Guidelines for Trainers in Meteorological, Hydrological and Climate Services

World Meteorological Organization
Weather • Climate • Water

WMO-No. 1114

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EDITORIAL NOTE

METEOTERM, the WMO terminology database, may be consulted at: http://www.wmo.int/pages/prog/lsp/meteoterm_wmo_en.html. Acronyms may also be found at: http://www.wmo.int/pages/themes/acronyms/index_en.html.

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PREFACE

Gustavo V. Necco, former Director of the WMO Education and Training Programme, wrote that one of the Programme's primary objectives was to assist "NMHSs in the attainment of an appropriate level of self-sufficiency in meeting their training needs and developing their human resources. The availability of well-prepared, skilled and knowledgeable instructors in order to fulfil this objective is an evident need." This quotation is taken from the preface to *Notes for the training of instructors in meteorology and operational hydrology*, Part I (WMO/TD-No. 1058), which was published in March 2001. Today, with the increasing emphasis on developing the job competencies of individuals and organizations to carry out their functions, it has become important to create a set of training competencies, as well as to update and extend WMO/TD-No. 1058, which remains a useful resource.

The WMO Executive Council Panel of Experts on Education and Training at its twenty-fifth session in Pune, India (March 2012), provided guidance on development of the training competencies and preparation of the *Guidelines for Trainers in Meteorological, Hydrological and Climate Services* to complement the *Manual on the Implementation of Education and Training Standards in Meteorology and Hydrology*, Volume I: Meteorology (WMO-No.1083). The Panel formed a task team, led by Bob Riddaway, to draft the competencies and this publication. Both have been subject to exhaustive review by the Panel, the Coordinating Committee of the Standing Conference of Heads of Training Institutions of National Meteorological Services, and many other education and training experts in the field, culminating in their acceptance by the sixty-fifth session of the WMO Executive Council in May 2013.

The competencies described in this publication are intended to increase the professional status of trainers and clarify their expectations by defining the knowledge, skills and behaviours required of trainers supporting WMO Members. In addition to the competencies, the publication contains a wealth of material that will help trainers develop those competencies. The aim is to encourage trainers, whether newly in post or experienced, to think more deeply about the learning process and thereby enhance their ability to provide more effective and enjoyable learning experiences that meet the needs of the individuals and the organization.

The WMO Education and Training Office wishes to thank the primary author of this publication, Bob Riddaway (former Principal, Met Office College, United Kingdom) for his many hours of service and commitment to excellence in developing the guide. Also contributing were Patrick Parrish (WMO), Chris Webster (MetService of New Zealand) and Jeff Wilson (WMO). The Education and Training Office also wishes to thank the Language, Conference and Publishing Services department of WMO for its exceptional handling of the editing, design and publication process.

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GUIDELINES FOR TRAINERS IN METEOROLOGICAL, HYDROLOGICAL AND CLIMATE SERVICES

1. OVERVIEW

1.1 Introduction

This publication is intended for those involved in providing training for staff in a National Meteorological and Hydrological Service (NMHS) or related agencies. In particular, it aims to strengthen training departments and enhance the expertise of trainers by providing a reference manual and introductory guide. It includes guidance on the options available to ensure positive learning experiences for individuals and organizations.

In this publication, the term "training" will cover all aspects of vocational education and training. In addition, the term "trainer" will be used to describe anyone who is involved in implementing the training process. In particular, a trainer is someone who helps learners achieve a desired state, standard or competence associated with a job function. Though some World Meteorological Organization (WMO) Members will have their own terminology for what are referred to here as "training" and" trainer", it is hoped that the consistent use of these terms in this publication will not cause any confusion.

The emphasis here is on training, but school and university education in science and mathematics is of crucial importance in providing the knowledge that underpins training. Some universities provide students with knowledge of meteorology and/or hydrology which forms the basis for the training provided by an NMHS. Although the primary role of these universities is to develop background knowledge and critical thinking skills rather than prepare students for specific job tasks, universities increasingly seek to understand the needs of the labour market and to tailor their courses accordingly. For example, some universities provide courses that directly prepare their graduates for taking up posts in an NMHS. Consequently, it is important that universities involved in meteorology and hydrology are aware of the competencies required of meteorologists and hydrologists within an NMHS and ensure that faculty members have the required expertise in the subject matter and in training. This also applies to other third-party organizations that provide training for meteorologists and hydrologists.

In order to avoid having to differentiate between services provided by NMHS training departments and third parties, the term "training department" will be used to cover both internal and third-party providers of training.

1.2 Content and structure

The content and structure of the publication is driven by two considerations:

– The learning cycle

– The specification of competencies for trainers

The competencies required of trainers (that is, the knowledge, skills and behaviour needed to perform a specific job to the required standard) are linked to the components of the learning cycle as shown in Figure 1.1.

Chapter 2 introduces some basic concepts associated with the learning process. The following chapters cover six training competencies which are concerned with the following topics:

– Organizational context and training processes (chapter 3)

Figure 1.1. The learning cycle. The progression from one stage to the next is represented by clockwise arrows, but often each step involves a period of iterative feedback before the next stage is reached. Alternative models place evaluation at the centre, because (a) evaluation can be performed for formative purposes during the learning cycle, and (b) learning, course and programme evaluation results can suggest changes in each of the other steps in the cycle.

– Learning needs (chapter 4)

– Learning solutions (chapter 5)

– Learning activities and resources (chapter 6)

– Learning delivery (chapter 7)

– Learning evaluation (chapter 8)

Each chapter starts with a description of the competency and the personnel who are likely to require that competency. The remainder of each chapter supports the development of the competency by providing information or links to resources.

The questions at the end of each chapter are intended to help consolidate the material that has been presented and assist trainers in:

– Assessing their own performance and identifying areas for development;

– Increasing awareness of training processes and opportunities for improvement within their own organization.

The Guidelines consider full learning process from initial identification of learning needs to evaluation after learning has been completed.

In many countries, the WMO Basic Instruction Packages will be delivered by a university or similar academic institution. In such cases, the organization might not need to identify learning needs and solutions on a regular basis because the learning outcomes have already been specified. However, the education and training still needs to be designed, delivered, assessed and evaluated. Once the Basic Instruction Packages have been completed there remains a need for continuing professional development (CPD), and in that context the organization will have to go through the full process.

1.3 Training competencies

The organizational training function within an NMHS or related agency might be accomplished by a variety of skilled personnel, including training managers, trainers, training developers and training support staff. Third-party organizations that supply education and training services, such as universities, international and regional institutions and centres, and private-sector companies, may have a similar division of labour.

The Guidelines set out a competency framework for personnel involved in training, but it is not necessary that each person has the full set of competencies. However, it is expected that any institution providing education and training services to current and future meteorologists and hydrologists will have staff somewhere within the organization who together cover all the competencies. This will clearly depend on the following circumstances, which will be different for each organization:

– The organizational context and priorities, and stakeholder requirements;

– The way in which internal and external training resources are used;

– The available resources (financial, human and technological), facilities and capabilities, and the organizational structures, policies and procedures;

– National and institutional legislation, rules and procedures.

The performance criteria and knowledge requirements that support the competencies should be customized based on the particular context of an organization. However, the general criteria and requirements provided here will apply in most circumstances.

National Meteorological and Hydrological Services should specify the competencies required for the jobs they have. For trainers, jobs vary according to the level of responsibility and area of expertise, and this affects the range of competencies required. For example:

– A junior trainer will mainly require competencies associated with delivering and evaluating learning events and activities;

– In addition to the competencies required of a junior trainer, a senior professional, who has to design learning programmes and events and choose learning solutions, will also need the competencies associated with these tasks;

– A training manager will probably need to be able to evaluate how others meet the full range of requirements, but should also have the necessary competencies to assess the organizational context and determine learning needs and learning solutions. Expertise in learning evaluation will also be important. Often the full range of competencies will be required of a training manager.

In addition, people involved in training support, for example, instructional designers, developers and technicians, might need the knowledge and skills to develop materials in a variety of media, to facilitate the use of technologies in the classroom and in distance-learning delivery, and to use development processes that ensure quality through prototyping, beta testing and revision. Some instructional designers may need the full range of competencies in order to assist also in learning needs assessment and evaluation.

Frequently, third-party trainers act on behalf of NMHSs to train their staff. The trainers in these organizations require the same set of competencies as trainers within the training department of an NMHS, but they also need to be aware of the following:

– *Organizational context and training processes*: third parties need to be able to analyse contexts and plan within their remit and often across several organizational/institutional boundaries.

Their approach and procedures should reflect their role and mandate as support organizations. They should also be able to critically evaluate their role, mandate and performance;

– *Learning needs*: third parties need to be able to aggregate information about learning needs from different sources. They might need to provide support to others in developing analyses of learning needs and specifying learning outcomes. Third parties may also need to support NMHSs in understanding changes in context such as competency frameworks, Quality Management System (QMS) requirements and new technologies.

Please note that the competencies specified at the beginning of each chapter are general and should be adapted and developed to suit the specific jobs within an organization.

1.4 Specifying training competencies

The competencies are written in the following format:

– *Competency statement*: a concise statement which describes in general terms what people are expected to do in their jobs;

– *Competency description*: a more detailed description of the competency statement, which provides the context for the performance criteria and knowledge requirements;

– *Performance criteria*: set of criteria describing the characteristics of successful performance while expanding upon how the job is to be carried out; they are not measures of success;

– *Knowledge requirements*: an outline of the background knowledge required to achieve competence.

Associated with each competency is an indication of who within an organization might be expected to have that competency.

As well as having the required competencies, trainers should take responsibility for their own CPD to maintain and develop their professional competence in other important areas. The following areas of competence are not covered in this publication:

– *Transferable skills*: these are skills associated with listening and communicating, presenting, motivating, project management, leadership, facilitating, managing conflict, coaching, mentoring, building relationships, and so forth;

– *Subject-matter expertise and technical skills*: those working in training must have subject-matter understanding or expertise, computing skills, and skills in using current and emerging technologies to support learning;

– *Professional standards*: training professionals must be able to comply with ethical and professional standards and maintain professional credibility and demeanour.

1.5 Terminology

Reference has been made to learning, knowledge and skills, but these terms should be defined as they play a central role in all that follows:

– *Learning*: a cumulative process through which individuals develop knowledge or skills, or modify behaviour;

– *Knowledge*: the body of facts, principles, theories and practices related to a particular field of study;

– *Skill*: the ability to perform a particular mental or physical activity.

The terminology used in these guidelines emphasizes "learning" rather than "education," "training" or "development". Why is that? The intention is to focus on the need to take learner-centred approaches to training, and for individuals to take responsibility for their own learning. Providing education, training or development opportunities is ineffective if the learners are not active in developing the knowledge, skills and behaviours specified by the learning outcomes.

Within the training community there appears to be a lack of uniformity in the way some terms are used. So in this publication each of the following terms will be given a specific meaning:

– *Learning opportunity*: any experience that provides individuals with the opportunity to develop their expertise; this can refer to a programme, event, session or activity;

– *Learning programme*: a structured sequence of learning events, with a start and an end, aimed at meeting a set of high-level learning outcomes (for example, a series of courses with a common purpose);

– *Learning event*: a learning occurrence, with a start and an end, aimed at meeting a narrow set of learning outcomes (for example, a semester-long course, a one-week or one-day workshop);

– *Learning session*: a part of a learning event that concentrates on a specific learning outcome and might include several learning activities (for example, a half-day portion of a workshop that starts with a lecture, has a period of questions and answers, and ends with a practical exercise);

– *Learning activity*: the component of a learning session, which has a well-defined purpose and uses a specific learning method (for example, a practical exercise).

The relationship between learning programme, learning event, learning session and learning activity is illustrated in Figure 1.2.

A learning programme is composed of several learning events. Each event is made up of a series of learning sessions, and each session has one or more learning activities. Each of these components generates a learning opportunity for participating learners.

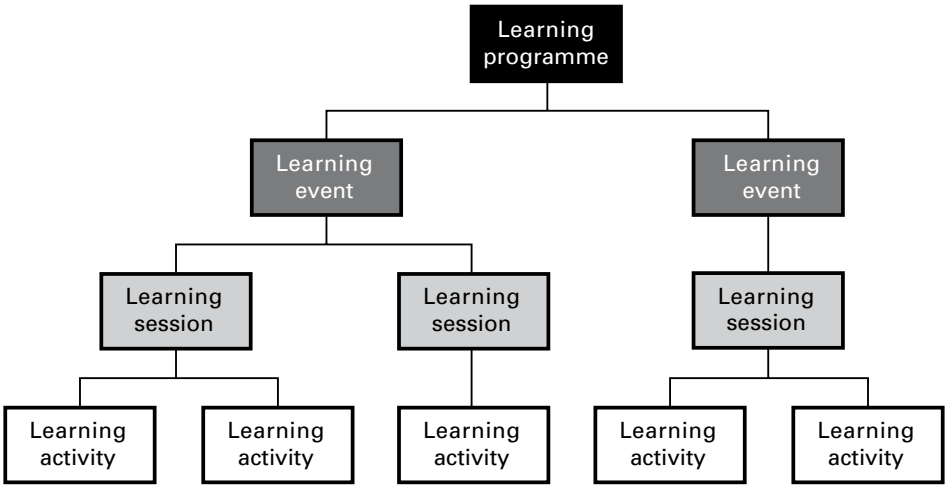


Figure 1.2. The relationship between learning programme, learning event, learning session and learning activity

The following terms are also used:

– *Learning method*: a technique or strategy, such as a lecture and small group discussion, used to help individuals learn;

– *Learning outcomes*: the set of knowledge, skills and behaviours an individual is able to demonstrate as a result of completing a learning experience;

– *Learning*: a cumulative process through which individuals change their level of knowledge or skill, or modify their behaviour;

– *Learner*: A person participating in a learning opportunity.

In the past "curriculum" was often interpreted as referring to the subjects covered in a formal learning experience. Nowadays, however, the term tends to have a broader meaning and refers to the inventory of outcomes associated with designing, organizing and planning a formal learning opportunity (for example, course sequence, learning outcomes, topics, learning activities, schedules, assessment process and learning resources). Here curriculum will take on the more modern meaning.

Finally, please note that in some languages there is no distinction between "assessment" and "evaluation". The context will indicate whether it is the assessment of an individual's ability to undertake a given task or the evaluation of a programme to determine whether it was successful in meeting its aims. This is discussed further in chapter 8.

1.6 Using the guidelines

The purpose of these guidelines is to encourage training and development professionals to think more deeply about the learning process and thereby enhance their professional expertise. This in turn will help them provide more effective and enjoyable learning experiences that meet the needs of the individuals and the organization.

2. SOME BASIC CONCEPTS

2.1 Introduction

This chapter introduces some basic concepts associated with the learning process that underpin the material covered in the other chapters.

2.2 Education, training, development and learning

Often a distinction is made between education, training and development, but sometimes it is difficult to decide whether a particular activity can be neatly classified into one of those three categories as they tend to overlap (see Figure 2.1).

Education can be thought of as a learning process aimed primarily at developing knowledge, transferable skills and critical thinking. For adults, this often provides preparation for follow-on professional development or professional practice.

Training is usually aimed at achieving performance objectives associated with a specific job. Over time the distinction between education and training has become less important.

Development refers to the continuous stimulation of the growth and potential of an individual. As with education and training, there is a lot of overlap between training and development. For example, if individuals undergo a learning programme to enhance the personal attributes required for management positions, such as analytical and decision-making skills, ability to influence others and strategic thinking, is that training or development? In the end, it does not matter. What is important is that the learning process produces the required outcomes.

To be healthy and vibrant, organizations need to recognize the importance of using training and development to build upon the expertise their staff have acquired through education and experience. Without staff training and development, an organization will not get the best out of its most valuable resource – its people.

Education, training and development are all aimed at ensuring that learning takes place. It is, therefore, better to focus on learning, because this is the outcome that these processes are trying to achieve. Focusing on learning also emphasizes that individuals are responsible for the outcomes of their education, training and development, rather than passive recipients.

Organizations benefit from having people who are lifelong learners: they are likely to take responsibility for their learning and are motivated and engaged in the learning processes that

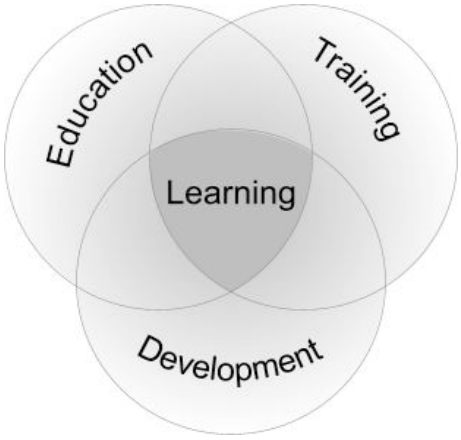


Figure 2.1. The overlap of education, training and development

support their jobs and career development. For either personal or professional reasons, lifelong learners will participate throughout their lives in informal learning activities, such as self–study, and in formal learning, such as education and training programmes and events.

Lifelong learning can be encouraged by:

– Using learner-centred methods;

– Building in opportunities for reflection within learning experiences;

– Supporting and rewarding both formal and independent learning;

– Fostering collaborative learning in the organization through, for example, informal sharing events, online collaborative help systems and repositories, and mentoring.

2.3 Continuing professional development

Continuing professional development (CPD) refers to additional education or training that people go through in order to:

– Improve or update their knowledge and skills;

– Develop new knowledge and skills for a change of job, career progression or taking on more responsibility.

Through CPD individuals keep their professional expertise up to date and enhance their capabilities – something that is expected of all professionals.

Continuing professional development focuses on the needs of the individual and supports the achievement of career goals. It should help answer the question: "where do I want to get to with my career and what do I need to do to get there?" Individuals benefit from it by becoming more confident, increasing their professional credibility and being able to cope positively with changes in what is expected of them (possibly due to organizational change). Through CPD, jobs may become more interesting with a corresponding increase in job satisfaction. At the same time the organization benefits from it by maximizing the potential of its staff, increasing staff morale and motivation, and having an adaptable workforce.

Continuing professional development is not primarily concerned with attending formal training. "Things done" or "time spent" are of secondary importance. Instead the emphasis should be on setting objectives for learning and then engaging in opportunities aimed at achieving that learning. Often learning comes from normal work activities, especially when someone is faced with a new challenge. Identifying what can be used is more important than simply recording what was done.

