define a set of instructional strategies that can be used to address these three learning goals (see Figure 6.1):

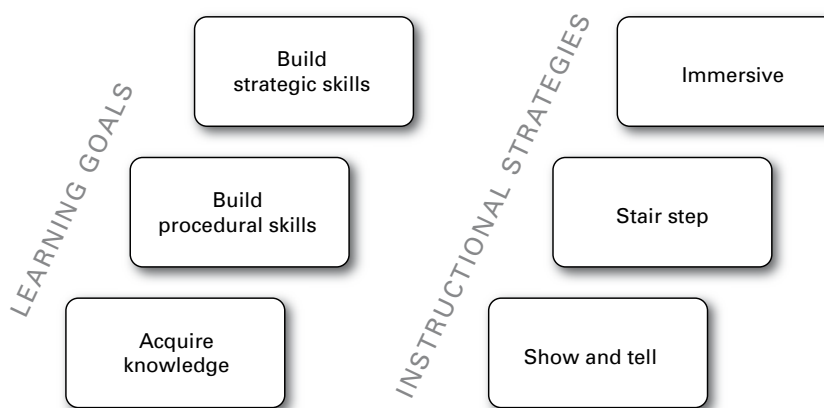
- *Show and tell*: material on concepts/facts is delivered, often with little direct engagement – for example, a lecture – although some interaction enhances its effectiveness. This approach builds declarative knowledge, but it is not usually effective for developing skills and changing behaviour or for deep learning and long-term memorization of large amounts of information (for example, multiplication tables);
- *Stair step*: this architecture is frequently called “tutorial” learning. It starts with an explanation of some aspect of knowledge or skill, illustrated by an example or demonstration, and followed by practice with feedback. This approach can help develop deeper declarative knowledge, but also builds procedural skills, especially for novices;
- *Immersive*: learners work together or alone to solve a workplace problem, with the trainer acting as a facilitator who provides help or guidance. This approach is best for helping experienced learners build strategic skills.

This categorization of strategies into three types tends to isolate approaches that in practice are often blended. For example, a lecture that is primarily “show and tell” may include a discussion or question and answer period that has tutorial characteristics, or even a short debate that has the

<sup>4</sup> Honey P. and A. Mumford, 1982: *Manual of Learning Styles*. London, P Honey.

<sup>5</sup> Kolb D. A., 1984: *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, New Jersey, USA, Prentice Hall.

<sup>6</sup> Colvin Clark R., 2010: *Evidence-based Training Methods: A Guide for Training Professionals*. Alexandria, Virginia, USA, ASTD Press.



**Figure 6.1. The relationship between learning goals and instructional strategies according to Colvin Clark**

immersive qualities of group problem solving. An immersive approach, such as a simulation, may also begin with a “show and tell” session to ensure that learners have the necessary background knowledge, and a tutorial period to help them learn the processes modelled in the simulation.

### 6.5 Trainer-centred and learner-centred instruction

Another way of categorizing instructional architecture is to differentiate between trainer-centred and learner-centred approaches:

- *Trainer-centred*: the trainer provides information to the learners whilst controlling the pace and content of what is being presented. The learners have a passive role: they are expected to accept what has been presented and take full responsibility for their own learning;
- *Learner-centred*: as well as providing information, the trainer plays a supportive role in helping learners build the required knowledge and skills, and develop their conceptual

#### **Box 6.3. Problem-based Learning**

This is a well-documented and frequently used learner-centred learning approach which was developed in medical schools. Groups of learners are asked to investigate a problem even though they might not have the knowledge (or skills) required to solve it yet. The group decides what needs to be learnt and then divides up responsibility for acquiring the knowledge between individuals or small groups. The whole group then meets again to share their new-found knowledge in an attempt to solve the problem (though there may not be a single solution). The goal of Problem-based Learning is learning how to solve problems (a transferable skill) and gaining knowledge about solutions. But it may also develop deeper understanding of a content area than that afforded by more direct, trainer-centred approaches.

This method provides opportunities for learners to develop critical thinking and independence, but designing and running Problem-based Learning sessions is time-consuming and the outcome cannot be easily assessed. However, the principles and strategies of Problem-based Learning can be adapted to other learning activities to the degree desired. Case studies, simulations and problem solving exercises have some of the characteristics of Problem-based Learning, but those learning activities usually assume that the required knowledge and skills are already there to be practiced. They apply existing expertise to a new situation.

Problem-based Learning, case studies and problem solving exercises are examples of Clark’s immersive method of instructional architecture.

More information on this approach can be found in The Interdisciplinary Journal of Problem-based Learning at: <http://docs.lib.purdue.edu/ijpbl/vol1/iss1/>.

understanding, through active learning approaches. The learning process is treated as a joint responsibility between the trainer and learners.

With a learner-centred approach, the trainer acts more as a facilitator of learning activities than a source of knowledge. With this approach it is quite normal for the trainer to say “I don’t know”, followed by a discussion about how the answer might be found.

In learner-centred approaches, activities might include solving problems, active discussions and brainstorming, or collaborative problem solving and projects. Learners are assumed to have an understanding of their learning needs, and their interests and personal goals are valued. Consequently they might be consulted about which topics and problems should be addressed; they might be asked to help define their own learning outcomes – to the extent these coincide with requirements – and to do self-assessment as part of the learning process. Problem-Based Learning, as outlined in Box 6.3, is a well-established learner-centred approach.

In general, the learner-centred approach is considered more effective, particularly when learning complex content and skills. However, at times, using a trainer-centred approach to quickly explain content is valuable for its efficiency.

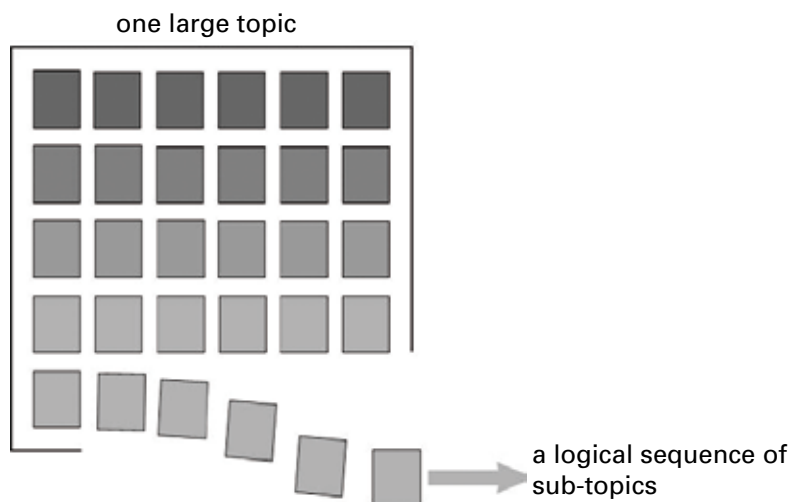
## 6.6 Planning learning sessions

The design of any learning session, whether it is a single meeting or series of classroom or online meetings, starts by considering the required learning outcomes and how they will be assessed. The designer should decide on the best means of delivery by considering the following questions:

- How can the learning activities be structured to best achieve the desired learning outcomes?
- What learning methods would work best to engage the learners?
- What learning activities will involve learners in realistic tasks and decisions?
- What resources and information technology skills will be needed?
- What is the learning culture of the organization?
- How can the knowledge and experience of the learners be used?
- What do the learners themselves want to achieve?
- Will learners be there because they want to be, or because they have to be?
- How homogeneous are the learners in terms of experience and expertise?
- Is external certification required?
- Are there any constraints that need to be taken into account?

Whether the activities take place in a face-to-face session or via distance learning, trainers need to plan how they will engage learners. Ideally the trainer will recall how past learners developed expertise about the topic being addressed, and would be aware of key points requiring learners to (a) make a conceptual leap of some kind or (b) pull together previous concepts in a new way.

Trainers should try to anticipate any difficulties the learners may have in grasping the material and should imagine themselves in the position of the learner. Then the trainer can think about ways of addressing those difficulties. For example, a trainer could pose a question that exposes what a meteorological equation means, generate a discussion among learners to let them test their



**Figure 6.2. Breaking down large topics in a logical way**

understanding, or provide a demonstration or interactive animation that helps overcome a common barrier to understanding.

The session plan should include an introduction that outlines what content the learning activities will include and why, and a summary at the end that briefly recaps the key learning points and looks forward to the next topics, or an activity that consolidates what has been learned.

Trainers should prepare a plan of each session that lists the topics, key points, exercises, demonstrations or other items – this is sometimes called a “lesson plan”. It will be the trainer’s guide during the session. It can be detailed or just a summary depending on the preference of the trainer or on organizational standards.

### 6.7 Learning sequences

In general, learning activities should start with simple or familiar material, then move on to more advanced and newer material. As shown in Figure 6.2, large topics should be broken down into small, manageable subtopics to allow learners to master content one chunk at a time, with summary and application provided for each chunk. The subtopics should also be presented in a logical sequence that draws on previous knowledge, establishes interconnections and gradually builds complexity. The level of detail in the subtopics will depend on the complexity of the topic and the backgrounds of the learners.

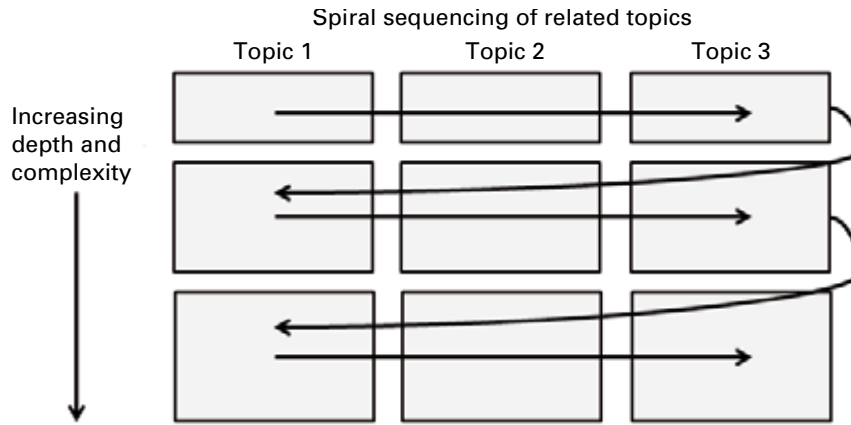
Sequencing decisions should be based on the type of content being taught. The elaboration theory of Charles Reigeluth<sup>7</sup> proposes types of sequencing based on increasing complexity and interconnections.