Often organizations expect staff to keep a record of their CPD activities. Then on a regular basis, possibly as part of the annual performance management process, there is the opportunity to use the record to reflect on past learning and plan the future.

2.4 Job competencies

Competencies specify the knowledge, skill and behaviour required to perform a specific job. Within some organizations there might be an existing competency framework that is used as a common basis for specifying the competencies of a range of jobs. Such frameworks have a key role in determining and supporting training within an organization.

Competencies fall into two broad categories:

– *Transferable skills or core competencies*: these include analytical, problem solving, communication and people management skills, and the ability to work in a team. They are applicable to many jobs, although some call for higher levels of skill in some areas, or for unique applications of those skills;

– *Technical/scientific competencies*: these tend to be more job specific. Within an NMHS they cover the competencies required for activities such as observing, maintaining/developing equipment, and forecasting.

As shown in Figure 2.2, transferable skills and core knowledge underpin the technical/scientific competences required of someone working in a specific professional area. They also provide a basis for the development of additional technical/scientific competencies when employees move to a new job in the same professional area. For staff in NMHSs the core knowledge might be that specified by the Basic Instruction Package for Meteorological Technicians (BIP-MT) or the Basic Instruction Package for Meteorologists (BIP-M) (see *Manual on the Implementation of Education and Training Standards in Meteorology and Hydrology* (WMO-No. 1083)).

Sometimes national or occupational competency frameworks already exist. This is particularly so for management and information technology jobs where the required competencies tend to be similar across many organizations.

When preparing a competency framework, it is good practice to (a) involve practitioners (i.e. do not leave it only to human resources staff or managers), (b) communicate how it is created and will be used, and (c) keep it as simple as possible. Here are a few things to remember when writing competencies:

– Use active verbs, keep competencies unambiguous, concise and relevant, and ensure they can be assessed;

– Avoid passive verbs, unnecessary words such as “reliable”, “effective” and “accurate”, which are assumed, and statements that cannot be objectively assessed, for example, those starting with ‘know’ or ‘understand’.

To test whether a competence is relevant and well specified, ask questions such as: “if someone does not have this competence, could they do the job?”; “is it clear and concise?”; and “how can it be assessed?”.

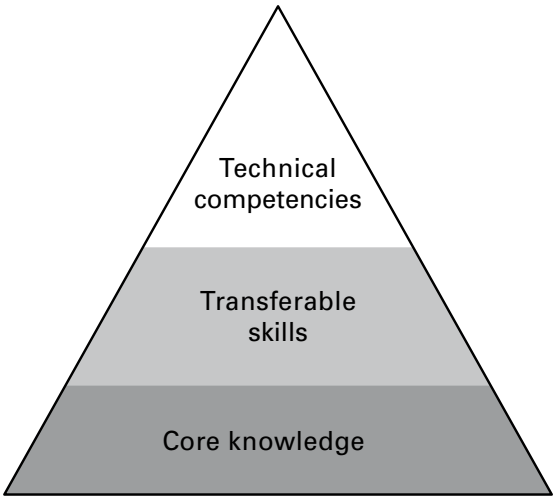


Figure 2.2. The core knowledge and transferable skills underpin the technical/scientific competencies required for a specific job.

Though developing a competency framework is time consuming, there are long-term benefits to be gained from it. Individuals will know what competencies are required for their job. The relationship between competencies required for different jobs will be known, providing useful information about the expertise needed for career progression. Some organizations base their performance management system and recruitment on a competency framework. But for any such framework to be effective, it needs to be straightforward, relevant, up to date and, most importantly, part of the organization's culture and beliefs.

Job competencies should not be thought of in isolation – they are an essential link between the goals of an organization and the learning outcomes that allow learners to become more competent (see Box 2.1).

Box 2.1. Organizational goals, job tasks, competencies, learning needs and outcomes

Learning outcomes are directly connected to organizational goals through a series of related concepts, with job competencies playing an essential role (adapted from a learning resource created for WMO by Ian Bell).

Goals	The goals of the organization or programme are primary; they are the reason why the organization exists.
Strategic support	The organization supports its goals through trained staff, infrastructure, services, policies, data, etc.
Job tasks	Job tasks are designed to ensure that the goals of the organization are met.
Competencies	Competencies are the knowledge and skills required to be able to perform the job tasks.
Learning needs	Learning needs are the existing gaps in competency that must be filled through learning.
Learning outcomes	Learning outcomes are what learners should be able to demonstrate as a result of participation in a learning opportunity; it is intended that learners become competent and help meet organizational goals.

Job competencies are particularly useful as a basis for identifying learning needs. The World Meteorological Organization has established competency frameworks in a number of areas, including training and aeronautical forecasting, but NMHSs may wish to customize these by expanding them or adding details that are specific to their region or organization.

2.5 Instructional System Design

The Instructional System Design is a systematic approach to ensuring that learning experiences are efficient, effective and appealing. The most common model is called the ADDIE process, first developed in 1975, which contains five steps:

Table 2.1. Relationship between the ADDIE process and trainers' competencies

ADDIE process	*Corresponding trainers' competencies*
Analyse	I. Analyse the organizational context and manage the training processes IIa. Identify learning needs
Design	IIb. Specify learning outcomes III. Determine a learning solution
Develop	IV. Design and develop learning activities and resources
Implement	V. Deliver training and manage the learning experience
Evaluate	VI. Assess learning and evaluate the learning process

– *Analyse*: identify the characteristics of the learners, their learning needs and the instructional context;

– *Design*: specify the learning outcomes, choose the instructional approach and the assessment strategy, specify learning methods, and design instruction;

– *Develop*: prepare presentations and learning resources;

– *Implement*: deliver the learning activity and resources, and monitor learning processes;

– *Evaluate*: assess learners to ensure that the learning outcomes have been achieved and identify ways of improving learning materials and processes.

Table 2.1 shows the relationship between the ADDIE process and training competencies. Note that there is not a one-to-one correspondence in all cases.

Evaluation, feedback and revision occur throughout the ADDIE process, so the process is iterative rather than linear.

2.6 Certification, accreditation and qualifications

Often certification and accreditation are used interchangeably, but they have different meanings in the context of education and training:

– *Certification* is the process attesting that a person has satisfied a particular academic standard such as a degree or professional qualification, or has the competencies required for a particular job or task;

– *Accreditation* is the process through which an external body evaluates an institution or programme against a specified standard. In essence, this is a form of quality assurance. Many universities and other educational institutions undergo an accreditation process to show that they have been approved by the relevant legislative or professional authority. Note that WMO is not an accrediting body so some WMO Members might decide to seek national accreditation of their training institutions.

The two are often linked. For example, an organization might be accredited to certify that people satisfy a standard. In other words, accreditation indicates that the organization has the resources and processes to offer certification of individuals.

A qualification is often the outcome of a certification process based on one or more assessment processes. The award of a qualification occurs when a competent body recognises that an individual's learning has reached a specified standard of knowledge and skills, based on the successful completion of a programme of study.

3. ORGANIZATIONAL CONTEXT AND TRAINING PROCESSES

Competence I: Analyse the organizational context and manage the training processes

Competency description
The organizational context is analysed and training plans, policies and processes are developed and monitored for effectiveness.

Performance criteria
- Analyse the current and evolving organizational and learning contexts, taking into account (a) the organizational requirements, (b) how resources are made available and applied, (c) how strategic training plans are developed, and (d) how training procedures are implemented to comply with training plans, policies and processes;
- Develop and implement a strategic training plan and an operational training plan;
- Implement training procedures in accordance with training plans, policies and processes;
- Monitor and update training plans, policies and processes to meet evolving needs and technological advances.

Knowledge requirements
To be able to understand, explain and/or critically evaluate:
- Factors causing change within an organization;
- Role of plans, policies and processes in supporting organizational change;
- Technologies required to support training;
- Role of quality assurance, financial management and marketing in managing the training process;
- Organizational, technological and research trends affecting the provision of training.

Personnel who should demonstrate this competency
- Senior staff who have overall responsibility for training;
- Training managers;
- Trainers who would benefit from having some awareness of the context in which they are operating;
- People who make decisions about overall human resource development strategies.

3.1 Introduction

Having competent staff is essential for any organization. Consequently, to be fully effective, an organization's strategy has to be supported by a strategic view of human resource management. As well as having a long-term view of requirements in terms of staff numbers, it is good practice to have a strategy that addresses the training needs of existing and future staff. Such a strategy should take into account the expertise required to meet current obligations and how that expertise will need to adapt to changing circumstances. This strategic view of training should take account of the organizational context.

Another consideration is the learning culture of the organization in terms of the emphasis on training and the way it is organised. For example, many NMHSs vary in their views about the following:

– The extent to which training is considered a cost rather than an investment;

– The flexibility for staff to carry out different functions within the NMHS. It would be useful, for example, to consider whether staff are trained just for a particular job, such as a forecaster, or whether the training is much broader so that people can easily move between jobs with little additional training;

– The sharing of responsibility for training between individuals, line managers, senior managers and the trainers;

– The importance of formal academic or vocational qualifications.

A training strategy should support the strategic aims of the NMHS and take account of its learning culture. It might be that in order to achieve the organization's strategic aims the learning culture has to change. In that case, the training strategy should indicate what needs to change and how that change will be brought about.

3.2 Why do organizations need to change?

The factors causing organizations to change are often described using a PEST (Political, Economic, Social and Technological) analysis. For each category, the following list provides one example of a factor causing change within NMHSs:

– *Political*: it is decided that all government departments providing services should be accredited as having a quality management system that meets international standards;

– *Economic*: the budget of the NMHS has been cut whilst the organization faces increased competition from private-sector providers;

– *Social*: members of the public and other users increasingly seek access to weather information through the web;

– *Technological*: the accuracy of Numerical Weather Prediction (NWP) forecasts continues to improve making it harder for forecasters to add value to NWP products.

Sometimes the analysis is extended to include legislative and environmental factors (PEST becomes PESTLE) such as the establishment of aeronautical competencies/standards and increased emphasis on the scientific basis and impact of climate change.

The evolution of an organization inevitably means that the people within the organization also need to change. To continuously develop in a managed way, NMHSs should foster a culture of learning that produces a flexible and responsive workforce within which many of the employees will spend their entire career.

In organizations experiencing periods of significant change, change management might become a specific responsibility or programme, helping the organization navigate the change and its disruptions successfully. Often change programmes have a significant training element. At the start, there might be a need to develop the competencies of a team responsible for running a change project, and of managers responsible for managing their teams in a time of change. In addition, the change will often require a specific job competence to be developed or improved for many individuals.

Within an organization with a strong culture of learning, the concept of talent management emerges, whereby individuals are encouraged and supported to gain new experience and to acquire the knowledge and skills needed to enhance their capabilities and progress in their careers. A key component of talent management is the development of management expertise (see Box 3.1). This helps an organization make full use of its key resources and ensures that a pool of high-calibre individuals is available to fill senior posts.

Box 3.1. Management development

To achieve their aims, organizations need their managers to have a core set of management skills. The skills required of a manager include the ability to solve problems and make decisions, plan and organize activities, build teams, communicate effectively and manage change. As well as these skills, good managers have leadership qualities that inspire and motivate others.

Management skills, including those associated with leadership, need to be developed – an organization cannot assume that someone taking up a management post has the required skills, no matter what their professional qualifications. Management programmes, which take full account of the needs and culture of the organization, are often used to develop the required skills.

The identification of learning needs associated with management skills can be undertaken in the same way as any other type of learning needs.

3.3 Planning for organizational change

Organizational change requires planning that identifies what needs to be done to take the organization from where it is now to where it wants to be. Without planning it is unlikely that an organization will fully meet its goals, or it will do so either late or at excessive cost. Outcome mapping, as outlined in Box 3.2, is a useful planning methodology. Any change process involves four basic steps, with planning at the centre as illustrated in Figure 3.1.

Box 3.2. Outcome mapping

Outcome mapping is a planning methodology that puts the emphasis on changes in behaviour, actions and activities. It can be used to develop a strategic plan or specify a development programme. Outcome mapping has three components:

- Intentional design, which answers the questions why, who, what and how;
- Outcome and performance monitoring, which provides a framework for monitoring actions and achievement of outcomes;
- Evaluation planning, which identifies how performance will be measured against objectives and used to determine whether there has been a successful outcome.

It is also worth considering how impacts will be assessed. This would answer the question: were our outcomes worth achieving?

For more information on outcome mapping go to http://www.odi.org.uk/publications/5212-outcome-mapping-learning-knowledge-sharing or http://www.intrac.org/data/files/resources/695/Impact-Assessment-Understanding-and-Assessing-our-Contributions-to-Change.pdf

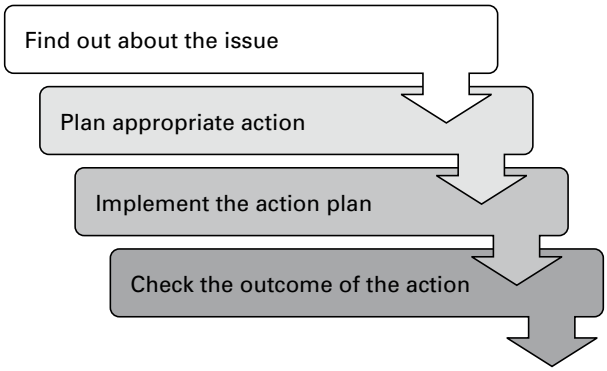


Figure 3.1. Basic steps of a change process. This also applies to training, where the implementation step covers both the development of learning activities and resources, and the delivery of training.

There tend to be two types of plan aimed at producing organizational change:

– A strategic (corporate) plan, which gives a vision of the future and specifies broad goals; this might entail changes to the size, shape, nature and culture of the organization;

– An operational (business) plan, which specifies objectives and actions to help reach the strategic goals; such a plan is implemented by individuals or departments.

In practice, the two plans are often merged into a single document.

The strategic and operational plans provide the context for the strategic learning plan and learning policy.

Training departments can contribute to:

– Delivering the operational plan of the organization;

– Changing the organization so that it is better able to carry out the operational plan and do new things as required by the strategic plan.

3.4 Components of a strategic learning plan

A strategic learning plan, which deals with capacity building, is a key document for any organization. It mainly focuses on ensuring that the organization has the ability to respond to internal and external changes. It supports organizational growth and the promotion of innovation with a view to enhancing service delivery. The strategic learning plan should directly link training requirements with the organization's strategic plan.

A strategic learning plan might have components that deal with the following questions:

– What are the organizational goals?

– What do people need to do differently or better for the organizational goals to be achieved?

– How will progress be measured?

– What learning opportunities are required to meet the organizational goals?

Often learning opportunities will contribute to more than one organizational goal. Once it has been decided what learning opportunities will be provided, it is necessary to specify time frames, resources and results for each one.

Having a strategic learning plan helps the staff of an organization understand how their development is linked to the strategic goals of the organization, hence they are more likely to actively participate in learning opportunities. The plan also helps emphasize that providing learning opportunities is an investment rather than just a cost, because of the benefits learning brings to the organization in helping it meet its strategic goals. Box 3.3 describes some benefits of investing in training.

The strategic learning plan will usually address both the operational and the strategic change requirements of the organization.

Box 3.3. Some benefits of investing in training

- Employees are more conscious of the aims of the organization and their own jobs;
- Newcomers are fully effective more quickly;
- More effective working methods and techniques are applied, leading to better ways of working;
- Quality of output is improved by an enhanced application of expertise;
- Attitudes towards customers and other departments are more constructive;
- Job and task flexibility is encouraged;
- Relationships between staff and managers are enhanced;
- Staff turnover is reduced by better induction;
- Information technology systems and other resources are put to better use;
- Accidents and waste are reduced.

3.5 Learning organizations

The term "learning organization", which refers to the culture of an organization rather than its outputs, became widely known with the publication of *The Fifth Discipline: The Art and Practice of the Learning Organization* by Peter Senge in 1990. Organizations gain strategic benefits from being able to manage change in harmony with the changing technology and the environment in which they operate. This has led to the concept of a learning organization, which has the following features:

- Learning opportunities are provided to individuals when they are hired and throughout their employment;
- Individuals are encouraged to seek and manage their own learning opportunities;
- Training is learner-centred;
- Empowerment of individuals is the norm and teamwork is fostered;
- Bureaucratic rules and administrative overheads are minimized;
- Performance feedback is given and mistakes are tolerated in the interests of learning.

In order to become a learning organization, a complete change in culture is often required. Indeed, the whole structure and operation of the organization may need to be realigned, but this cannot be done successfully without commitment throughout the organization. In general, a learning organization has a learning culture with processes in place to ensure that learning opportunities are planned (based on an assessment of learning needs), action is taken to satisfy the learning needs and learning programmes and events are evaluated after implementation.

As well as nurturing a culture of learning amongst the staff, learning organizations usually have effective processes for knowledge management (see Box 3.4).

Box 3.4. Knowledge management

According to Bryant Duhon[1], knowledge management is "a discipline that promotes an integrated approach to identifying, capturing, evaluating, retrieving, and sharing all of an enterprise's data, information, and knowledge assets. These assets may include databases, documents, policies, procedures, and previously uncaptured expertise and experience in individual workers".

To understand knowledge management it is important to differentiate between:
- *Data*: sets of facts, concepts or statistics;
- *Information*: data that have been analysed and organized so that they have structure and meaning;
- *Knowledge*: the understanding and application of information to aid decision-making.

The aim is to manage knowledge so that it can be applied to meet the operational and strategic aims of the organization. This allows organizations to:
- Avoid repeating mistakes by using a "lessons learned" database;
- Make full use of expertise within the organization by identifying people who have knowledge and skills in a particular area;
- Develop networks of people with a shared interest by using what are known as "communities of practice".

In addition, it is possible to base decision-making and strategic planning on evidence, to transfer good practice from one part of the organization to another and to identify common issues or concerns.

[1] Duhon B., 1998: It's All in Our Heads. *Inform*, 12(8):9–13.

3.6 Components of a learning policy

As well as having a learning plan, some organizations have a learning policy that provides a broad approach to identifying learning needs and the allocation of responsibilities.

In many organizations, the expertise and creativity of their staff are the major assets that need to be supported and developed. In some organizations, however, providing learning opportunities is seen as a luxury, especially if there is no culture of learning and no recognition of its strategic value. Furthermore, if there is no dedicated training department within an organization, there might not be a champion who ensures that learning is acknowledged and valued.

A learning policy covers topics such as an organization's beliefs about and commitment to learning, the benefits derived from providing learning opportunities and the roles and responsibilities of members of staff at all levels. A learning policy might specifically cover:

– Benefits of training to the individual and the organization;

– Provision of learning to meet current and future needs;

– Culture, style, attitudes and beliefs about learning;

– Who is eligible to participate in learning programmes and events and how to gain access to them;

– Responsibilities of the line manager, training department and individuals.

In many organizations, the learning policy might be part of a wider policy concerned with human resources, that is the workforce of an organization.

3.7 Organizational training structures

National Meteorological and Hydrological Services vary in size and approach to how learning opportunities are managed. Consequently, training functions within an NMHS can take on many different forms. For example:

– A separate department with full-time trainers is responsible for managing training;

– A single person is responsible for managing training that is provided by staff from within other departments of the NMHS on a part-time basis and/or through distance learning;

– All learning opportunities are provided externally with someone from the NMHS responsible for commissioning them.

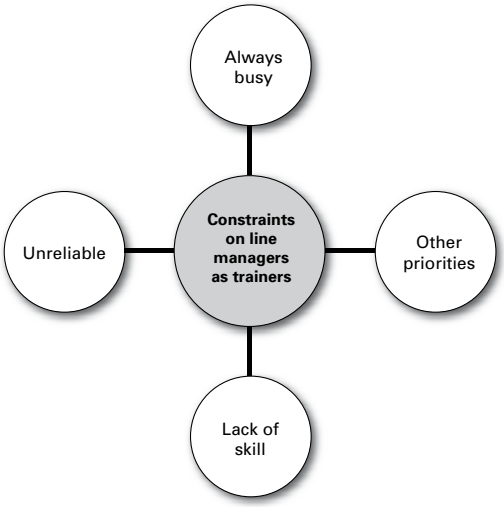
In some organizations, line managers take increasing responsibility for the learning of their staff. These responsibilities might involve tasks such as identifying learning needs and deciding how they could be addressed, providing coaching and assessing the impact of participation in learning opportunities. These tasks are best carried out by individuals and line managers working together in partnership, but trainers could be responsible for providing guidance, encouragement and support (see Box 3.5).

Within an NMHS, the members of staff having overall responsibility for training have to balance the needs of the individual with those of the organization. Just focussing on individual learning needs means that the organization's strategic aims might not be met. On the other hand, if individual learning needs are ignored, the staff might not be motivated to maintain or develop their expertise, nor would they receive the training they need the most, and thus a key resource would not be fully utilized.

Box 3.5. Role of the line manager

Line managers (or supervisors) can play a key role in training their staff, but often this does not happen because they:

- Are too busy to think about training;
- Think that training does not have a high priority;
- Do not have the required instructional or interpersonal skills;
- Can be unreliable by cancelling or interrupting training to meet short-term needs.



To overcome these problems the organizational culture needs to be such that (a) line managers are expected to take responsibility for the training and development of their staff, and (b) all levels of management are committed to encouraging and supporting training and development as a means of reaching the goals of the organization.

Trainers within an organization can help line managers by:

- Providing training that is focussed on developing the training skills of line managers and explaining the benefits of taking an active role in the training process;
- Supporting line managers by giving advice and encouragement when they are dealing with performance issues;
- Informing line managers of the training opportunities that are available.

Though the trainers tend to concentrate on satisfying the learning needs and aspirations of individuals, they must do this in the context of organizational requirements and direction. This is a major task, and success depends on direction, support and recognition from a high level within the organization.

3.8 Facilities and resources required to support training

A training department requires the standard office systems as well as specific facilities, hardware and software for promoting learning.

In the past, in addition to rooms for staff, the facilities occupied by a traditional training department might include:

- One or more classrooms for lectures, private study and exercises;

- Libraries, meeting rooms and other facilities in accordance with local policies and procedures;

– Printing and photocopying facilities, storage for teaching and learning resources, and hard and e-copy filing systems;

– Amenities such as bathrooms/toilets, kitchens and locker rooms.

Nowadays many institutions also take advantage of technological developments that enhance the training process.

The amount of funding that an organization can allocate to its training department to maintain and develop the training facilities and resources will vary with time, the type and amount of training being undertaken, and institutional or national regulations such as Occupational Health and Safety requirements. Training managers will need to be able to justify the investment through ongoing evaluation of their programmes (chapter 8) and careful monitoring of the amount and type of technology used. Collaboration and liaison with the national education sector and training groups in other NMHSs are encouraged to share experiences and resources.

Nearly all aspects of training can benefit from making full use of the wide range of technologies that are available. Some technologies, such as a Learning Management System, can support learning through the whole organization, whereas others, such as forecaster workstations, are primarily used within the training department and operational areas.

3.9 Using technology to support training

Use of technology in training has been affected by:

– Learning delivery methods becoming more varied and flexible;

– Economic pressure on organizations and the need for increased efficiency;

– Introduction of Quality Management and regulations which require that more attention be paid to record keeping and retrieval.

This has resulted in training departments having to embrace technological developments and putting more emphasis on developing the skills required to make full use of the technology.

Many training departments have access to video and data projection systems, computer laboratories, and black/white and smart boards. In addition, because training focuses on developing the knowledge and skills required for a particular job, the training department needs access to the same technology used within the workplace. Trainers, therefore, must be competent and confident in the uses and limitations of the wide range of technology that is being used.

3.10 Learning management systems

A learning management system (LMS) is a software package or system of applications that supports the delivery and management of training resources and events. Such a system can be used for a wide variety of purposes, including managing training records, registering for courses, providing learning resources, delivering on-line courses, facilitating communication between learners and teachers, and assisting in the assessment of outcomes. Most LMSs are web-based, so they allow access to information and resources from anywhere at any time. But such systems require sufficient support to maintain the integrity, usefulness and currency of the information they contain. Consequently, an organization can benefit from adopting an LMS, but care needs to be taken to ensure that the system is used properly.

Ideally an LMS will work well with any performance management or appraisal system that is in place within an organization.

Moodle is an example LMS. It is an open source, web-based application which is used within WMO to manage and administer a variety of meetings and training events. More information on how Moodle can be used is given in chapter 7.

A Virtual Learning Environment is similar to an LMS in many ways, but it tends to be used in educational establishments and offers a broader range of capabilities. A Virtual Learning Environment provides a set of learning tools that typically allow access to curriculum information and resources, on-line support to teachers and learners, and live and asynchronous communication. Usually teachers see everything that the learners can access, but they can also track their performance.

3.11 Organization-specific facilities, hardware and software

To enhance learning related to specific tasks and roles it is strongly recommended that learners have access to the same equipment that they will be using in real-time operations. In some organizations this will mean that learners use equipment and facilities within an operational facility whilst in others this equipment will be part of the training department. Training managers will need to consider the cost/benefits of equipping their centres or providing access to a wide range of facilities such as:

– Surface and upper-air instruments and radars;

– Maintenance facilities and communication and calibration equipment;

– Forecasting workstations and observing equipment;

– Computer laboratories.

In situations where operational equipment or facilities cannot be provided to the training department, learners may have to undergo extensive on-the-job training to develop the required level of skills and expertise.

3.12 Quality assurance

Increasingly NMHSs have to ensure that the quality of their products and services meet the needs of their customers. A common approach is to have their Quality Management System (QMS) accredited as satisfying the ISO 9001 Standard. This Standard can help both product- and service-oriented organizations to achieve standards of quality that are recognized and respected throughout the world. Box 3.6 provides a link to a training module, Quality Management Systems: Implementation in Meteorological Services, which has been developed by the COMET Program in collaboration with WMO. Another important resource on quality management is available from WMO at http://www.wmo.int/pages/prog/amp/aemp/documents/QM_Guide_NMHSs_V10.pdf.

Box 3.6. Implementation of a Quality Management System

Quality Management Systems: Implementation in Meteorological Services is a one-hour online learning module which provides an overview of the key concepts, benefits and principles of an effective QMS based on the ISO 9001:2008 quality management Standard. It also introduces guidelines for the successful implementation of a QMS in aviation weather service agencies. Although primarily aimed at management personnel responsible for implementing, monitoring and updating QMS processes, it also provides a basic introduction to QMS suitable for all agency staff.

The first part of this module provides an overview of QMSs, introduces key concepts and terms, and describes the benefits of QMS implementation. The second part outlines 12 key steps for successful QMS implementation, including important tips, examples and critical success factors. After registering on the meted website the module can be accessed by going to http://www.meted.ucar.edu/training_module.php?id=869.

Training departments might seek further accreditation based on ISO 29990:2010, Learning services for non-formal education and training – Basic requirements for service providers. However, the ISO terminology "non-formal education and training" applies to all training offered outside universities and other educational institutions. So even the "formal learning" offered within training organizations would be considered non-formal according to the ISO definition.

ISO 29990 is divided into two areas:

– Learning services, which is concerned with all aspects of the training process;

– Management at the learning service provider, which is concerned with ensuring that there is a certifiable management system such as a business plan or a system for financial risk or human resources management.

Even if formal accreditation for ISO 29990 is not sought, this Standard can be used to benchmark learning services.

3.13 Financial and promotional considerations

Financial management systems allow organizations to monitor income and expenditure, and provide a basis for decision-making. Two common approaches to managing the training budget are:

– *Cost centre*: this implies a central budget for training with costs divided between direct costs (for example, consumables and travel and subsistence), departmental overheads (for example, salaries, energy and equipment) and organizational costs (for example, building maintenance and quality management systems). There is no standard way of allocating costs under these three headings;

– *Profit centre*: the training department provides services to other parts of the organization and charges for those services. This means that income to offset the costs comes from internal transfers of funds and selling services outside the organization.

Setting up the training department as a cost or profit centre makes the cost of this activity clearer. It also encourages efficiency and recognition of the benefits of training.

Organizations should raise awareness about the contribution that education and training can make to achieving organizational goals, addressing performance issues and minimising organizational risk. Investment in learning is worthwhile and whoever has responsibility for learning should effectively promote what is available. In doing so, it is worth applying two basic principles:

– *Sell benefits, not features*: emphasize the benefits to the individual and/or organization of participating in a specific learning opportunity (for example, the learning outcomes) rather than just listing the features (for example, topics covered);

– *Identify the unique selling point*: identify what is special about the learning opportunity (for example, that it is linked to a specific internal or external development) or about those responsible for its delivery (for example, the expertise of the trainers).

It is appropriate to apply these principles to both internal and external promotion of learning opportunities. However, if the aim is to attract participants from outside the organization, applying these principles is essential to maximize uptake. Both training managers and trainers can help promote training within an organization (see Box 3.7).

Box 3.7. What can training staff do to help with promotion?

Training managers

- Identify the benefits of training for upper management and stakeholders;
- Develop examples that show the value of participating in learning opportunities;
- Make sure that the training budget and plans reflect the needs of the organization;
- Have flexible training plans so that unexpected demands can be accommodated;
- Invite internal clients to contribute to the design and delivery of training;
- Seek feedback from people who have taken advantage of learning opportunities and show that action has been taken in response to any concerns;
- Keep up to date with the organization's activities;
- Act as a champion of learning at every opportunity;
- Ensure that trainers have enough subject-matter expertise and instructing ability.

Trainers

- Lead by example in pursuit of their own CPD;
- Liaise with others in the organization;
- Deliver consistent, high-quality training;
- Demonstrate an interest in issues affecting the organization.

3.14 Trends affecting the provision of training

The provision of training can be affected by a number of factors which need to be taken into account by all those involved. The following were some of the key trends when this document was being prepared.

3.14.1 *Trends affecting organizations*

– *Quality management*: an increasing number of organizations are moving towards adopting QMSs which provide a systematic way to achieve continual improvement and to demonstrate this to management and external stakeholders. These systems normally require staff to show expertise in particular tasks;

– *Professional standards*: in many occupations, professional standards have been developed for particular jobs. Within the meteorological community competency standards have been set for Aeronautical Meteorological Forecasters and Observers, and others will follow. In some countries, there are also standards for trainers;

– *Knowledge management*: there is increasing recognition that the management of knowledge is important, because the accumulated organizational knowledge distributed among its members can facilitate decision-making, support learning and stimulate innovation when it is available to all. Knowledge management includes having systems in place to create, store and provide access to knowledge of individuals and organizational processes;

– *National and international cooperation*: cooperation between learning institutions has increased as NMHSs recognize that sharing training materials and expertise benefits all.

3.14.2 *Trends directly affecting training*

– *Learning outcomes*: increasingly learning opportunities are being specified in terms of learning outcomes rather than a syllabus describing topics to be covered. This reflects a desire for accountability in the training function – it needs to be demonstrated that training adds value to the organization. It also reflects a deeper desire to help learners achieve personally-valued learning. For trainers, this means moving towards being a facilitator of learning;

– *Distance learning*: many organizations have developed high-quality, self-paced distance-learning material. This has created access to a wealth of training material that can be used either for stand-alone learning opportunities or to augment other modes of learning. Synchronous or blended distance-learning courses are also becoming more common, increasing the availability of learning opportunities where they did not exist previously;

– *Just-in-time training*: with increasing scientific knowledge and technological change, there has been a move towards learning systems that deliver training to workers when and where they need it. These learning materials can be web-based, computer-based, or paper-based, and can provide the information required to solve problems, perform specific tasks or quickly update expertise;

– *Learning through social networks*: the increasing use and availability of social networking tools, such as blogs, podcasts, tagging and online communities, encourage people to learn in a social context through discussion, file sharing and collaboration;

– *Continuing professional development*: organizations are increasingly recognizing the importance of CPD. For example, in meteorology, developments in observing systems, numerical weather prediction and customer requirements mean that the expertise of forecasters has to be continually updated;

– *Transferable skills or core competencies*: there is increasing emphasis on the development of transferable skills such as those associated with effective communication and being customer focussed. These skills are of value in many different jobs.

3.15 Next step

Training plays a key role in helping an organization to meet its strategic aims whilst motivating individuals and improving their performance. For the training to be successful, everyone involved in the learning process needs to be aware of what is happening within the organization and of the internal and external factors that are shaping its future. They need to understand what is expected of training and the contribution it can make to the organization.

Having set training in the context of the organization that it is serving, the next step is the identification of learning needs.

3.16 You and your organization

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

– What are the main factors causing change within your organization and training department?

– What are the main aims of your organization and how does the training department contribute to the attainment of those aims?

– What are the characteristics of your training department in terms of inputs, processes and outputs?

– Who are the main stakeholders for training in your organization and what influence do they have on the training process?

– To what extent does your training department make effective use of technology to support the training process?

– In your organization, how are stakeholders made aware of the training opportunities that are available?

4. LEARNING NEEDS

Competence II: Identify learning needs and specify learning outcomes

Competency description
A systematic approach is used to identify organizational and/or individual learning needs which are then specified in terms of a set of learning outcomes.

Performance criteria
- Apply a systematic approach to specifying job competencies and performing learning needs analysis;
- Base the identification of learning needs on job tasks or the existing competency framework;
- Identify organizational and/or individual performance gaps that are due to learning deficits;
- Specify learning needs that take account of organizational and individual requirements, the views of stakeholders and external factors;
- Set learning outcomes in collaboration with stakeholders so that, if the outcomes are achieved, learners will be able to perform the job at the required level.

Knowledge requirements
To be able to understand, explain and/or critically evaluate:
- Why learning needs occur and the benefits of learning needs analysis;
- Sources of performance gaps not related to knowledge, skills or behaviour (organization, motivation, management, tools and procedures);
- How to carry out competency definition and learning needs analysis;
- Sources of data and techniques used to identify learning needs;
- Ways of classifying learning outcomes.

Personnel who should demonstrate this competency
- Training managers;
- Trainers who would benefit from knowing how learning needs are identified within their organization;
- Line managers who carry out their own learning needs analysis before seeking the assistance of the learning professionals in addressing those needs.

4.1 Introduction

Learning needs analysis – also referred to as training needs analysis – is the systematic gathering of information about any gaps in the knowledge, skills and behaviour of staff, taking into account current and future organizational requirements and the capabilities of individuals. It consists of three steps as shown in Figure 4.1.

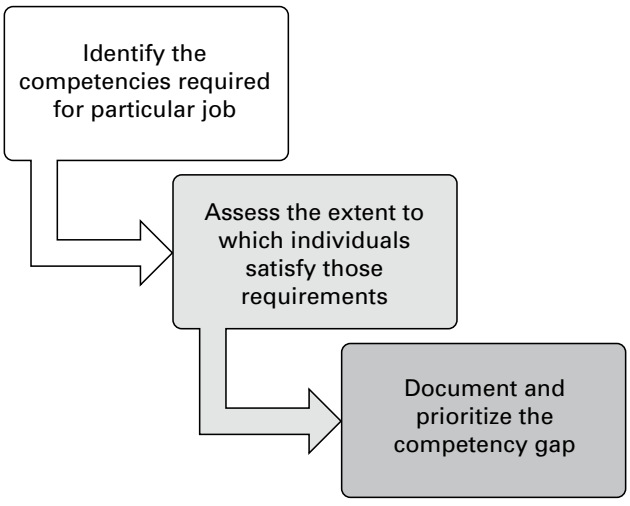


Figure 4.1. The three steps in learning needs analysis

Though this is the logical process to follow, it can be implemented in many different ways. It is important, however, that these three steps are covered in some way, whether they have already been taken within prior organizational efforts or need to be undertaken for new organizational initiatives.

Having carried out the learning needs analysis, the next step is to identify the learning outcomes that will address the competency gap.

The organizational context described in chapter 3 should be the basis for identifying learning needs.

4.2 Why analyse learning needs?

All NMHSs have restricted budgets for providing learning opportunities. Consequently, priorities should be based on a full understanding of the learning needs and the context in which they arise. This should be done on an ongoing basis to take account of the changing requirements and capabilities of the NMHS associated with factors such as:

– Organizational objectives or strategy – for example, increased income, enhanced customer satisfaction or expansion/contraction of the workforce;

– Products or services– for example, new services for the public or commercial customers;

– Sources of information – for example, new remote-sensing data or output from an NWP model;

– Work practices – for example, new forecaster workstations;

– National or international standards – for example, new international standards for the provision of aeronautical services.

In addition to responding to changing requirements (doing new things), organizations need to maintain (doing things well) or develop (doing things better) the core expertise of staff. They must also be prepared to address the needs of new incoming staff at various levels of competency and education.