### 6.8 Learning concepts and principles

When presenting conceptual models, physical processes, classification systems, or a set of related concepts and processes, first teach the broadest ones then gradually include those that are more narrow and detailed. This can be done for one broad concept or principle at a time (linear), or in an integrated, spiral manner. In a spiral approach, the broadest concepts or principles are covered first, then are reconsidered multiple times as details and complications are added. This might look conceptually as shown in Figure 6.3. Many topics in a college curriculum, for example, are taught

<sup>7</sup> Reigeluth C. M., 1999: The Elaboration Theory: Guidance for Scope and Sequence Decisions. In *Instructional-design Theories and Models: A New Paradigm of Instructional Theory*, Volume II (C. M. Reigeluth, ed.). Mahway, New Jersey, USA, Lawrence Erlbaum Associated Inc, pp. 425–454.





**Figure 6.3. Spiral content sequencing**

in a spiral manner as individuals progress to the more advanced courses. But the same approach can be used for smaller learning sequences.

### 6.9 **Learning complex procedures**

There are two general approaches for teaching complex procedures. Reigeluth suggests teaching a simpler version of the whole task first, and then gradually adding complexity and variables. This has the advantage of being more realistic and demonstrating the targeted learning outcome early, which can be motivating for learners and may help create more integrated knowledge. Others recommend a parts/whole approach, in which smaller portions of a task are demonstrated and learned before learners integrate them into the final targeted procedure. Authors have recommended avoiding the second approach. However, if procedures are highly complex and contain many details, the methods can be combined according to Jeroen van Merriënboer<sup>8</sup>. Learners could first be taught a simple version of the whole procedure, and then learn and practice the smaller parts of the complex procedure more thoroughly before reintegrating them.

### 6.10 **Application of instructional theory**

#### 6.10.1 **The Nine Events of Instruction**

In addition to content sequencing, a trainer needs to consider how to logically arrange the individual learning activities. It is worth bearing in mind the Nine Events of Instruction proposed by Robert Mills Gagné<sup>9</sup> as requirements for effective instructional activities. These events, in sequence, correspond to cognitive processes considered by many as critical to any learning activity:

1. *Gain attention*: stimulate the interest of learners so that they are receptive (for example, present a problem or a novel situation, or ask a provocative question);
2. *Tell the learners what the learning objectives are*: explain to the learners what they will gain from the learning event (for example, explain the outcomes of the learning event or demonstrate what they will be able to do);

<sup>8</sup> Van Merriënboer J. J. G., 1997: *Training Complex Cognitive Skills: A Four-component Instructional Design Model for Technical Training*. Englewood Cliffs, New Jersey, USA, Educational Technology Publications.

<sup>9</sup> Gagné R. M., 1985: *The Conditions of Learning and Theory of Instruction*. Fourth edition. New York, USA, Holt, Rinehart and Winston.  
—, 1992: *Principles of Instructional Design*. New York, USA, Holt, Rinehart and Winston.

3. *Stimulate recall of prior learning*: remind learners about the relevant knowledge they already have and can use to support further learning (for example, ask questions, lead a discussion about basic content, ask them to perform a related task, or provide a pre-test or other form of assessment);
4. *Present the stimulus*: provide learners with new information or demonstrate new skills, emphasizing what is important. Use a variety of methods, including visuals, and apply a good learning sequence;
5. *Provide learning guidance*: help learners through the learning process by offering alternative explanations or demonstrations (for example, use analogies and multiple examples);
6. *Elicit performance*: ask learners to perform a task that will demonstrate whether learning has taken place (at minimum, ask questions and get a response from learners);
7. *Provide feedback*: give feedback to the learners about their performance (for example, provide an alternative answer or method of performing the task);
8. *Assess performance*: reinforce learning through a consolidating performance and assessment (for example, provide a final, more thorough practice opportunity and give more feedback);
9. *Enhance retention and transfer to other contexts*: summarize or review what was learned and ask learners to reflect about what they have learned (for example, relate the knowledge gained to the current and future needs of the learners, and show how it can be used in other situations).

While Gagné proposed these events as a prescriptive sequence, they do not have to be thought of as a rigid template, but rather as a way of thinking about the required components of a learning session.

### 6.10.2 **First Principles of Instruction**

More recently, M. David Merrill<sup>10</sup> analysed contemporary instructional theory and developed a more concise system which comprises five basic principles for the development of instructional events. He called these five principles “First Principles”, because they are fundamental and form the basis of diverse instructional theories:

1. *Activation*: trainers should have learners recall relevant prior knowledge upon which to build new knowledge. This can be done by having learners share their experience or demonstrating and reminding them what they learned previously, in other courses or earlier in the current sequence;
2. *Demonstration*: learners should be shown an application of what they are learning, and the demonstration should be discussed. Depending on the specified learning outcomes, the demonstration could involve the illustration of a concept (for example, identifying cloud types), a procedure (for example, analysing a pressure chart or satellite image), or a decision-making process (for example, forecasting of precipitation);
3. *Application*: learners should be given an opportunity to practice – not just to observe – what they are learning;
4. *Integration*: learners should be given an opportunity to use what they are learning in practice, reflect on what they have learned, and critique or explore other applications of what they have learned;

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<sup>10</sup> Merrill M. D., 2009: First Principles of Instruction. In *Instructional Design Theories and Models: Building a Common Knowledge Base*, Volume III (C. M. Reigeluth and A. Carr, eds.). New York, USA, Routledge Publishers, pp. 41–56.

5. *Task*: instruction should be embedded in an authentic task, or a task that resembles those done on the job. Learners should have a project or goal that offers a context and reason for learning.

Performance and tasks play a central role in both these general systems of instruction, suggesting that learning is not just passive reception of information offered by a trainer but implies the active participation of learners. Another key aspect is the activation of prior knowledge. According to Ruth Colvin Clark<sup>11</sup> and others, prior knowledge of the learners is the most important factor influencing the effectiveness of training. While learning sequences should be pitched at the right level, depending on whether the learners are novices or experts in the subject being covered, prior knowledge should also be stimulated so that learners can build upon it.

### 6.11 Learning methods

In broad terms, learning activities can be categorized according to whether they are primarily:

- Face-to-face or remote (distance learning);
- Synchronous (live) or asynchronous (self-paced: the learner is not required to interact with the trainer and other learners at fixed times);
- Individual or collaborative;
- Trainer-led or self-directed.

Regardless of whether they fit exactly in these four categories, all activities are based on general learning methods. Nearly all methods can be used in either face-to-face or remote modes, and most can also be used in synchronous or asynchronous, individual or collaborative modes. Many can be either teacher-led or self-directed.

Learning media are often confused with learning methods. Media are the technologies – such as books, computer-based material, web-based communications, videos and printed material – used to communicate with learners. Methods are the ways in which learning activities are structured and the strategies used for engaging learners with content and with other people. Learning methods are independent of media; a variety of media can be utilized in delivering training through a single learning method.

The strengths and limitations of some of the most widely used methods are outlined in Table 6.1.

#### Box 6.4. Flipped classes

Learners view recorded lectures or other distance-learning material as homework. The next day in class they apply what they've learned, doing exercises and solving problems under the supervision of a trainer. In this way the trainer can work with some learners on a one-to-one basis and act as a facilitator rather than a lecturer.

Flipped classes provide a learner-centred approach that emphasizes interaction between the trainer and learners. It allows learners to view material at the time, place and pace that suit them. But it only works if the learners can access the material from home. Trainers need to develop resources or record their presentations and put them on a website or DVD. Alternatively, material created by others can be identified and made available with a learning guide.

Flipped classes may work well for online synchronous sessions as well. Learners can review material at their own pace prior to the session and then engage with the trainer and other learners during the synchronous session to deepen or consolidate their learning from the pre-session material.

<sup>11</sup> Colvin Clark R., 2010: *Evidence-based Training Methods: A Guide for Training Professionals*. Alexandria, Virginia, USA, ASTD Press.