Identifying learning needs ensures that tasks are carried out by individuals with the right expertise. This can also lead to contented staff, because identifying and then addressing learning needs promotes job satisfaction and gives individuals the opportunity to develop their expertise and possibly progress in their careers. Meeting learning needs also encourages ambitious and talented individuals to remain within the organization. Furthermore, clearly specified learning needs provide trainers with a basis for choosing and designing learning solutions, and assessing whether the required learning has occurred.

4.3 What are learning needs?

The requirements for any job can be divided into three categories:

– *Knowledge*: the information and understanding someone needs to perform the job;

– *Skill*: what someone has to be able to do on the job;

– *Behaviour*: how people should conduct themselves on the job.

There is a learning need if there is a gap between the knowledge, skill or behaviour of an individual and those required to carry out their job. A gap may occur because a job is evolving or because the person lacks the required expertise.

As indicated in Figure 4.2, there are learning needs associated with both organizations and individuals:

– *Organizational needs* are frequently associated with organizational strategy, restructuring of the NMHS, changing customer needs, technological/scientific developments and new national/international policies or standards;

– *Individual needs* are often associated with compliance requirements, performance issues, change of responsibilities and/or job requirements, and being new to the organization.

Between these levels are the learning needs of groups, teams or departments, which are sometimes referred to as occupational needs. These middle levels tend to reflect the organizational needs which may require varied responses from different parts of the NMHS. For example, introducing a new forecaster workstation or providing access to new remote-sensing data might create a learning need within the forecasting team and technology support group, but would have little impact on the rest of the NMHS. Alternatively, there could be a common learning need for people across different teams. For example, corporate strategy might indicate that management skills across the NMHS should be enhanced. Unique needs might arise not at the organizational level, but only for a particular group or department, such as a new administrative software package used only by managers and administrators.

Though it can be helpful to think of learning needs in terms of organizational, occupational and individual needs, there is often considerable overlap. Training departments are usually concerned with addressing both individual and occupational learning needs.

In this publication it will be assumed that organizational learning needs cover both the needs of the organization as a whole and those of specific occupations.

Sometimes the assessment of learning needs takes little account of individual requirements. For example, an initial forecasting course might have a standard content based on national or international standards and common assumptions about learners' knowledge of mathematics and physics.

Identification of learning needs is most effective if the process is shared among managers, job holders and trainers. Broad involvement creates a sense of ownership and awareness of the importance of addressing the learning needs.

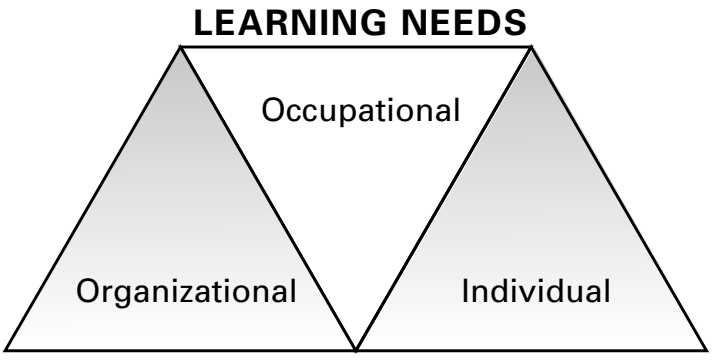


Figure 4.2. Types of learning needs within an organization

4.4 Sources of information about learning needs

Most NMHSs already have a lot of information that can be used to identify learning needs. In addition to the organization's strategic and operational plan and strategic learning plan, which were discussed in chapter 3, the following sources of information might be available:

– *A risk register*: a document resulting from a risk analysis. It lists all project or organizational risks, their impact and likelihood, and methods of risk mitigation. A risk register might indicate any learning areas that have been identified as being critical for the organization;

– *Succession plans*: having the right people with the right skills in the right jobs is essential for a successful NMHS. This is particularly important for key managers and specialists. For example, if a large number of senior managers or experienced forecasters are soon to retire, an organization needs to ensure their successors have the right level of expertise;

– *Management information systems or quality management systems*: such systems provide information that allows managers to monitor activities and make decisions at the organizational or occupational level. This information might indicate a gap in performance. For example, the quality of warnings from one station may be much worse than that from another station. This could indicate a specific learning need for a group of forecasters, although consideration should also be given to other reasons, such as the effect of complex terrain or lack of observations;

– *Performance management system*: most NMHSs have a performance management (appraisal) system to assess the performance of individuals against job expectations and to identify their development needs. This information can be useful for identifying learning needs, but its quality depends on the effectiveness of the performance management process.

Training will not always be the best approach to addressing a performance issue. Indeed, providing a learning opportunity might have no impact at all. Issues such as insufficient staff, inadequate systems or an individual's lack of native ability or motivation may be underlying factors affecting performance but cannot be addressed by providing learning opportunities. However, training is justified where lack of competence is the reason for poor performance (provided lack of native ability is not the root cause). A systematic approach to solving problems or providing opportunities related to the performance of people is called Human Performance Technology (see Box 4.1).

Box 4.1. Human Performance Technology

Human Performance Technology consists of the following three processes:

– Performance analysis, which focuses on the work environment (resources, tools and policies), work (workflow, procedures and responsibilities) and workers (knowledge, skills and motivation);
– Cause analysis, which considers several factors that might affect performance:
  - Data, information and feedback
  - Environmental support, resources and tools
  - Consequences, incentives and rewards
  - Skills and knowledge
  - Individual capability
  - Motivation and expectations
– Intervention selection and design, which might involve training, but alternative solutions could include changing the work design, communication arrangements, the organizational structure or financial system.

Information about Human Performance Technology is available from the International Society for Performance Improvement at http://www.ispi.org/content.aspx?id=54.

4.5 Process for analysing learning needs

As indicated at the start of this chapter, analysing learning needs includes three basic steps:

1. Identifying the competencies required for a particular job (now and/or in the future);

2. Assessing the extent to which individuals currently satisfy those requirements;

3. Documenting and prioritizing the competency gaps.

These will be considered more closely in turn.

Step 1. Identifying the competencies

A logical sequence to identify competencies is first to define the job responsibility and then to specify the tasks that must be performed to fulfil the responsibility. In most cases, it is necessary to identify several component activities that comprise a top-level task (for example, the top-level task of providing warnings might be split into two component tasks: forecasting hazardous weather and preparing and issuing warnings in accordance with agreed thresholds). Performance criteria might be included to describe characteristics of successful performance of the tasks. Finally, specify the knowledge, skills and behaviours required to carry out the tasks. Together, these components describe the competencies required for a job responsibility.

Competencies could have already been defined for some jobs so this step might not be required. Indeed, within the NMHS there might already be a competency framework covering many different jobs. However, for a new job or one that has radically changed, going through this process is beneficial.

Examples of WMO competency frameworks for a variety of job responsibilities can be found at http://www.wmo.int/pages/prog/dra/etrp.php in the online publications section.

Step 2. Assessing the current situation

The next step is to assess the extent to which individuals currently satisfy those requirements. As indicated in Figure 4.3 there are many techniques for doing this:

– *Surveys*: use questionnaires to obtain information from many people. They should be relevant, valid and reliable, and data analysis tools and procedures should be in place;

– *Interviews*: use a combination of prepared and follow-on questions to interview members of staff, including line managers and supervisors. A high level of listening and questioning skills is required;

– *Self-assessment*: ask individuals to assess themselves against a set of competencies using a standard form;

– *Direct observation*: assess the actions or behaviour of individuals against what is expected of them, either in the workplace or as a simulation;

– *Assessment/development centre*: give small groups a set of tasks that allows them to demonstrate competencies whilst being observed by an assessor;

– *Consulting key people*: seek the views of key people within the organization, such as senior managers, who have a broad view of the organizational context and the learning needs of a group;

– *Focus groups*: assemble a group of people representing a particular job or function for which the learning needs are explored;

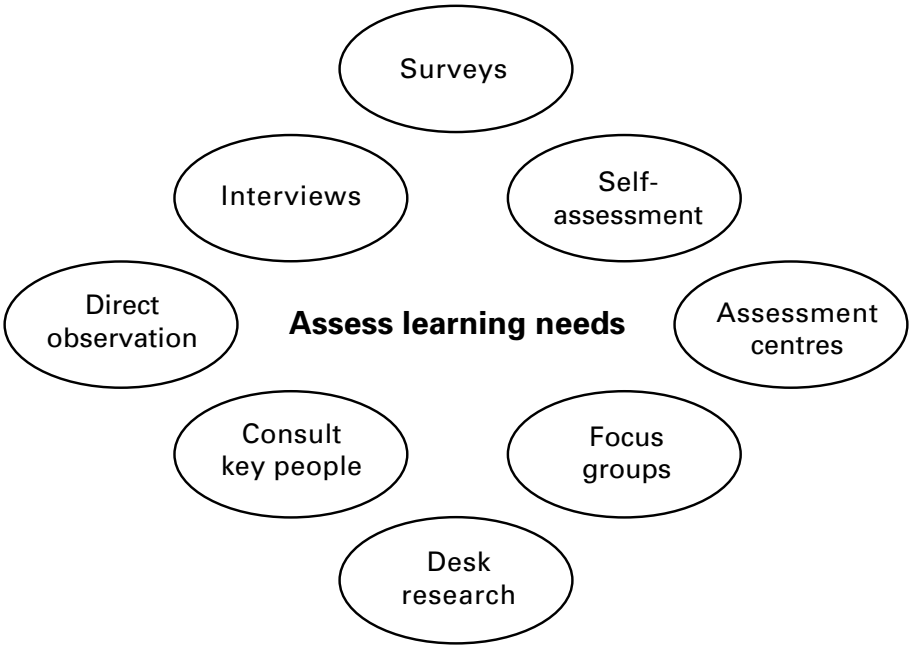


Figure 4.3. Different techniques for assessing learning needs

– *Desk research*: review existing documents and reports such as logs of complaints or problems to assess whether there is an underlying learning need.

Although there are many techniques available for assessing learning needs, the approach taken will depend upon the culture of the organization, the management system used, the importance or prevalence of the job in the organization, the available resources, and the commitment of senior management. A combination of techniques might be used.

Step 3. Documenting and prioritizing competency gaps

The first two steps serve to identify the gap between the competencies required and those demonstrated. The results of the learning needs analysis have to be clearly documented and agreed with stakeholders. Part of that process could involve prioritizing the learning needs because it might not be practical to address them all. A key consideration for prioritization might be the risk to the organization of tackling or not tackling the learning needs.

4.6 Learning outcomes to address the gap

Once the analysis of learning needs has been completed and agreed, and priorities established, the next step is to define the learning outcomes (sometimes identified as learning objectives) that will address the gap.

Learning outcomes are statements of what a learner is expected to be able to do as proof of consolidation of knowledge, understanding or skills developed during a learning activity. These statements should be specific, measurable and achievable. Ideally, a learning outcome will include the situation (the circumstances in which the learner demonstrates what can be done), the action (what the learner can do) and the standard (a measure of success). Organizations often emphasize the actions (what the learner can do and/or whether the learner can apply the learnt knowledge to the tasks), rather than the situation and standard. This allows trainers to be flexible in helping learners at various skill levels and working in different contexts whilst still satisfying the learning outcomes.

Learning outcomes complete the statement: "After participating in the learning opportunity the learner will be able to….". The end of the sentence will vary according to whether the aim is to

change knowledge or skills. Different verbs will express actions associated with the specific outcome sought:

– *Skills*: perform, make, select, use and operate (for example: "Use water vapour imagery to indicate areas of significant potential for convective weather");

– *Knowledge*: identify, describe, define, explain and state (for example: "Identify the key atmospheric conditions required for fog formation").

For knowledge-based outcomes it is better to avoid verbs such as "appreciate", "know" or "understand" as these are more difficult to measure. Similar to competencies, learning outcomes are more usefully stated in terms of actions.

For learning interventions aimed at modifying behaviour it is more difficult to find suitable descriptions of learning outcomes. However, words such as "demonstrate an awareness (or appreciation) of", "comply with" and "display" could be used.

Much of what is learned is in the form of cognitive or thinking skills. For those outcomes, there is a commonly used hierarchy. Table 4.1 gives an overview of the various levels and some examples of the associated descriptors. The higher-order cognitive skills of analysing, evaluating and creating are built upon the lower-order skills of remembering, understanding, applying and analysing. As well as cognitive skills, there are also those associated with the psychomotor (physical coordination skills), affective (attitudes, values and beliefs) and interpersonal domains; these are described in Box 4.2.

Learning outcomes emphasize the results of learning rather than the learning process. In particular they:

– Clarify what the learning event should achieve and thereby help to identify the best learning solution and method;

– Ensure that learners and trainers understand what needs to be achieved, can prepare themselves and are able to gauge the progress they are making;

– Ensure that the right people participate;

– Provide a robust basis for assessing whether the required learning has taken place.

Table 4.1 Classification of intellectual behaviour and related descriptors

Cognitive skill level	*Examples of descriptors*
Remembering: the learner recalls information	list, define, identify
Understanding: the learner explains ideas or concepts	explain, interpret, discuss
Applying: the learner uses new knowledge in a familiar situation	apply, use, relate
Analysing: the learner differentiates between constituent parts and relates them to the whole	analyse, compare, investigate
Evaluating: the learner justifies a decision or course of action	evaluate, argue, recommend
Creating: the learner generates new products, ideas or ways of looking at things	create, organize, assess, predict

[2] This table is based on the classification of intellectual behaviour developed by Benjamin Bloom and colleagues (see Bloom B. et al., 1956: *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*. London, Longman) later modified by L. Anderson and D. Krathwohl (see Anderson L. and D. Krathwohl, 2001: *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Longman).

Box 4.2. Psychomotor, affective and interpersonal domains

– *The psychomotor domain* deals with performing sequences of activities requiring manual dexterity, though this is often underpinned by cognitive understanding. The stages in this domain cover topics such as elementary and synchronised movements;
– *The affective domain* deals with attributes that are critical for learning. It includes a willingness to listen, to participate and to be involved;
The interpersonal domain deals with people interacting with others. It includes asking for and offering information, putting forward ideas, motivating others, and appropriately offering a different opinion.

The affective and interpersonal domains are not often addressed as part of a learning experience, unless the training is focused on related core competencies. To achieve affective and interpersonal outcomes, using face-to-face meetings, group discussions, coaching and motivational material can be of value. Unlike the cognitive and psychomotor domains, these domains are not often expressed as a hierarchy.

Skills in the psychomotor domain can be developed using practicals, demonstrations and simulations.

Learning outcomes provide the basis for designing and delivering any learning opportunities.

Writing good learning outcomes is not easy. The stakeholders who have called for the learning needs analysis need to agree on the learning needs. Ideally they would play a major role also in developing or approving the learning outcomes. Stakeholders should have a clear understanding of the measures of success that will be used. They should also indicate preferred types of learning solutions and the constraints that might apply.

4.7 Next step

The learning needs analysis and specification of learning outcomes will form an essential part of an implementation plan. But implementation also requires an appraisal of possible training solutions in terms of costs/benefits, non-financial aspects and resources. The extent to which those solutions satisfy all the required learning outcomes should also be assessed. The next step is concerned with determining learning solutions.

4.8 You and your organization

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

– What are the learning needs that your organization has to address in order to satisfy its aspirations?

– What information is available in your organization to assess learning needs and what techniques are used to identify them?

– To what extent is a systematic approach taken to identifying learning needs in your organization?

– Based on an analysis of the strengths, weaknesses, opportunities and threats (SWOT) of your training department (or equivalent), what are its own learning needs?

– What learning needs have to be satisfied so that you can further progress in your own career?

5. LEARNING SOLUTIONS

Competence III: Determine a learning solution

Competency description
The learning solution is determined and a plan is prepared for implementing the chosen solution.

Performance criteria
- Assess learning solutions in terms of costs, organizational and audience characteristics, resource implications and the extent to which they satisfy all the required learning outcomes;
- Choose a learning solution that meets requirements and fits constraints;
- Consider a wide range of potential solutions, including using a mixture of formal, semi-formal and informal learning methods;
- Prepare a plan to implement the chosen solution, including timeframe, costs, location and technology, personnel, targeted learners and evaluation criteria.

Knowledge requirements
To be able to understand, explain and/or critically evaluate:
- How the nature of the learning outcomes and organizational requirements help determine a learning solution;
- Types of formal, semi-formal and informal learning methods that might form part of a learning solution;
- Strengths, weaknesses and appropriate uses of learning methods that are parts of a learning solution;
- Key components of an implementation plan.

Personnel who should demonstrate this competency
- Senior trainers;
- Instructional designers or other education specialists;
- Trainers who would benefit from an awareness of different learning solutions and the factors taken into account in choosing those solutions.

5.1 Introduction

Having identified and assessed learning needs, the next step is to decide how to satisfy them. There are many factors and many possible solutions to take into account in this process. In this chapter, we use the term "learning solution" to describe the mode of training delivery and its general structure. In the next chapter, we will discuss the design of learning activities and resources, which are the components of a solution.

Learning solutions tend to fall into three broad categories:

- *Informal learning*: learning embedded in activities not explicitly designated as part of a learning programme, so there are no specified learning outcomes. The learning is unstructured and often experiential, and is acquired by interacting with colleagues, undertaking self-study and performing tasks that serve to develop expertise. Trainers, coaches or mentors are not involved;

- *Semi-formal learning*: learning associated with ongoing activities with specified learning outcomes, but which also encourage and support learning that might go beyond the specified outcomes. Trainers are not usually directly involved, but interactions with coaches or mentors might contribute;

- *Formal learning*: learning based on a structured programme of study, which is explicitly designated as learning and has well-defined learning outcomes. The learning is acquired through, for example, participation in courses and workshops. Formal learning is usually trainer-led.

Michael Lombardo and Robert Eichinger[3] have suggested that for the development of leadership and management skills the learning components should be in the following proportion: 70% (informal), 20% (semi-formal) and 10% (formal) – this is sometimes called the 70:20:10 framework.

The 70:20:10 proportions are not prescriptive, but provide a useful framework when planning a comprehensive learning solution. It is important to remember the significant role that experiential learning (informal and semi-formal) can play. However, the proportions will depend on the individuals involved, the area of expertise being developed and the organizational learning policy.

This model should not be interpreted as indicating that learning through formal processes is unimportant. Experiential learning and self-study is only effective if it is underpinned by well-structured development of knowledge and understanding, so formal learning plays a critical role, even if learners spend less time engaged in it.

A training department should encourage and support informal and semi-formal learning as well as running formal courses. Ideally all three types of learning should be integrated into a comprehensive learning process. This means that the training department might need to guide line managers in developing strategies to facilitate experiential learning. It is likely, however, that many training departments will be mainly concerned with formal learning, perhaps with some aspects of semi-formal learning also falling within their remit.

Figure 5.1 identifies the most commonly used formal and semi-formal learning activities. Later these will be considered in more detail.

The choice of the learning solution should be guided by the organizational context and learning needs as described in Chapters 3 and 4. At times, it might be necessary to reconsider the learning needs and priorities once the resource requirements for implementing the best learning solution have been identified.

5.2 Considerations for determining learning solutions

There can be a variety of root causes of a performance gap. These can be grouped into three broad categories (see Figure 5.2):

– *Lack of competence*: for example, a forecaster might not know how to make full use of new NWP products or data from a new observing system (this could be addressed by formal or semi-formal training);

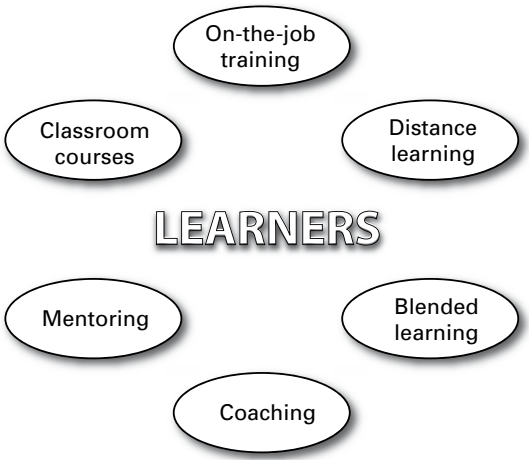


Figure 5.1. The most common formal and semi-formal learning methods

[3] Lombardo M. and R. Eichinger, 2010: *The Career Architect Development Planner*. Fifth edition. Minneapolis, Minnesota, USA, Lominger International.

– *Lack of motivation*: for example, someone could be demotivated because of concerns about career progress or uncertainty about the future (best addressed by the line manager who can understand the cause of the problem and work with the individual to find a solution);

– *Lack of environmental support*: for example, the procedures and production facilities for providing forecasting services are cumbersome and could lead to mistakes (the best solution is to redesign the procedures and production facilities).

Because training mainly addresses a lack of competence, that will now be the focus.

Normally, the prioritization of learning needs will have been addressed as part of the learning needs analysis. If that is not the case, a key consideration would be the extent to which addressing the learning needs contributes to the success of the NMHS and timely action. Furthermore, NMHSs have their own policies about how individuals gain access to learning opportunities and these policies have to be considered along with the learning culture within the NMHS.

A key consideration in determining appropriate learning solutions is the nature of the intended learning outcomes. The following gives some examples:

– If the outcome is one that a learner can demonstrate only by using task-specific technologies, such as setting up and repairing an observing station, then more direct, hands-on learning solutions are called for, under the guidance of a trainer if the task is sufficiently complex (for example, in a classroom with laboratory facilities or through on-the-job training or job aids);

– If the outcome requires the use of cognitive skills in easily replicated conditions, such as cloud identification using satellite imagery, a much wider variety of solutions are available, including classroom courses and self-paced online learning modules;

– If the outcome requires complex decision-making based upon a large number of data sources, such as generating a weather forecast, a wide range of solutions are available, but they require a level of interaction and feedback that can be offered best through trainer-led classroom learning, synchronous distance learning, or on-the-job training and mentoring;

– If the outcome is acquisition of information, such as understanding a new policy or procedural change, learning solutions might include less complex choices such as a short lecture or written documentation.

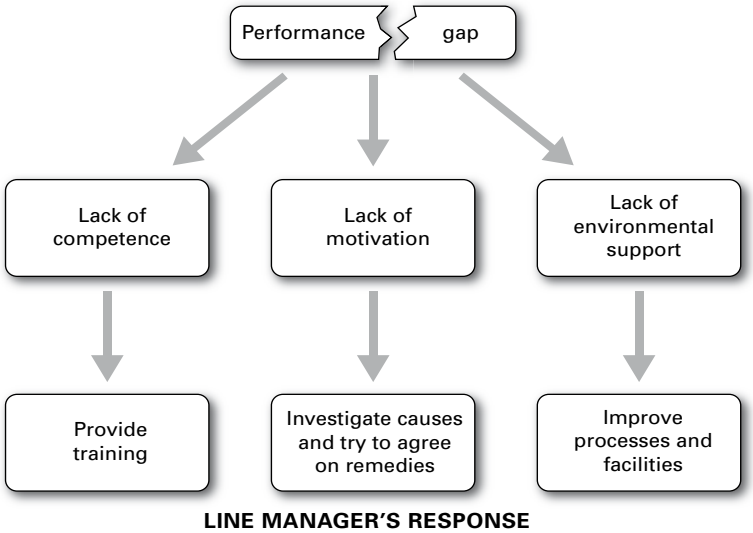


Figure 5.2. Ways in which a line manager can take action to address a gap in job performance.

In addition to the intended learning outcomes, there are a variety of other considerations to bear in mind when choosing learning solutions:

– *Are the required resources available?* There might be a capped budget for learning opportunities which will limit options for solutions. Moreover, if the training is to be delivered in-house, the availability of suitable facilities and trainers will also have to be taken into account;

– *Can the people with the learning needs be released?* This is an issue particularly for operational staff. Not only will their participation put pressure on their colleagues (unless the staffing arrangements have taken the need for professional development into account), but operational staff might also be based at stations far from the training facilities. Operational managers need to judge whether everyone can participate at the same time or staggering is required, or whether distance learning is an option;

– *How critical is it to meet the learning needs quickly and effectively?* The cost of not providing the training should also be considered, and is typically framed from an organizational risk perspective;

– *What are the characteristics of the learners?* A group of people might have similar learning needs, but the depth and range of prior learning and experience may vary. For example, a formal course might suit novice forecasters, whereas a less formal workshop or self-study might be better for highly experienced forecasters;

– *How will the success of the learning solution be evaluated?* This can determine how the solution is implemented and also, to a degree, the choice of the solution.

The rest of this chapter will focus on options for learning solutions, with a distinction being made between formal, semi-formal and informal learning.

5.3 Formal learning

Formal learning usually refers to what occurs in a classroom with a trainer, though this can include, besides lectures, other activities such as exercises, case studies, simulations, practicals and projects. Nowadays, however, distance learning can make an important contribution, even without face-to-face or live interaction with a trainer. Rather than classroom versus distance learning, a more useful distinction is between trainer-led learning (in the classroom or at a distance, in synchronous or asynchronous mode) and self-paced or self-directed learning.

5.3.1 *Classroom (face-to-face) courses*

A classroom course can be used to develop the skills or knowledge of a group of people with similar learning needs. Though this can be an efficient way of using resources when the learning is complex, or the number of learners is small, it also makes it more difficult to take into account a wide range of prior knowledge and skills, and to ensure that the pace of learning suits everyone. Classroom learning can be effective when dealing with complex or intimidating content that requires significant discussion, confidence-building and feedback for those new to a discipline, or for developing a sense of community among learners.

Many NMHSs have their own training department, but a key issue is whether the trainers have the expertise (or can call upon it) and resources, and are available to deliver the required course. Those running in-house courses should ensure that the training is tailored to satisfy specific learning needs, uses material and equipment that are familiar to the learners, and takes account of the organizational context. However, there is the risk that some learners never get away completely from their normal job, so the learning process is not fully effective. Use of external courses is an alternative.

External courses delivered by outside organizations allow learners to get away from the pressure of their normal work, but can sometimes be generic rather than tailored. If the learning need is associated with transferable skills such as management, communication or customer relations, then a generic course might be an appropriate option.

5.3.2 *Distance learning*

Distance learning is a formalized approach to learning in which the learners are far from the trainer. There are two modes of distance learning:

– *Synchronous*: all learners are involved in a learning activity at the same time, even though they are far from each other. This approach uses technologies such as webcasts, videoconferencing, teleconferencing and educational TV. In many cases, the trainer and learners can interact in a variety of ways, particularly with current web-based technologies;

– *Asynchronous*: learners access the learning material according to their own schedule and pace. A correspondence course is based on an asynchronous approach. Nowadays, a wide variety of communication technology such as DVDs and, most commonly, web-based material can be used.

Both distance-learning modes can be effective if the approach suits the learning outcomes and the activities are well designed.

While older forms of distance learning were limited in their options for interaction, recent forms provide substantial opportunities to ask questions, receive feedback and learn from other learners. Distance learning can be cost-effective especially if the learning resources are already available and relevant to the learning needs.

5.3.3 *Blended learning*

Classroom courses and distance learning have been shown to be equally effective when well designed, but some learners prefer and thrive on the face-to-face interactions with trainers and fellow learners, while others prefer the flexibility of distance learning. Blended learning combines elements and advantages of distance learning and face-to-face courses.

In blended learning, elements of distance learning and classroom courses can be combined in any proportion or sequence. The distance-learning component could be trainer-led, self-paced or collaborative, synchronous or asynchronous, and could occur at any point in the course (at the beginning, end, or periodically). Similar to college courses, distance learning could involve assignments, readings or online activities that supplement more traditional classroom courses. However, in a blended course, the classroom sessions might be devoted to practical exercises, highly interactive discussions or simulations that require more trainer attention and feedback.

5.3.4 *On-the-job training*

On-the-job training in the workplace uses the tools and facilities that are part of the job. Expertise is normally acquired through experience or instruction from a supervisor or more knowledgeable colleague. This type of training is particularly effective at developing skills and influencing behaviour. Usually, on-the-job training is aimed at specific learning outcomes that have to be satisfied before an individual is considered to be competent to work independently.

5.4 Semi-formal learning

As with formal learning, there are a number of ways in which semi-formal learning can take place.

5.4.1 ***Coaching***

Coaching is perhaps the most effective type of semi-formal learning. It is a systematic process where a more experienced person helps a learner develop expertise through a structured or semi-structured programme of guidance, feedback, demonstration or collaborative work experience, primarily to improve performance (often short-term) in a specific area of skill. While the learner has primary ownership of the learning goal, the coach has primary ownership of the coaching process.

A coach assists an individual in understanding performance and developing expertise. Coaching is particularly effective at enhancing existing skills and modifying behaviour. It can be directive – that is, telling someone what to do – or non-directive – that is, helping someone decide what to do. The latter approach involves active listening and questioning. If the existing skill level is good and improvement, rather than basic-level performance, is sought, non-directive coaching is more effective.

The main benefit of coaching is that it is tailored to meet the specific learning needs of an individual. It generates frequent and targeted feedback and allows individuals to take responsibility for their own development. But the coach needs good coaching skills and there has to be a positive relationship between coach and learner. The purpose of the coaching sessions needs to be clearly defined and planned. In many organizations, managers take responsibility for coaching their teams, but a more experienced colleague could perform that task as well.

5.4.2 ***Mentoring***

Mentoring is a process by which a respected, trusted and competent individual provides guidance and advice to help less experienced people maximize their potential, develop their skills and improve their performance, often based on a long-term relationship. The learner owns both the learning goals and the learning process.

Mentoring is similar to coaching, but the mentor tends to be a highly experienced or senior person who has no line management responsibilities for the individual being mentored. A mentor provides more general and less frequent feedback than a coach, because the mentor is consulted at the instigation of the learner.

The mentor acts as a role model and a source of advice for work and career issues rather than providing the targeted, directive guidance of a coach. But as with coaching, success depends critically on a positive relationship between the two people and their desire for a successful process. The mentor might be a colleague, especially for someone taking up a post requiring new skills. Newly trained forecasters might, for example, benefit from having a mentor when they start at an operational station, particularly after they have already had sufficient on-the-job training and have attained a functional level of competence.

5.4.3 ***Other types***

There are other forms of semi-formal learning that can be used, including the following:

– *Secondment*: moving to another part of an organization to develop the expertise and a broader understanding of the workplace to prepare for career progression;

– *Shadowing*: working alongside or with someone to develop skills or knowledge to carry out specific tasks;

– *Project work*: contributing to a project to broaden experience and develop project management skills.

5.5 Informal learning

Informal learning occurs in a variety of places, such as at home and work, and through daily interactions. It is often self-directed or unintentional and can take different forms:

– *Peer learning*: participating in a group that is supportive and shares experiences to give new perspectives and stimulate new ideas;

– *Self-study*: using self-selected learning resources to acquire skills and knowledge;

– *Practice*: developing expertise by doing the job;

– *Gaining access to corporate knowledge*: acquiring information from a knowledge management system to take advantage of the insights and experience of others;

– *Social networking*: using online applications that allow people to come together around an idea or topic of interest;

– *Social interaction*: acquiring knowledge unintentionally and perhaps without realizing it is happening, through casual or social interaction with colleagues.

5.6 Cost and resource factors

In choosing a learning solution, cost and resources are always critical factors.

Costs can be divided into two types:

– *Development costs*: those required for designing the learning event, preparing materials and developing evaluation plans;

– *Delivery costs*: those entailed in the use of facilities, trainers or facilitators, duplication of material, learners' time away from the job (opportunity costs), catering, accommodation, travel and administrative support.

For some solutions not all of these costs apply. Whether the learning activity is delivered once or repeatedly will make a big difference to the training costs per learner.

5.7 Developing an implementation plan

After determining the learning solution, which may include a variety of approaches to learning, an implementation plan should be prepared. The type of plan will depend on practices within the NMHS. However, the plan might include all or some of the following:

– *Plan context*:

  - Performance issue or changing requirements that need to be addressed

  - The benefits to the organization

  - The desired learning outcomes

– *Plan features*:

  - The planned learning opportunity, including timescale, costs and assessment of risks

  - How, when and where the learning opportunity will be provided

- Who will provide the learning opportunity
- The targeted learners and how they will be selected
- Evaluation criteria
- Roles and responsibilities of managers, trainers/facilitators and learners.

5.8 Next step

When determining learning solutions, it is important to consider the full range of solutions available and not simply make a choice based on tradition. The eventual choice of learning solution will depend critically on the learning needs – that is, what kind of knowledge, skill or behaviour needs to change – as well as the learning culture within the organization and the availability of resources.

Having chosen the solution, the next step is to design and develop the learning activities and resources.

5.9 You and your organization

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

– What constraints or considerations influence the choice of learning solution in your organization?

– Within your organization, how are learning solutions determined once a learning need has been identified?

– What are the main learning solutions used in your organization? Why do you use them? What are their strengths and limitations?

– Based on the current learning needs of your team, what would be the best learning solution and what are the reasons for that choice?

– To what extent is on-the-job training used to support other types of formal training?

– To what extent is semi-formal learning, particularly coaching and mentoring, used within your organization? What limits its use?

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.

Expert learners are	*Foster expert learners through*
– Resourceful and knowledgeable – Strategic and goal-directed – Purposeful and motivated	– Multiple means of representation (different ways of presenting content) – Multiple means of action and expression (different types of learning activities) – Multiple means of engagement (different ways of interacting with the trainer, fellow learners and the learning formats)

For more information about Universal Design for Learning go to http://www.udlcenter.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;

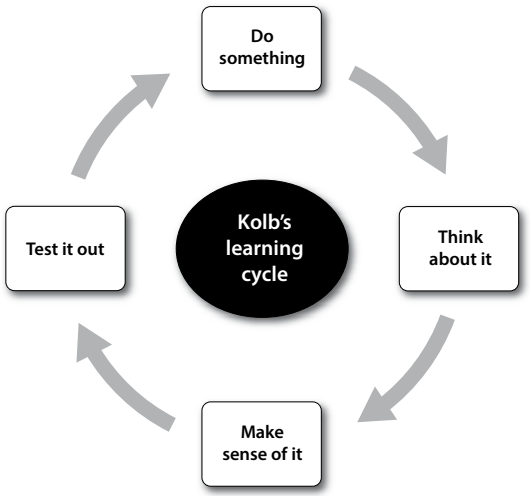
– *Tactile (kinaesthetic) learners* learn best by doing a hands-on task. Even taking notes or doodling sketches related to the content is a form of tactile learning.

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



Do something	Participate in activities	"Activists" get involved in new experiences
Think about it	Review and summarize what has taken place	"Reflectors" observe experiences from different perspectives
Make sense of it	Link and connect with previous knowledge	"Theorists" want to understand models and principles
Test it out	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[4] and builds upon the conceptual model of how people learn through experience, developed by David Kolb[5] (see Box 6.2). The assumption is that learners may have a preference for one phase of the experiential learning cycle.

Ruth Colvin Clark[6] 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

[4] Honey P. and A. Mumford, 1982: *Manual of Learning Styles*. London, P Honey.

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

[6] Colvin Clark R., 2010: *Evidence-based Training Methods: A Guide for Training Professionals*. Alexandria, Virginia, USA, ASTD Press.

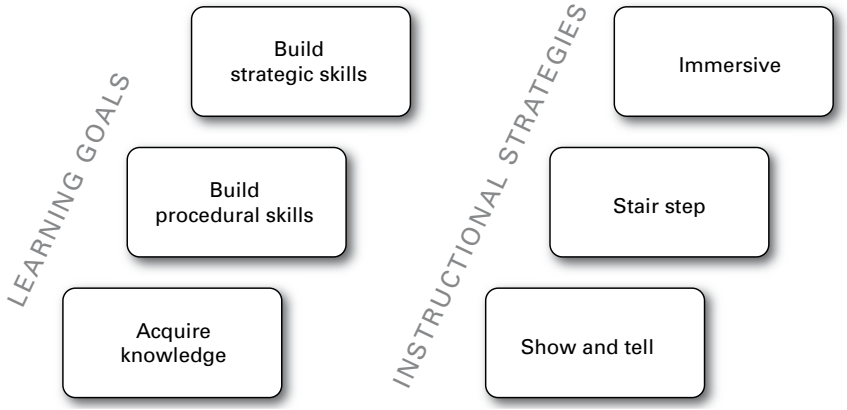


Figure 6.1. The relationship between learning goals and instructional strategies according to Colvin Clark

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 needs 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

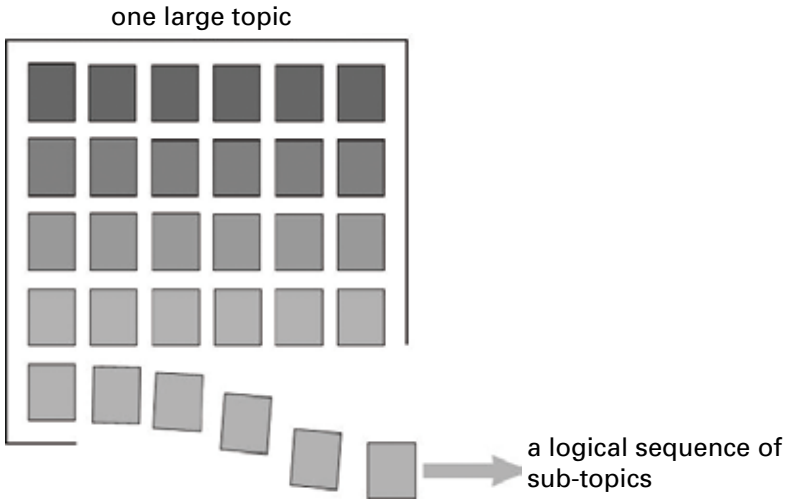


Figure 6.2. Breaking down large topics in a logical way

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[7] 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

[7] 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.