**Table 6.1. Some key strengths and limitations of various learning methods**

<i>Method</i>	<i>Strengths</i>	<i>Limitations</i>
Lecture or presentation	<ul style="list-style-type: none"> <li>– Presents knowledge and facts in a quick and direct way;</li> <li>– Useful for large groups.</li> </ul>	<ul style="list-style-type: none"> <li>– Little learner participation or ownership;</li> <li>– Relies heavily on the presentation skills of the trainer.</li> </ul>
Guest/expert lecture	<ul style="list-style-type: none"> <li>– Presents specialized knowledge in an authoritative way;</li> <li>– Adds variety and interest.</li> </ul>	<ul style="list-style-type: none"> <li>– May include little learner participation or ownership;</li> <li>– Relies heavily on the presentation skills of the guest/expert.</li> </ul>
Didactic question starting with “what,” “where,” “when”, and “how”	<ul style="list-style-type: none"> <li>– Allows learners to articulate and think about what they are learning;</li> <li>– Provides good opportunities for corrective feedback.</li> </ul>	<ul style="list-style-type: none"> <li>– Can take longer than direct presentation of information to cover the same content;</li> <li>– Trainers cannot rush to give the correct answers immediately.</li> </ul>
Review question (or informal quiz)	<ul style="list-style-type: none"> <li>– Reinforces previously covered material;</li> <li>– Provides focus and recall prior knowledge if used at the start of a new topic.</li> </ul>	Can make some people feel uncomfortable, unless reassured beforehand.
Small group discussion	<ul style="list-style-type: none"> <li>– Exposes people to other views and can change attitudes;</li> <li>– Gives everyone the opportunity to participate.</li> </ul>	<ul style="list-style-type: none"> <li>– Impaired if some people do not participate or a few dominate;</li> <li>– Relies heavily on the facilitation skills of the trainer to avoid loss of focus.</li> </ul>
Demonstration	<ul style="list-style-type: none"> <li>– Supports the development of skills;</li> <li>– Lets the learner observe an activity carried out correctly.</li> </ul>	<ul style="list-style-type: none"> <li>– May be oversimplified for practical reasons;</li> <li>– The demonstration may fail.</li> </ul>
Repetitive practice	<ul style="list-style-type: none"> <li>– Helps learners master critical skills that are limited in scope;</li> <li>– Provides many chances for self-checking and feedback.</li> </ul>	<ul style="list-style-type: none"> <li>– Can become boring if carried out too long;</li> <li>– Can prevent learners from seeing the more meaningful whole task they need to learn.</li> </ul>
Brainstorming	<ul style="list-style-type: none"> <li>– Engages the audience;</li> <li>– Encourages lateral thinking.</li> </ul>	<ul style="list-style-type: none"> <li>– Sometimes the ideas produced are unrealistic;</li> <li>– Relies on facilitation skills to avoid confrontation and to keep moving forward.</li> </ul>
Role play	<ul style="list-style-type: none"> <li>– Develops skills through practice;</li> <li>– Explores difficult situations.</li> </ul>	<ul style="list-style-type: none"> <li>– Some people might feel uncomfortable participating;</li> <li>– Difficult in a large group.</li> </ul>
Simulation	<ul style="list-style-type: none"> <li>– Develops skills and knowledge which can be assessed;</li> <li>– Exposes people to realistic work-based practices and problems.</li> </ul>	<ul style="list-style-type: none"> <li>– Complex simulations take a long time to set up and run;</li> <li>– Often requires setting-up workplace information sources and equipment.</li> </ul>
Case study or exercise	<ul style="list-style-type: none"> <li>– Develops analytical and problem solving skills;</li> <li>– Applies new knowledge and skills to a realistic situation.</li> </ul>	<ul style="list-style-type: none"> <li>– Gathering resources and preparing good materials is time consuming;</li> <li>– May not be relevant to the workplaces of all learners.</li> </ul>
Project	<ul style="list-style-type: none"> <li>– Develops research, analytical and problem solving skills;</li> <li>– Engages the learners when they choose their own topics.</li> </ul>	<ul style="list-style-type: none"> <li>– Time consuming for the learner;</li> <li>– Learners might require information that is not readily available.</li> </ul>
Learner presentation	<ul style="list-style-type: none"> <li>– Develops research, analytical, and organization skills;</li> <li>– Develops communication skills;</li> <li>– Allows learning from peers and exposure to many points of view and experiences.</li> </ul>	<ul style="list-style-type: none"> <li>– Takes significant class time;</li> <li>– Presentations can be uneven in quality.</li> </ul>
Field trip	<ul style="list-style-type: none"> <li>– Exposes individuals to real work environments or natural situations;</li> <li>– Can be actual or virtual.</li> </ul>	May require considerable organization, time and costs.
Self-study or self-directed reading	<ul style="list-style-type: none"> <li>– Lets the learner control the pace and learning goals;</li> <li>– Uses a wide variety of available material, including online resources.</li> </ul>	<ul style="list-style-type: none"> <li>– May require informed direction to achieve useful outcomes;</li> <li>– Not suited to people who prefer to interact with others.</li> </ul>

An alternative approach to the learning methods described in Table 6.1 is the use of “flipped classes”: essentially learners do at home what is usually done in class and do in class what is usually considered homework (see Box 6.4).

Learning is enhanced if several learning methods are employed, but trainers should avoid using so many different methods that learners become confused. Learning is also enhanced when the activities chosen require the active participation of learners, but this participation has to be integral to the activity rather than accessory.

**6.12 Presentation design**

Presentations are still the most common component of training, even though trainers are finding increasing value in active learning methods. Presentations can be efficient and easier to prepare than other learning methods; they can be useful for providing factual information and for teaching ideas, concepts and processes, but they need to be well planned. The following should be considered during the planning stage:

- The intended learning outcome of the presentation;
- How to engage the learners;
- How to build upon the prior knowledge and expertise of learners;
- The structure of the presentation;
- Cognitive and visual design of the accompanying presentation images.

Box 6.5 describes a simple way of clarifying the intended learning outcomes of a presentation.

**Box 6.5. What changes do you want learners to experience?**

A useful and simple way of clarifying the intended learning outcomes of the presentation – in terms of what the learners currently think and do, and what you would like them to think and do – is to complete the following table. For each box, you would describe what most learners currently think or do in regards to the content of your presentation, and what you intend them to think or do afterwards. For changing attitudes, a third “Feel” row can be added to describe what learners currently feel about the topic and what you hope they will feel after the presentation. This relates to affective learning outcomes, such as attitude or confidence toward the topic.

Some common, but generic responses are included in the example below:

	Now	After
Think	<ul style="list-style-type: none"> <li>- It’s too difficult</li> <li>- I’ve always done it this way</li> <li>- This isn’t relevant for me</li> </ul>	<ul style="list-style-type: none"> <li>- I understand this now</li> <li>- I can master this</li> <li>- These ideas are useful</li> </ul>
Do	<ul style="list-style-type: none"> <li>- I do not do it</li> <li>- I would do it but I don’t know how</li> <li>- I do it, but I could improve</li> </ul>	<ul style="list-style-type: none"> <li>- I’ll try it out to see if it works</li> <li>- I know how to do it</li> <li>- I know how to do it better</li> </ul>
Feel	<ul style="list-style-type: none"> <li>- Apprehensive</li> <li>- Reluctant to change</li> <li>- Opposed</li> <li>- Overwhelmed</li> </ul>	<ul style="list-style-type: none"> <li>- Motivated to try new things</li> <li>- Confident about changing</li> <li>- Enthusiastic</li> <li>- Supported</li> </ul>

These considerations should lead to a clear outcome for the presentation, which is crucial for success.