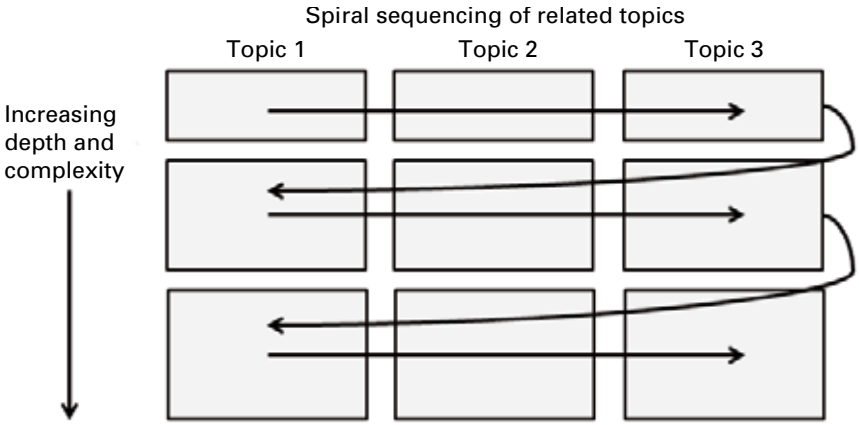


Figure 6.3. Spiral content sequencing

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[8]. 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[9] 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);

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[8] 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.

[9] 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[10] 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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[10] Merril 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[11] 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.

[11] 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

Method	*Strengths*	*Limitations*
Lecture or presentation	– Presents knowledge and facts in a quick and direct way; – Useful for large groups.	– Little learner participation or ownership; – Relies heavily on the presentation skills of the trainer.
Guest/expert lecture	– Presents specialized knowledge in an authoritative way; – Adds variety and interest.	– May include little learner participation or ownership; – Relies heavily on the presentation skills of the guest/expert.
Didactic question starting with "what," "where," "when", and "how"	– Allows learners to articulate and think about what they are learning; – Provides good opportunities for corrective feedback.	– Can take longer than direct presentation of information to cover the same content; – Trainers cannot rush to give the correct answers immediately.
Review question (or informal quiz)	– Reinforces previously covered material; – Provides focus and recall prior knowledge if used at the start of a new topic.	Can make some people feel uncomfortable, unless reassured beforehand.
Small group discussion	– Exposes people to other views and can change attitudes; – Gives everyone the opportunity to participate.	– Impaired if some people do not participate or a few dominate; – Relies heavily on the facilitation skills of the trainer to avoid loss of focus.
Demonstration	– Supports the development of skills; – Lets the learner observe an activity carried out correctly.	– May be oversimplified for practical reasons; – The demonstration may fail.
Repetitive practice	– Helps learners master critical skills that are limited in scope; – Provides many chances for self-checking and feedback.	– Can become boring if carried out too long; – Can prevent learners from seeing the more meaningful whole task they need to learn.
Brainstorming	– Engages the audience; – Encourages lateral thinking.	– Sometimes the ideas produced are unrealistic; – Relies on facilitation skills to avoid confrontation and to keep moving forward.
Role play	– Develops skills through practice; – Explores difficult situations.	– Some people might feel uncomfortable participating; – Difficult in a large group.
Simulation	– Develops skills and knowledge which can be assessed; – Exposes people to realistic work-based practices and problems.	– Complex simulations take a long time to set up and run; – Often requires setting-up workplace information sources and equipment.
Case study or exercise	– Develops analytical and problem solving skills; – Applies new knowledge and skills to a realistic situation.	– Gathering resources and preparing good materials is time consuming; – May not be relevant to the workplaces of all learners.
Project	– Develops research, analytical and problem solving skills; – Engages the learners when they choose their own topics.	– Time consuming for the learner; – Learners might require information that is not readily available.
Learner presentation	– Develops research, analytical, and organization skills; – Develops communication skills; – Allows learning from peers and exposure to many points of view and experiences.	– Takes significant class time; – Presentations can be uneven in quality.
Field trip	– Exposes individuals to real work environments or natural situations; – Can be actual or virtual.	May require considerable organization, time and costs.
Self-study or self-directed reading	– Lets the learner control the pace and learning goals; – Uses a wide variety of available material, including online resources.	– May require informed direction to achieve useful outcomes; – Not suited to people who prefer to interact with others.

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	– It's too difficult – I've always done it this way – This isn't relevant for me	– I understand this now – I can master this – These ideas are useful
Do	– I do not do it – I would do it but I don't know how – I do it, but I could improve	– I'll try it out to see if it works – I know how to do it – I know how to do it better
Feel	– Apprehensive – Reluctant to change – Opposed – Overwhelmed	– Motivated to try new things – Confident about changing – Enthusiastic – Supported

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.

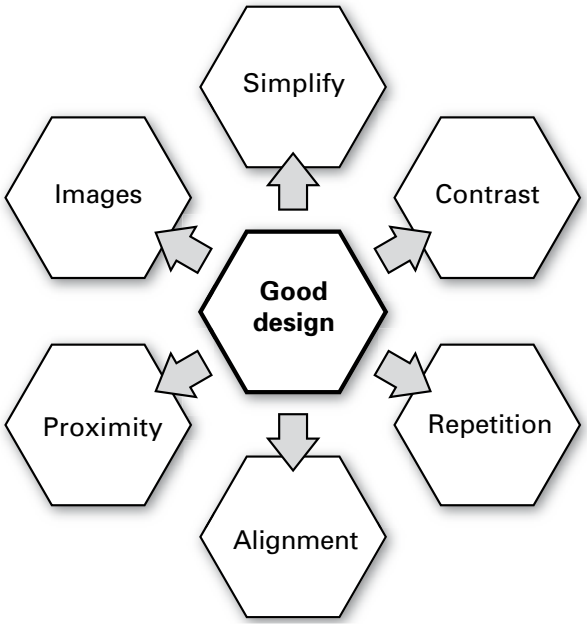

Figure 6.4. The six visual design principles

Adaptation of the four principles for visual design identified by Robin Williams[12]

[12] 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.

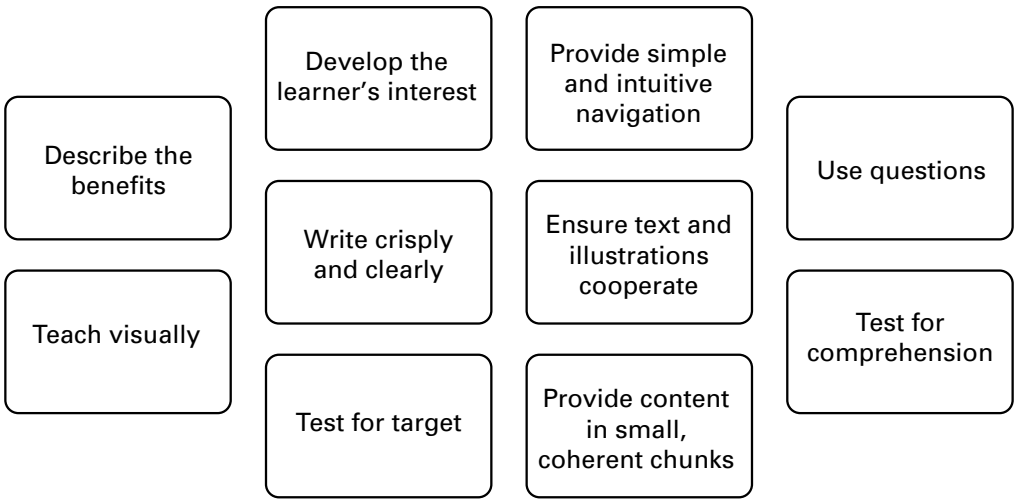

Figure 6.5. Some guidelines for preparing self-paced learning resources

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.

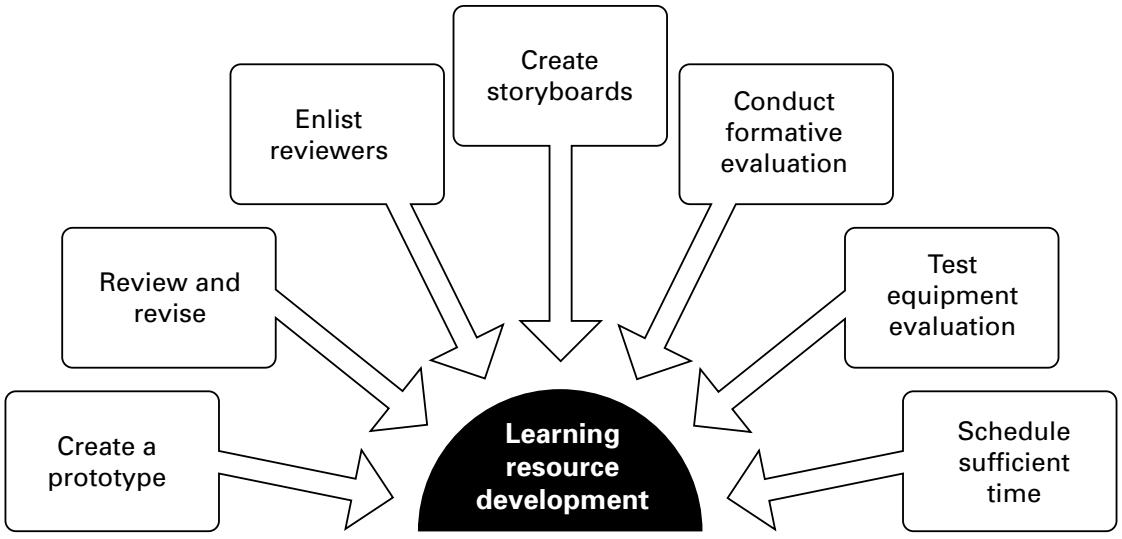

Figure 6.6. Some basic guidelines for the development of learning resources

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?

7. TRAINING DELIVERY

Competence V: Deliver training and manage the learning event

Competency description
Classroom and/or distance-learning courses are delivered in an environment that fosters and sustains learning.

Performance criteria
- Create an environment conducive to learning;
- Ensure learning activities are engaging and effective;
- Clearly communicate the purpose and expected outcomes of learning activities;
- Apply technologies that aid the learning process;
- Give feedback and manage and mitigate disruptions to learning.

Knowledge requirements
To be able to understand, explain and/or critically evaluate:
- What preparation and decisions are needed before a learning event;
- How to create an environment that supports learning;
- How to develop mutual trust and respect between trainer and learners;
- How to give presentations and conduct learning exercises;
- How to listen, question and give feedback;
- How to deal with conflict.

Personnel who should demonstrate this competency
All trainers and training managers.

7.1 Introduction

Delivering training is the culmination of much thought and effort underpinned by careful planning. For success, trainers need to ensure not only that the activities and resources they have designed are good, but that the learning environment is conducive to learning. The factors that contribute to an effective learning environment are illustrated in Figure 7.1.

An effective learning environment can be established by:

– Creating a relaxing and non-threatening atmosphere;

– Using collaborative activities to make learning meaningful and memorable;

– Appealing to multiple senses to aid stimulation and retention.

From the start, learners need to fully understand the purpose and structure of the learning activities and their role as learners in contributing to the success of the training. The information provided in advance and at the start of the learning event should set the scene and establish expectations. Learners with less background knowledge and experience, and learning outcomes that require more complex skills, will need more careful and thorough scene-setting to ensure

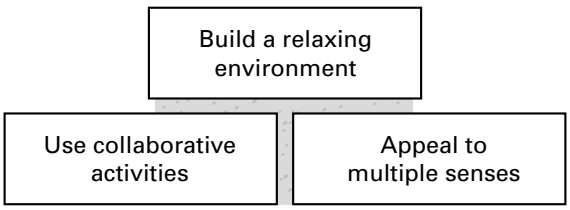

Figure 7.1. Factors contributing to an effective learning environment

learners are ready for the experience. Trainers should spend a significant portion of their total effort in pre-course planning and preparation, and in the initial days of the event. For distance-learning courses, the ratio should probably be higher than for classroom courses: up to 70% effort in pre-course and initial course activities.

Many formal learning solutions will involve a variety of learning activities, including giving presentations, using learning resources, running exercises and providing feedback. Trainers need a range of both subject matter and training knowledge and skills to apply it. Implementation of semi-formal solutions requires similar skills, but there is even more emphasis on the ability to listen, question and give feedback.

Providing relevant and high-quality learning solutions will support learning and add to the learners' enjoyment. Though enjoyment is no guarantee of learning, it is likely that deeper learning will take place if the activity is a pleasurable experience and learners become and remain engaged.

This chapter will focus on formal learning solutions, namely classroom and trainer-led distance learning, because these require the most direct and ongoing involvement of trainers. The term "learning events" will be used to refer to a range of solutions including single sessions lasting only a few hours, week-long workshops and courses lasting several months. The guidelines for classroom and distance-learning courses are similar and sometimes identical, but they are given separately to take account of existing differences.

7.2 **Before the learning event**

Learners need joining instructions before the start of a formal learning event so that they have plenty of time to prepare. Normally learners and their managers would already have accurate information about the event. However, it is wise to provide this information again as part of the joining instructions.

Learners should be clear about the knowledge, skills or behaviour that will be learned. They should be given information about the aim of the event and the key learning outcomes rather than only a description of the content. In addition, joining instructions usually include the following:

Classroom courses:

– The location of the event, how to find it and the start and end times;

– Dress code and domestic arrangements such as accommodation, meals and refreshments;

– Preparatory work required;

– The types of activity that will be undertaken;

– Equipment or resources to bring;

– Assessment and post-course expectations;

– What to do if a learner has special dietary, visual/hearing or mobility requirements;

– How to contact the organisers of the course.

Distance-learning courses:

– The schedule for live or asynchronous events;

– Information about the web-based or telecommunication tools, location of online resources and login instructions;

– Participation expectations and protocols;

– The types of activity that will be undertaken and the technologies used;

– Personal introductions of trainers and learners;

– Preparatory work required;

– Assessment and post-course expectations;

– What to do if the learner has special schedule requirements or technical difficulties: do have back-up plans and do not make room for excuses for limited participation.

7.3 Creating the right environment: facilities

It is important to create an environment in which learners feel comfortable and want to learn, and can interact in desired ways. A collaborative learning environment can be created using a managements learning system such as Moodle (see Box 7.1).

Box 7.1. Moodle: a learning management system

The philosophy behind Moodle is the creation of a collaborative learning environment in which groups, including trainers and learners, communicate and provide information from which everyone can benefit. Having learners provide information for others is a very effective way of enhancing their own learning. The Moodle environment is flexible and can quickly respond to the needs of particular groups. These can include:
– Resources such as course information, handouts, presentations, video and web links;
– Activities such as discussion forums, assignments, quizzes, wikis, and blogs.

Moodle can be thought of as the distance-learning alternative to the physical space of the classroom. It can be used as a platform for complete on-line courses or to supplement classroom courses. For more information on Moodle go to http://moodle.org/.

7.3.1 *Classroom courses*

Depending on the planned learning activities, the room should be set out in a way that supports and encourages the appropriate interaction among learners and between trainers and learners. Layout options, such as those illustrated in Figure 7.2, may be more conducive to large group discussion (U-shape, Boardroom, Group Circle), small group activities (Cabaret), or lectures (Classroom and Theatre), and should be chosen accordingly. It is also possible to change rooms or move furniture depending on the planned activity. The degree of learner-centeredness should be reflected in the classroom layout.

The seating and temperature need to be comfortable and the room should be reasonably quiet. Interruption – for example, from mobile phone calls and inattentiveness – for example, dealing with e-mails – can disrupt the learning process. Equipment should be working and ready to use, and learning resources should be available. Learners should have a clear view of the trainer's presentations and demonstrations, and be able to communicate easily with the trainer and fellow learners.

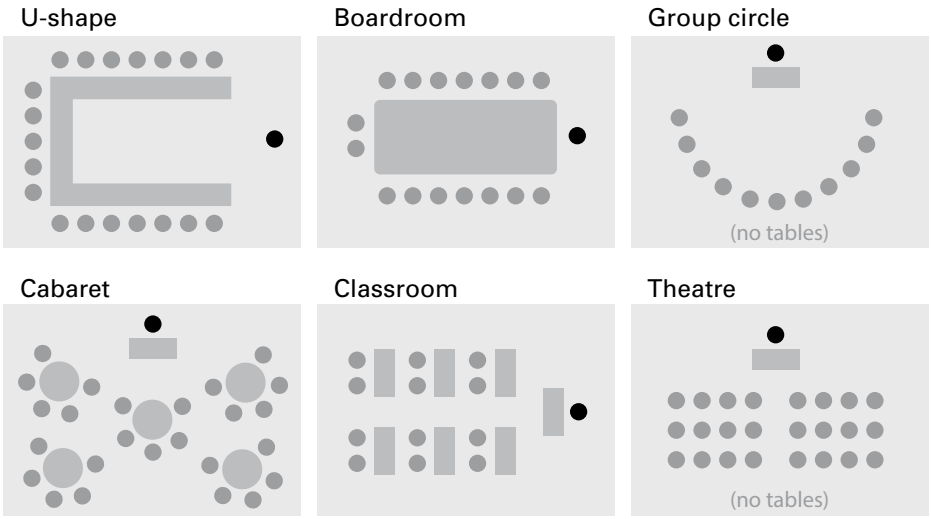

Figure 7.2. Various seating configurations that suit different purposes

Facilities for activities involving case studies, simulations and practical exercises should be set up to allow some degree of interaction and support by the trainer, at a minimum over-the-shoulder guidance. Ideally, the facilities would also provide space for collaboration between two or three learners, even if each learner can have access to a separate computer system. Hardware and software need to be thoroughly tested to avoid disruptions to the schedule.

7.3.2 *Distance-learning courses*

In distance learning, the central course website is the equivalent of the classroom. Even though there is no communal physical space, there is a communal virtual space, and it is most likely accessed via the course website. The way the site is organized and the resources it contains will be strong determining factors in the success of the course.

A distance-learning course website should be well structured, easy to navigate and easy to read. The interface should be intuitive and all the course elements and activities clearly titled and described. The structure of the website should reflect the guiding structure of the course. If the course is broken into logical units based on a series of topics, then those logical units should determine the headings under which the course content is presented. On the other hand, for a course more driven by schedule, a structure organized by the days, weeks or months of the course is probably best. The key consideration is to use whatever organization will best help learners remember the content and activities.

On the course website, provide all possible learning resources, including recordings or transcripts of lectures, learning guides to support the readings or viewings, links to discussion forums, instructions for projects and exercises, test guides and evaluation criteria, the course syllabus, links to outside resources, and anything else learners may find useful. Clearly label all of these so that they can be distinguished from one another. The more general, frequently used, or more important resources, such as the syllabus, the final assignment or the course evaluation, might be placed prominently at the top of the course website.

7.4 Creating the right environment: personal and social considerations

The behaviour and personal qualities of trainers and learners can have a profound effect on the learning environment. A few of these considerations are outlined below.

7.4.1 ***Trainers***

Trainers should show interest, confidence and enthusiasm for the subject, which help establish their credibility. By describing their own experiences and what they like about their work, trainers can provide insights for learners and help bring activities alive. Trainers should also demonstrate confidence in their training skills.

Trainers should show respect and demonstrate support for the learners: they should be prepared to learn from them as well as to teach them. There is a need to build trust so that learners will speak up, ask questions and feel comfortable about making mistakes. Sharing opinions, making mistakes and asking questions are a critical part of learning, and learners should feel comfortable doing so. Trainers should show empathy for learners, teach at the needed level and respond helpfully to questions.

The delivery style used by trainers should not distract or put off learners. Trainers may have distracting mannerisms, overuse particular words, phrases or overly technical jargon, or use poor body language – for example, not appearing confident or displaying culturally insensitive traits.

Trainers should work to develop a strong sense of community among learners. The tone for this is set at the start (see 'Beginning the event') but it is something that must be nurtured throughout. A conscious effort to build community is particularly important in distance learning, where learners have little opportunity to chat before and after class, unless it is explicitly supported. But the recommendations for building community are very similar regardless of the venue:

– Give each learner opportunities to speak and share ideas. This allows them to feel part of the class;

– Use learning activities that require cooperation and collaboration;

– Create opportunities for non-instructional interactions such as sharing personal hobbies and stories, sports events, meals together and job experiences. For distant learners, this can be done in a non-instructional discussion forum;

– Foster high-quality discussions, either in class or online, but these should be moderated so that the exchanges contain personal opinions and deep thinking whilst respecting differing views;

– Assign projects that require long-term collaboration, which can develop stronger supportive relationships;

– Ask learners to give presentations to the entire group. These can be based on project reports or a topic of interest;

– Consider creating a social networking site, such as a Facebook page, and encourage participation and sharing.

Trainers might need help and training in developing the skills required to support learners. This can be achieved through a trainer mentorship system, in which an experienced trainer offers guidance, an observer sits in a course and provides feedback to the trainer, and feedback from learners is gathered at several stages of the course.

7.4.2 ***Learners***

Frequently, learners need assistance in overcoming barriers to their success. Some learners might lack motivation – perhaps, attending the course was not their decision – or confidence in their ability to learn new things. Trainers should look for opportunities to understand individual values and interests, to be encouraging and acknowledge success. Some learners might have difficulty

working in groups, while others could have difficulty managing their independent learning responsibilities, particularly in distance-learning courses. Significant difficulties might require individual facilitation and coaching, but all learners could benefit from trainers who provide motivation, foster confidence and help them to develop good learning habits.

Of course, some learners may lack the required prior knowledge and skills, or even the capacity to benefit from the course. These are not personality issues and require careful handling by trainers. A decision has to be made whether to provide or recommend remedial learning or to ask the learner to discontinue participation in the event.

Even if the learning needs have been carefully identified, and the solutions and activities have been chosen well, there might still be a mismatch between the learning outcomes for the course and the learning needs of some of the learners, or between the chosen learning solutions and activities and learners' expectations or desires. Some course content might be less relevant to learners working in environments different from those anticipated. Trainers, therefore, should develop a supportive attitude towards learners and be willing to modify activities when they are too difficult or do not correspond to learners' needs. Where this would be too time consuming and disruptive, or serve only a few individuals, trainers need to ask learners to be flexible and to try and gain from the experience at their level, or to find a study partner for collaborative study.

7.5 Beginning the event

It is important to make learners feel comfortable amongst what will often be a lot of strangers. If the group is sufficiently small then people can introduce themselves thoroughly. They might talk about their background, job, leisure interests and what they would like to get from the event or how they hope to use it. A very large group might have to be split into smaller groups for successful introductions, or introductions will need to be shorter and combined with other team-building activities.

"Icebreakers" are sometimes used to get learners to mix and learn more about each other. Ideally, they should be informal, non-threatening, short (5 to 10 minutes) and related to the subject of the learning event. At the end of the icebreaker, learners should feel more relaxed and ready to participate. A variety of ideas for icebreakers, for both classroom and distance learning, can easily be found by doing a quick internet search on icebreakers for training events.

As well as welcoming learners and asking them to introduce themselves, at the beginning of a learning event, trainers need to communicate important course logistics, even if they were presented before the event began. They should also outline again the aims and key learning outcomes of the event and how it will be structured. Workplace learners like to know from the start what is planned and should be given the opportunity to ask questions about the event.

Even after introductions and icebreakers, learners will likely know little about each other, so a team-building activity may help create a group in which participants trust one another, are willing to share questions and concerns, and can work together toward common goals. The challenge of building a team is different for classroom and distance learning courses.

7.5.1 *Classroom courses*

In the classroom, team building can occur in the course of repeated meetings and class activities, but trainers sometimes forget to give it the attention it deserves. In addition to introductions, icebreakers and orientation, it is useful to devote a good portion of the first session to discussing individual learning goals, backgrounds and experience in similar courses. Having learners report about their work and workplaces will help everyone understand the context from which they will be approaching the event. Learners might also help each other in recalling important prior knowledge by talking about their experience on the job or in training related to the goals of the event.

7.5.2 *Distance-learning courses*

Due to the remoteness of distance learning, team building can be more difficult and this is something that must be attended to from the start. Distance learners can quickly feel lonely if there are not enough opportunities and reasons to interact at a distance. There are many tools available for facilitating such interactions, including discussion forums, blogs, wikis and the personal profile pages of a course management system.

Distance-learning communication tools can be used to carry out the same team-building activities recommended for classroom courses, such as having learners report about their workplaces and work experiences. In addition, trainers might also want to try to incorporate other activities:

– *Non-instructional activities* create the opportunity for interaction outside the pressures of the course (for example, a project to develop a social networking site that is not course-related, or hosting an "online café" for sharing favourite new movies, music, sports, news or other things from daily life);

– *Personal profiles* encourage learners to share both professional and personal information using the personal profile pages on the course management system. Trainers should lead by example;

– *Group projects* teach learners about collaboration tools like those within a course management system, which are available as online applications;

– *High-quality discussions* aim to create a safe and stimulating environment for learners by engaging them in discussion forums and live events. Some tools for facilitating interaction are described in Box 7.2.

7.6 Delivery modes

The role the trainer assumes will determine the choice of the primary delivery mode. One can view trainer roles as falling within three main categories:

– *Lecturing role*: the lecturer presents information that helps learners acquire knowledge, primarily passively;

– *Training role*: the trainer delivers information that learners use, under his/her direction, in activities aimed at enhancing knowledge or developing skills;

– *Facilitating role*: the facilitator supports learners who learn in primarily self-directed activities, building upon their existing knowledge and skills.

The role chosen determines the level of engagement and participation of the learners.

During a particular learning event, the trainer can take on all three roles at various times, and the delivery mode can move from lecture to training to self-directed learning. For example, during a lecture, a trainer could use questions and audience interaction techniques to make the lecture more active, thus taking on also a training role. If, during training, a trainer consciously provides less information up front and allows learners to research on their own the information they require for completing their activities, he/she is acting more in a facilitating role. The key is to adopt the best role to suit the required learning outcomes whilst retaining variety to enhance learning.

7.7 Giving presentations

Presentation delivery should not be taken for granted, because even a well-designed presentation (as described in chapter 6) can fail if the learners do not become engaged. Engagement with

Box 7.2. Distance-learning tools to facilitate interaction

Advances in technology continue to increase the effectiveness of distance learning, with the development of more sophisticated tools for real-time conferencing, as well as asynchronous tools for extended online interactions. The following are some of the most popular tools used by successful online trainers:

Live online learning tools
Online meeting and Webinar software provide ways to interact in real time with learners, offering the possibility to share presentations and whatever application can be opened on the computer. In addition to web-based voice communication (VoIP: voice over Internet Protocol), many also allow live, text-based chats with individual or multiple learners. Most offer the possibility to interact with learners in a way that replicates what trainers feel are the advantages of live instruction.

Discussion forums
Forums create the possibility for asynchronous discussions, just like those that occur in the classroom, but written and carried out over time. They provide the opportunity for structured dialogue that can lead to shared ideas or highlight differences of opinion. Unlike classroom discussions, the contents can be preserved for later rereading.

Wikis
Wikis are used to build documents collaboratively. They are public projects, different from discussion forums in that their goal is to build a lasting resource with the input of everyone in the collaborating group. A Wiki can be used for a group report, a brainstorming session or a collaborative planning forum. It might also be shared with many others who are not helping to build it.

Blogs
Learning blogs are individual writings from learners about their learning experience, ideas on or attitudes toward the content, and changes in their attitude over time. They provide opportunities for reflecting on and sharing of personal impressions. They can be publicly shared or restricted to certain groups. Most blogs also allow readers to contribute comments, but they are not as interactive, or meant as much for true discussion, as a discussion forum.

For additional information on this topic, visit the Education and Training Resources section of the WMO/ETR website at http://training.wmo.int.

learners needs to be authentic, relevant and non-threatening. The aim is to build relationships and promote learning. Presenters can achieve this by asking questions, getting a show of hands about a topic or pausing the presentation to have learners discuss something with their neighbours.

The presenter supports engagement by having a positive and enthusiastic attitude, open demeanour and a willingness to interact with the audience – for example, by being an active listener and providing helpful responses to questions. Even things as simple as maintaining eye contact and speaking in a conversational manner, using first- and second-person voice, and polite, personal phrasing, can be critical to successfully engaging learners and encouraging them to think about what they are being told.

Trainers will give a better presentation if they speak clearly and without distracting verbal or physical mannerisms. But a reasonable amount of moving around, using the physical space in the room, and being animated can help retain the attention of the audience. Beware of speaking too fast, using jargon and not fully explaining important content.

Research has shown that it is almost impossible for a learner to absorb what is being said and to read at the same time. This is because written words are processed in the same part of the brain as spoken words. However, the brain is able to process verbal and visual information at the same time. So presenters should use a minimum of text accompanying slides, but should provide graphics and images to support the spoken content.

The guidance for distance-learning presentations is nearly identical, but additional considerations are covered in the document available at the Education and Training Resources section of the WMO/ETR website at http://training.wmo.int. The eLearning Guild offers a free handbook on

synchronous e-learning at http://www.elearningguild.com/publications/index.cfm?id=6&from=content&mode=filter&source=publications&showpage=2.

7.8 Learning exercises

For any exercise that requires their active involvement, learners need to:

– Understand the purpose of the exercise and how it addresses the learning outcomes;

– Receive clear instructions about how to carry out the exercise, the time available and what they are expected to have produced or achieved at the end;

– Have the materials and equipment to carry out the exercise.

If the exercise involves group work, the trainer should decide beforehand how the groups will be formed (for example, randomly or based on some common characteristics).

Soon after the exercise starts, the trainer should check that the groups are clear about what they are supposed to do. After that, it is best to just monitor progress without getting closely involved unless a problem occurs.

At the end, the trainer should address publicly what each of the various groups or individuals have prepared, or at least allow each group the option to offer their results. All participants must feel that their efforts have been worthwhile. Any significant differences in what the groups or individuals have produced should be discussed. If there is a "correct" solution, the trainer should explain it and lead a discussion on why different solutions might have been proposed. This feedback will point out common misconceptions or challenges to understanding and help everyone learn from the efforts of others. Sometimes a group will identify an unexpected issue that is not the focus of the session; the trainer should try to anticipate this eventuality and have a plan for how to address such issues at a later time, or offer additional resources.

7.9 Listening and questioning

Dialogue has often been said to be the heart of learning[13]. Trainers should consider the interactions with learners, rather than the presentation of information, as the key to effective training. Even quality self-paced distance learning should generate a form of dialogue through the use of questions and exercises with feedback.

Before learning is complete, learners need to test and solidify their growing knowledge by explaining it in their own words. Trainers should listen carefully to what learners are saying to enhance their engagement as well as to gauge whether the required learning has taken place. Responding thoughtfully to what has been said indicates that the views and comments of learners are valued, which in turn builds trust. This approach is often referred to as "active listening". But a thoughtful response also provides the feedback loop critical to guiding learners toward productive learning. In general, learning is an active process that comes about through interactions, and conversations have an important role to play (see Box 7.3).

Hearing (using the senses) and listening (using the mind) are not the same. Active listening can be demonstrated to learners by:

– Using a positive facial expression (for example, nodding and smiling), having good eye contact (though not in all cultures) and avoiding distracting mannerisms;

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[13] Laurillard D., 1993: *Rethinking University Teaching: A Framework for the Effective Use of Educational Technology*. London, Routledge.

Box 7.3. The role of conversations

An examination of the work of some learning theorists has identified several ways in which active conversations between trainers and learners can support learning.

Trainers should:
- Encourage learners to talk, write or use other forms of expression to articulate their knowledge about the subject matter;
- Provide substantial feedback to learners' attempts at expressing what they know;
- Encourage learners to tell stories of their relevant experiences; trainers should also tell their own;
- Avoid providing definitive answers to learners until they have had a chance to articulate their own thinking;
- Encourage learners to work outside their comfort zones;
- Create a supportive environment where learners can express themselves without fear of embarrassment;
- Challenge learners to think deeply about content through active and probing conversation;
- Prepare learners to be conversant about the discipline by offering them practice in conversing about it.

– Using confirming statements, paraphrasing what has been said and asking if your understanding is correct;

– Being patient;

– Taking action in response to what has been said.

There might be signs that someone wants to say something, but for some reason does not, maybe because others are more vocal. The trainer can encourage the reluctant speaker, though care needs to be taken not to force someone to speak and thus break his/her trust.

Questioning skills are as important as active listening skills. There are three basic types of questions:

– *Open questions* require answers of more than one word and are aimed at getting general information showing what learners are thinking. They often start with "What", "How" or "Why";

– *Probing questions* follow up answers that have already been given – for example, by checking understanding or extending learning – and sharpen the focus. They often start with "Tell me more about…", "Why was that" or "What then";

– *Closed questions* require a one-word answer aimed at getting specific information. They might start with "When", "Where", "Who" or "How many".

All three types would normally be used in a session: open questions to check for depth of learning or to understand perspectives (for example, "Describe a time when…" or "Explain why you think that…"), probing questions to learn more (for example, "Tell me more about…") and a closed question to check understanding (for example, "So you are saying that…").

7.10 Giving feedback

Usually, providing feedback immediately enhances learning. It is particularly useful for developing skills and changing behaviour. Feedback (using the acronym BOOST) should be:

– *Balanced*: describe both what went well and where improvements could be made;

– *Observed*: only include information based on what has been directly observed and only deal with shortcomings over which the person receiving feedback has some control;

– *Objective*: ensure that there is no personal bias and that the feedback is related to the learning outcomes;

– *Specific*: Give specific examples rather than general statements;

– *Timely*: Provide feedback at an appropriate time during learning activities.

Research has shown that for complex tasks, such as making a weather forecast, delaying feedback until immediately before the next attempt, rather than giving it immediately after a failed attempt, offers a better teachable moment for improvement. Delayed feedback following stressful end-of-course assessments has also been shown to be effective.

When giving feedback to learners, it is important to take into account the cultural, organizational and hierarchical mix of the group, the context of the session and the content of the feedback. The trainer should give feedback in a supportive and positive way, ensuring that the learner understands what is being said. The learner might disagree with the feedback but, as long as it is evidence-based and related to the learning outcomes, the trainer has a sound basis for the views being presented.

When giving feedback, it is usually better to start with asking about the learner's own perception of their performance – what went well and what did not. Frequently, this will lead to the individual identifying what needs to be improved, perhaps in more detail than the trainer is able to do. The discussion can then go on to what can be done to help that improvement take place. At the end of the feedback session, it is worthwhile asking the learner to summarize what has been learnt from the feedback.

Giving feedback in distance-learning environments can be more challenging if it is sensitive and negative. Distance-learning trainers should take special care in being specific and objective, and using good communication skills. Because e-mail can sometimes result in ambiguity, live conversation via the phone or Internet may be best in many cases.

7.11 Dealing with conflict

During the learning event, conflict or disruptive behaviour can arise, indicated by strongly voiced disagreement, body language, disengagement or lack of respect. Even if only one person is involved, it can have an adverse effect on the whole group. The trainer needs to recognize that there is a problem and do something about it.

The conflict might be rooted in the learning activity itself; for example, there might be something wrong with the material or pace of delivery. In that case, bringing the issue into the open and discussing it can lead to a resolution that benefits everyone.

If a personality conflict arises, it can either be dealt with by raising the issue with the whole group or separately with the individual or individuals responsible for the disruptive behaviour. Whichever approach is taken, the trainer needs first to clarify what is causing the problem, which might require some probing. Throughout the discussion the trainer must show respect to those raising concerns and listen carefully. Holding different views is not unusual or unreasonable, but everyone will benefit from resolving disruptive differences in a way that everyone finds acceptable; it is better to avoid having winners and losers. However, do not agree to something just to make the matter go away.