As guidance for structuring a presentation, consider using principles suggested earlier for designing instructional sequencing, such as “The Nine Events of Instruction” and “The First Principles of Instruction”, and for conceptual and procedural sequencing. Even if presentations themselves do not offer learners the opportunity to practise as suggested in these approaches, trainers can use questions and examples to reinforce content.

The old adage “tell them what you are going to tell them, tell them, and tell them what you have told them,” also fits these models to a certain extent. For example:

- *Tell them what you are going to tell them:* specify the outcomes and outline the structure of the presentation. Gain attention (for example, by using humour, questions or a story) and establish a relationship with the learners. Remind them what they already know;
- *Tell them:* present the content clearly, at a pace that suits the majority of the learners. Provide short breaks whenever appropriate, ideally between topics, to keep the audience engaged and summarize content. Avoid trying to cover too much material. Use clear signposts so that learners are reminded of the overall structure introduced at the start. If possible, include activities;
- *Tell them what you told them:* give a summary, show applications and indicate what learners should now be able to do.

### 6.13 **Visual design for presentation slides**

When preparing presentation slides, visual design is important for the quality of learning. How learners perceive the information presented, particularly in conjunction with the accompanying talk, can impact their understanding. For example, too many words or words that do not reflect what is being said will compete with the spoken content. Poorly laid out slides can be hard to decipher or confusing for learners. Poor quality slides may also make the content appear non-professional.

Adhering to six visual design principles will help make the slides visually appealing and support effective learning (see Figure 6.4):

- *Simplify:* eliminate words or graphics that do not support understanding. Words on a slide should not compete with what is being said in the presentation, nor should they take long to understand. Images should be simpler than printed illustrations in books or journals which allow more time for study;
- *Contrast:* use contrast to focus attention on the important things. If only one text size is used, for example, the organization of the slide can be hard to discern. Use colour for emphasis, but sparingly;
- *Repetition:* use style, colour and layout consistently. Too much variety causes learners to spend time thinking about why items in the visual are varied, and wondering if it is meaningful. Vary slides when variety will be useful for learning, for example, to provide contrast;
- *Alignment:* align headings, text and graphics. Poorly aligned visuals look sloppy, create distraction and could give the impression of poor quality content;
- *Proximity:* ensure that things that go together are placed together. This is particularly important to ensure understanding, otherwise the wrong relationships might be perceived. Placing text close to the illustration it supports will also speed processing;
- *Images:* use high-quality illustrations and photographs and minimal clip-art which can reduce the impression of quality. Images should relate directly to the content and not be

used simply for decoration. Instructional illustration design, required to produce diagrams, charts and graphs, is a complex skill, but good illustrations can help learners understand in ways that words cannot;

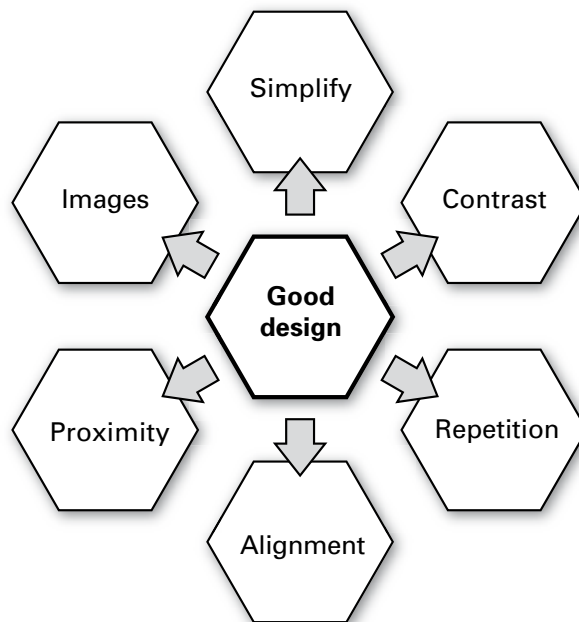
Even when presentation slides are well designed, they are often not self-explanatory. Usually both the spoken words and visuals are required for effective learning, but it is essential that what is said supplements and enhances the visual information. In particular, there is little point in simply saying what is already written on the slide.

#### 6.14 Using existing learning resources

Before developing new learning resources, investigate what already exists. This can save significant costs and effort.

Within most organizations there is already a vast amount of learning resources that can be used to enrich the learning environment. Additionally, a growing wealth of high-quality, online, meteorological distance-learning resources exists, covering both the science of meteorology and the practical aspects of observing and forecasting (see, for example, <http://www.meted.ucar.edu>). Some of these resources can be used as they are or adapted and supplemented to meet current requirements.

Existing resources may have to be translated, and translation can require significant effort depending on the format of the material. Local data and examples can also be substituted to demonstrate relevance of the content being taught. A less costly approach to adaptation is to develop low-cost supporting web pages or slide presentations to teach about regional or local applications of the content, including local case studies; such material can be used in addition to the existing resources.



**Figure 6.4. The six visual design principles**

Adaptation of the four principles for visual design identified by Robin Williams<sup>12</sup>

<sup>12</sup> Williams R., 2009: *The Non-Designer's Presentation Book*. Berkeley, California, USA, Peachpit Press.

### 6.15 Developing handouts and other reference material

Handouts and other written material for either classroom or distance learning should be provided if they will help learners achieve the desired learning outcomes or reinforce the knowledge acquired following formal learning events. Handouts and reference material should be:

- *Structured*, with a table of contents or concept map. Handouts should be easily navigated (for example, with sub-headings) and show how various parts are related; If information is squeezed to fit into as few pages as possible, this can harm readability; instead, use the space to highlight the structure of the content;
- *Modular*, so that the user can “dip in” sections as needed. Each section should have an overview, detailed information and a summary of key points;
- *Easily readable*, with text that is succinct and conversational in style: short sentences and paragraphs, no spelling mistakes and bullet points;
- *Visually oriented*, containing tables, diagrams, charts and text boxes when these support the text content. Some handouts might be limited to a single complex instructional illustration that requires study.

Including questions or posing problems in handouts provides an opportunity for reflection, just as it does in a lecture. If a handout includes detailed physical explanations or mathematical derivations, it is better to have these as annexes to preserve the flow of the body of the text. Including references to other sources of information to supplement or extend the material given is often worthwhile.

A learning guide could be incorporated into a handout or provided as a separate document. It might contain a summary of the content, the location of useful resources with a description of their relevance, and information about upcoming assessments.

### 6.16 Developing self-paced learning resources

Self-paced learning materials, whether web-based, computer-based or paper-based, are important resources which help learners master complex content. They are individualized to the extent that learners can use them at their own pace and can review them as necessary. Although not always easy to develop, these resources are most effective when instructional designers, graphic artists and subject-matter experts work together to satisfy a set of clearly defined learning outcomes.

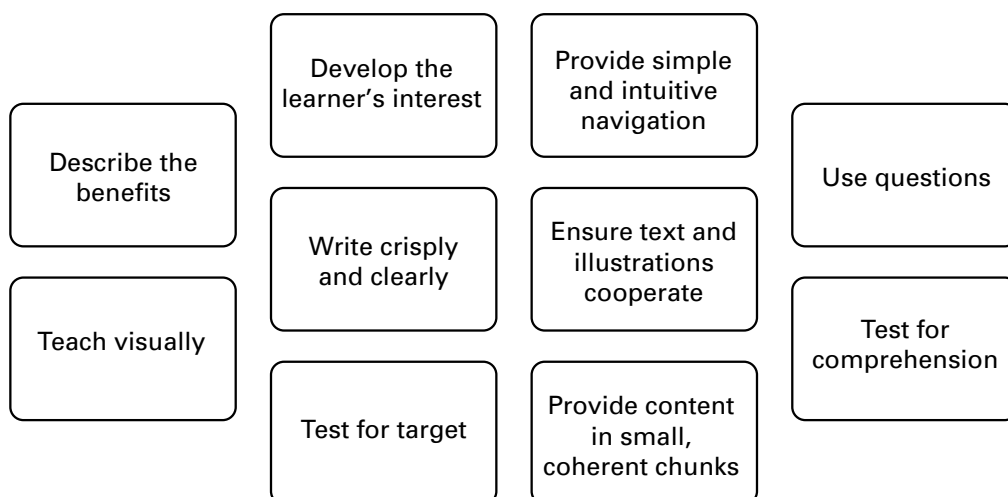


Figure 6.5. Some guidelines for preparing self-paced learning resources



Some basic guidelines for preparing self-paced learning resources are outlined in Figure 6.5.

The following provides more detail about each item in Figure 6.5:

- *Describe the benefits of the resource:* provide enough information up front so that learners can decide for themselves if they want and need to use the resource;
- *Develop the learners' interest:* demonstrate the skills they will learn, using compelling visuals or dramatic story elements to develop their interest rather than jumping straight into presenting information;
- *Provide simple and intuitive navigation:* make menus as intuitive as possible. Learners should not have to search for what they need or want to look at next. Provide quick access to relevant supporting materials such as conceptual models, maps, key data products, job aids and reference documents;
- *Use questions:* help learners recall knowledge they need to continue with their learning, or to generate curiosity or motivation to learn. Questions are also for learning, not just assessment;
- *Teach visually:* employ good visuals to create an engaging and compelling learning environment. Visuals can also be critical in teaching complex content: they are the instruction when teaching about spatial concepts. Words alone won't be sufficient. Maps, data imagery, and conceptual illustrations can be more useful for learning than any good verbal explanation;
- *Write crisply and clearly:* write in a way that is unambiguous, concise and well constructed. Instructional writing should also be to the point and free of unnecessary jargon. Make sure each new sentence flows from the previous one to build strong paragraphs and pages of content;
- *Ensure text and illustrations cooperate:* use text to support graphics by explaining how to interpret the visual. Graphics should support text by illustrating the critical points;
- *Test for comprehension:* utilize questions and exercises to check whether learners understand the content and skills as they are presented. Do not wait too long before giving learners a chance to interact;
- *Test for target competencies:* provide questions and exercises that give learners an opportunity to practice the targeted learning outcomes;
- *Provide content in small, coherent chunks and sequence them for learning:* help learners make progress in small steps, because learning usually relies on a slow accretion of knowledge rather than radical leaps of understanding.

## 6.17 **Development processes**

It is, of course, impossible to outline in an overview document such as this one the range of technical and design skills required for developing high-quality instructional resources. While visual and verbal media all rely on some general media design skills, some of which have been covered in this chapter, they will also require unique technical knowledge and skills. It takes time and effort to develop expertise in video and audio recording, webpage development, computer graphics software or integrated training design software packages, and only rarely do trainers possess all these skills. In addition, the tools required evolve rapidly and advances require new learning with each new version. Instructional developers, who have expertise in this area, should be called upon for any complex, technology-based instructional development project.

Some basic guidelines for developing learning resources are given in Figure 6.6:

- *Create a prototype*: early in the process, create prototypes of the resources or key components to better understand the viability of design decisions, the capabilities of the development tools and whether the designs and learning needs have been communicated well;
- *Review and revise repeatedly*: never assume that one draft will produce a good product. Review the work many times and, because it is difficult to see all issues with a draft in one review, allow for time between reviews to gain a new perspective. Correct typos and ensure text readability, illustration clarity, ease of navigation, and overall flow and coherence;
- *Enlist reviewers*: at the beginning of the project, identify external reviewers – experts who can be trusted and people at the same level as the intended learners. Find a colleague to review the content at all its various stages – as an outline, an early draft and as a near final draft;
- *Create storyboards*: if the resource is going to be highly visual, as with a web-based learning module or slides for a presentation, use storyboards to help both the developer and reviewers understand the larger picture, and finally, to provide instructional developers with detailed instructions for the final product;
- *Conduct formative evaluation*: when possible, test near-finished materials with representative learners or, at a minimum, colleagues from outside the project. Be willing to make revisions even late in a project if it looks as though there are significant issues that could impede learning;
- *Test equipment and delivery software*: especially when planning online sessions or web-based delivery, but also for classroom technology applications, test technologies well in advance to understand their proper setup and limitations, and to ensure learners can access training without problems;
- *Schedule sufficient time*: the time actually spent on development can be less than the time for review and revision. Allow for this long review and revision period in the project schedule.

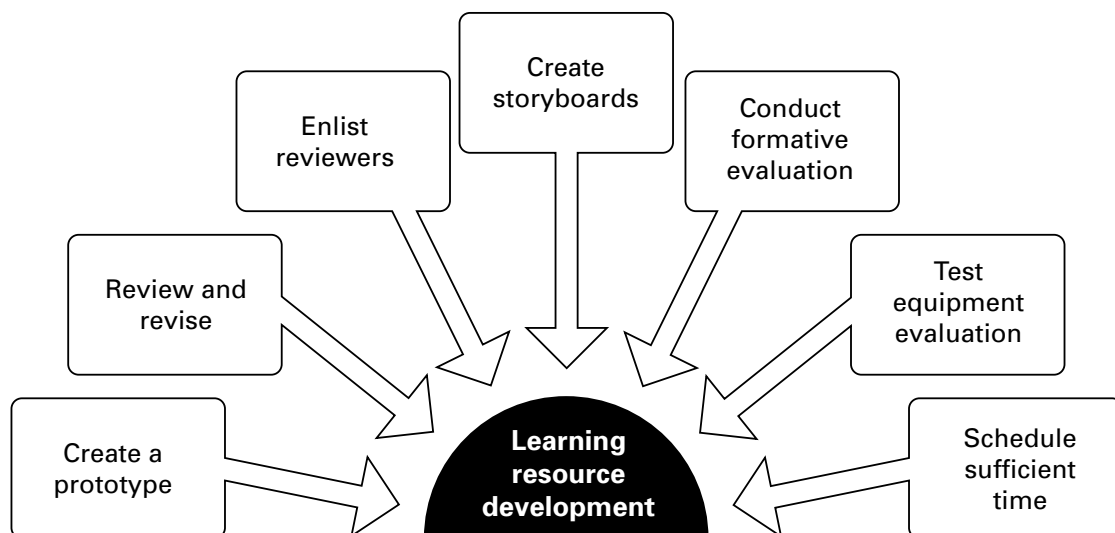


Figure 6.6. Some basic guidelines for the development of learning resources

**6.18 Next step**

The design of a learning activity should take into account the way people learn. Also, the instructional approach should be determined by the desired learning outcome. There are many learning methods, each with their own strengths and limitations, and there are benefits in using several methods. Development is a varied and complex phase which can require specialized expertise, particularly when one uses technology and varied approaches to help learners.

After designing and developing the learning resources, the next step is to deliver training.

**6.19 You and your organization**

In order to consolidate the material presented in this chapter, try answering the following questions:

- What are the characteristics of learners in your organization and what evidence do you have for this?
- Think about your best and worst training experiences: what training design elements affected those experiences?
- What do you need to know from each stakeholder in order to design the best possible learning solution?
- To what extent do you apply instructional theory to the design of learning activities?
- Which are your preferred learning methods and why do you prefer them?
- To what extent do you use design principles in preparing learning resources such as presentation slides, handouts and self-paced material?
- In your organization, to what extent is a systematic approach taken to the development of learning activities and resources?