7.12 Next step

Using a range of learning methods, creating a community of learners, engaging with the learners and ensuring all components of the activity are of high quality will help make the learning activity enjoyable. But the activity will only have been successful if the required

learning has taken place and has enhanced some aspect of job performance or career development. To find out whether this has been achieved, one has to assess learners and evaluate the impact of the learning activity.

7.13 You and your organization

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

– How do face-to-face and distance-learning training differ in terms of training delivery? In what ways are they the same?

– Think about your best and worst training experiences: what delivery elements affected those experiences?

– What do you consider to be the top ten features of good training delivery and to what extent do you incorporate those features into your training?

– What are the main barriers to learning in your organization and what can be done to overcome them?

– What do you do before a learning event to engage with the learners and make the learning event a success?

– How could you improve the learning environment within your organization or within your own courses?

– In what circumstances do you use the lecturing, training and facilitating roles?

– What can you do to improve your listening and questioning skills?

– When do you use feedback as part of the training process?

– How do you deal with conflict and those who contribute too much or too little in a training event?

8. LEARNING EVALUATION

Competence VI: Assess learning and evaluate the learning process

Competency description
Learning is assessed against the required learning outcomes, and training activities, events and programmes are monitored and evaluated to improve learning processes.

Performance criteria
- Provide clear assessment policies and guidelines;
- Use formative assessment to promote deep learning;
- Assess learning against specified performance outcomes;
- Collate, analyse and use data on all aspects of the training;
- Evaluate training at the required level using established models;
- Improve training on the basis of the results of the evaluation.

Knowledge requirements
To be able to understand, explain and/or critically evaluate:
- Purposes and characteristics of assessment and evaluation;
- Advantages and limitations of assessment strategies;
- How to design good assessment items;
- Application of the Kirkpatrick Model and/or other models of evaluation;
- How to conduct the evaluation process;
- How to evaluate a training department and training programmes.

Personnel who should demonstrate this competency
- Training managers and senior trainers;
- Trainers involved in assessment procedures;
- Managers of staff identified as having a learning need;
- Human resources personnel.

8.1 Introduction

To find out whether it has benefited from investing in a learning activity, an organization needs to evaluate whether the knowledge, skills or behaviour of the participants have changed in a way that enhances job performance or career development. The evaluation process should extend beyond the trainers and learners to involve also the stakeholders, who must support the learning enterprise. Enhancing the learning process should be a shared responsibility.

8.2 Assessment and evaluation

The concepts of assessment and evaluation tend to overlap and, in some languages, there is no difference between them. In the context of learning activities, the terms will be used to mean the following:

– *Assessment*: a way of measuring what individuals have learnt as a result of a learning activity – for example, by testing a learner's knowledge, skill or behaviour – or of determining current knowledge or competency. The assessment should be based upon the objectives of the learning situation or job requirements;

– *Evaluation*: a way of measuring the worth of providing a learning opportunity – for example, by judging whether the learning opportunity met its objectives, made a difference to the organization or was good value for money – with the aim of improving the learning process.

Though there are differences between assessment and evaluation, they are intimately linked because a full evaluation has to include information on what the individuals have learnt.

8.2.1 ***Assessment: basic concepts***

Assessments can be used for a variety of purposes, including recruitment, identifying learning needs, performance management and certifying competency.

An assessment may be categorized according to when it occurs in relation to a learning event:

– *Initial assessment*: identifying the existing knowledge and skills of individuals to decide which type of learning would be most suitable for them. This also provides a basis for assessing the resulting gain in knowledge and skills;

– *Formative assessment*: gathering information during training to provide feedback to both learners and trainers about progress and to identify any alterations that might be required. A formative assessment allows the trainer and learner to monitor progress, thus reducing the chance of failure at the final (i.e. summative) stage;

– *Summative assessment*: determining the knowledge and skills acquired, in terms of the learning outcomes, or the gain in learning since the initial assessment.

An assessment may also be categorized according to an external standard:

– *Criterion-referenced assessment*: compares the learning of individuals with a standard, such as job competencies, or specified learning outcomes (an absolute measure);

– *Norm-referenced assessment*: compares the learning of individuals and ranks the learners (a relative measure). A norm-referenced assessment only works with a large number of learners.

Assessments are used as a basis for making judgements, some of which may be crucial for the learners being assessed; for example, they might control career progression or have a significant influence on job satisfaction. They therefore need to be reliable and valid:

– *Reliability*: the extent to which an assessment process yields consistent results each time it is used in similar circumstances;

– *Validity*: the extent to which an assessment process measures what it claims to measure. Internal validation is concerned with assessing whether learners have met the required learning outcomes; external validation determines with whether the learning outcomes were based on an accurate assessment of the learning needs.

Assessment processes also need to be administratively workable and consistent with any professional, functional and status-related expectations (see Figure 8.1).

Consideration will now be given to the evaluation process. Ways of carrying out assessments will be described in the context of evaluating learning activities.

8.2.2 ***Purpose of evaluation***

Evaluation is an important part of the learning cycle. It can provide information about:

– Ways of improving the delivery of learning activities by asking questions such as “were the learning methods appropriate” and “was the content relevant?”;

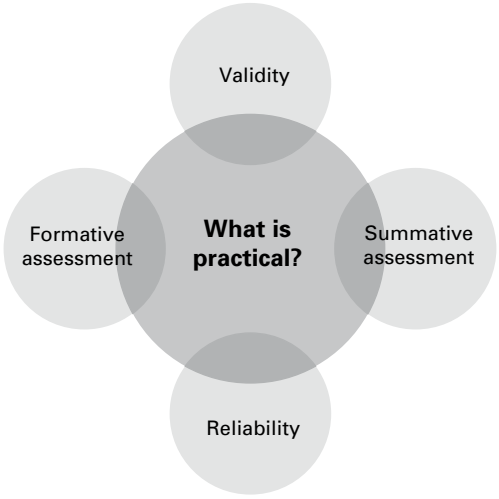

Figure 8.1. The type of assessment chosen and the need for reliability and validity will determine what is practical.

– Whether the organization benefited from its investment by asking questions such as "were learning outcomes satisfied?" and "has job performance improved?".

A full and frank evaluation improves learning activities, engages learners and their line managers, enhances the credibility of training, and provides evidence of the value of learning events and programmes for the organization.

According to Mark Easterby-Smith,[14] the purpose of evaluation can be specified as follows:

– *Proving*: demonstrating to stakeholders that positive outcomes have resulted from training and development;

– *Improving*: identifying how training processes can be improved;

– *Learning*: providing feedback to support individual learning;

– *Controlling*: ensuring that training is being delivered according to agreed procedures and requirements.

Evaluation is only effective if the results are communicated to all the stakeholders and any concerns are promptly acted upon.

8.3 The Kirkpatrick model

A widely used approach to evaluation is the Kirkpatrick model which proposes four levels of evaluation (see Figure 8.2):

– *Level 1: Reaction*. Are learners satisfied with the learning activities?

– *Level 2: Learning*. Have the required changes in knowledge, skills and behaviour been achieved?

– *Level 3: Transfer*. Have the knowledge, skills and behaviour acquired through the learning activities improved job performance?

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[14] Easterby-Smith M., 1994: *Evaluating Management Development, Training and Education*. Brookfield, Vermont, USA, Gower.

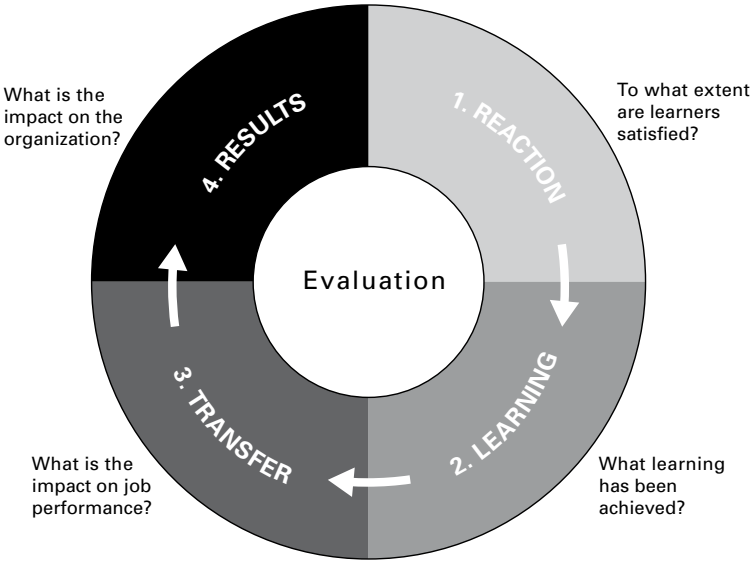

Figure 8.2. The four levels of evaluation of the Kirkpatrick model

– *Level 4: Results*. Has the learning had an impact on the performance of the organization?

An organization can use various techniques to evaluate these four levels. An evaluation process might incorporate techniques that provide information about several levels at once.

Level 1: Reaction

Finding out about the satisfaction of learners gives the trainer feedback on how to improve the learning process, administration, facilities and domestic arrangements. Seeking their views, gives learners a role in the learning process and in making it better.

Feedback may not reflect the true feelings of some learners: they may, for example, give a high rating to avoid offending anyone, or a low rating because they were unwilling participants. Ratings can be subjective and influenced by a variety of factors, for example, an opinion about one part of an activity can rub off onto others.

Reaction questionnaires (sometimes referred to as "happy sheets") are the most common tool for gaining information, especially because they are easy to prepare. They often cover:

– *Content*: was it relevant? Were there omissions or any unrelated material?

– *Learning methods and materials*: were the learning methods and materials suitable?

– *Length, structure and pace*: were the length, structure and pace of the learning event okay?

– *Learning outcomes*: were the learning outcomes clearly defined and satisfied?

– *Trainer's skills*: did the trainers have the required knowledge and skills?

– *Learning transfer*: how much of the learning will be used in the workplace?

– *Facilities and domestic arrangements*: were these satisfactory?

– *Administrative arrangements*: did participants get the information they needed?

In addition, questionnaires usually include an overall rating for the activity. Box 8.1 outlines the main types of question that might be used in questionnaires.

Box 8.1. Questionnaires

Unjustified questions
(a) The session was:

Useful								
False	1	2	3	4	5	6	7	True
Interesting								
False	1	2	3	4	5	6	7	True

(b) I found the session to be:

Useless	1	2	3	4	5	6	7	Useful
Uninteresting	1	2	3	4	5	6	7	Interesting

(c) How useful was the session? Useless, not very useful, useful, very useful, extremely useful (circle one).

Justified questions
As a result of the session:

I learnt little	1	2	3	4	5	6	7	I learnt a lot

If you chose 4, 5, 6 or 7, please state why you gave that rating. If you chose 1, 2 or 3, please state what aspects you did learn.

Open questions
Which part of the session did you find most useful? Why?
Which part of the session did you find least useful? Why?

Blank sheet
Please provide comments about the session or anything related to it. Be as open as you can, and be specific.

It may be worthwhile having separate questionnaires on the learning aspects and on the organization of the event, that is, facilities, domestic and administrative arrangements. Separate questionnaires may help learners differentiate more easily between their levels of satisfaction with those two aspects.

Questionnaires should be easy to understand, attractive in appearance and short. They should include space for comments and suggestions to augment the data from ticked boxes or ratings.

Web-based questionnaires are becoming more common. They provide easily adaptable templates for questionnaires and analysis of results that is mostly automatic.

For a training event or programme that lasts a long time, such as an initial forecasting course, it might be worth issuing questionnaires throughout as well as at the end of the event. The final questionnaire could be distributed a day or so before the end so that the results can be analysed and discussed with the learners before everyone departs. This would clearly demonstrate that the views of the learners are valued.

Apart from questionnaires, information about learners' reaction can be gathered through a general critique session towards the end of a learning event. This allows all participants to put forward their views and the trainer to respond to any comments or suggestions. There is, however, a danger that the session becomes dominated by a few people or just focuses on areas of discontent. Blogs maintained by learners during the activity can also provide useful feedback throughout an event.

Another way of collecting information is to interview – either by telephone/teleconference or face-to-face – some of the learners or a focus group after the activity. The interviewer would use open questions similar to those in the questionnaire and also probing questions.

Once the information has been gathered, the evaluator needs to analyse the results and ensure action is taken in response to the feedback, if necessary. Note that a high level of satisfaction is no guarantee that the required learning has taken place.

Level 2: Learning

The next step is to find out if changes in knowledge, skills and behaviour have been achieved. Recall that jobs require the following kinds of learning:

– *Knowledge*: the information and understanding someone needs to perform the job;

– *Skill*: what someone has to be able to do on the job;

– *Behaviour*: how people should conduct themselves on the job.

These should be evaluated differently. It is also worth remembering that knowledge and skills requirements can each cover a broad spectrum. For example:

– Knowledge can be recalled, applied in new situations or used to solve problems;

– Skills can be rehearsed, applied in a new context or used in a creative way.

When developing ways of assessing learning, it is necessary to decide what is relevant and to ensure that the assessment covers either all or a reasonable selection of the learning outcomes.

Some of the issues that should be considered when assessing learning are listed in Box 8.2.

Box 8.2. What trainers should ask about any assessment

– What level of assessment is really required?
– What do I want to know and what will I do with it?
– How much time and effort will be involved? Is it worth that effort?
– Who is the information for and why do they need it?
– Am I using the correct kind of assessment?
– Are my questions or instructions simple, direct and unambiguous?
– Do my questions cover an appropriate range of topics?
– Has the assessment been peer-reviewed?

Knowledge

The level of knowledge is usually determined by the use of tests. These fall into two broad categories:

– *Objective tests* contain yes/no or multi-choice questions that test knowledge of facts, regulations and procedures most easily (see Box 8.3). But objective questions can also be designed to measure aspects of learning at higher levels of Bloom's taxonomy (see Table 4.1), such as application, analysis and evaluation, though this is not as straightforward as assessing knowledge. Objective tests can often be web-based;

– *Subjective tests* include open questions, essays, oral questioning, interviews or case studies, which test knowledge and application of complex concepts. Marking these tests is, however, time consuming even if there is a well-defined marking scheme.

Box 8.3. Examples of objective tests of knowledge and skill

Multiple-choice questions
Which parameter is conserved during unsaturated adiabatic ascent?
(a) Dew point temperature
(b) Potential temperature
(c) Temperature
(d) Relative humidity

Which parameters are conserved during unsaturated adiabatic ascent?
(a) Dew point temperature
(b) Potential temperature
(c) Temperature
(d) Relative humidity

Analyse the accompanying satellite image and Numerical Weather Prediction (NWP) product and select those areas of highest concern for heavy precipitation. (Select all that apply)
(a) Area A
(b) Area B
(c) Area C
(d) Area D
(e) Area E

Advice: use simple, clear language, avoid negatives and words that give a lead, ensure that choices are of a similar length, vary the position of the correct answer and keep questions independent.

True/false and binary questions
The humidity mixing ratio is conserved during unsaturated adiabatic ascent.

True False

Is the humidity mixing ratio conserved during unsaturated adiabatic ascent?

Yes No

Advice: use simple, clear language, avoid negatives and words that give a lead, and keep questions independent.

Questions requiring short or selected answers
During unsaturated adiabatic ascent……is conserved.

Snow cover can inhibit fog when the boundary layer moisture is … … … (deep, shallow, or mixed) and radiative processes are … … … (dominant, negligent, or absent).

Advice: keep the blank space towards the end of the question or statement, leave the same space for each answer and, for a numerical answer, indicate the required units.

Skills

The acquisition of skills is usually best assessed through exercises, direct observation or role playing. For example, complex skills associated with synoptic analysis and forecasting could be assessed using exercises based on case studies or real-time data (possibly employing the workstation used by forecasters). Alternatively, a trainer could watch someone carry out a task and ask questions about what is being done and why. A similar approach could be used to assess meteorological observing skills. These examples illustrate that it may be desirable to

combine the assessment of skills, behaviour and underlying knowledge to achieve higher assessment validity.

The assessment of complex skills tends to be time consuming because it is most effective when carried out on a one-to-one basis. Assessors should record evidence of skills as they are demonstrated to ensure some objectivity and to give immediate feedback.

Behaviour

Assessing behaviour is much more difficult than assessing knowledge and skill. The workplace, or a simulation of the workplace, is probably the best location for directly observing and assessing behaviour.

In some cases, role playing can be used, but it needs to be carefully prepared and managed. To observe how someone behaves naturally, the trainer should not leave the participants time to think about what behaviour they are expected to display, so that they are less likely to modify their natural inclinations. Developing a good role-play exercise or simulation is time consuming and resource-intensive.

Another way of assessing behaviour is to use a survey designed to measure likely responses to situations, asking participants to complete it before and after the learning event. Alternatively, interviews could be used. In both cases, however, the assessment is based on a hypothetical situation and written or verbal response rather than observed behaviour in work situations.

Level 3: Transfer

Unfortunately, just because something has been learnt it does not mean that it will be used to improve performance on the job. Organizations should, therefore, assess whether learning is being put into practice. Some of the actions that support the transfer of learning into enhanced job performance are given in Box 8.4.

There are, however, other factors, apart from the level of newly acquired knowledge, skills and behaviour, which can influence the transfer of learning into improved performance:

– *Support*: the level of support, for example, through coaching given by the line manager and the learner's colleagues;

– *Practice*: the time available to practice new skills and behaviour, and to reflect on and assimilate newly acquired knowledge;

– *Culture*: the expectations of the organization and rewards offered for improved performance;

– *Infrastructure*: the availability of information technology or other infrastructural support.

Despite these complicating factors, the assessment of job performance provides valuable information about the overall impact of a learning activity.

There are basically three ways of assessing the impact of a learning activity on job performance:

– *Direct observation*, which could be carried out by the line manager or an external assessor, preferably using a structured form to record evidence. This approach is similar to the one used to assess skills. The assessment could be treated as part of the normal performance management process;

– *Questionnaires*, which could be completed by the learner, the learner's manager or both. They could contain questions about the application on the job of the newly acquired knowledge, skills and behaviour, and related issues, such as their utility or barriers to their use that have hindered job performance. Questionnaires could be part of an organization's routine performance management process;

– *Interviews*, which would normally be face-to-face or over the telephone, with someone from training doing the interviewing and recording the results. Both learners and managers could be interviewed.

Whichever approach is taken, there is a need to collate the results and draw conclusions. For example, if the impact of learning on performance is low for most participants but they have achieved all the learning outcomes, it is likely that the learning outcomes were not suitable and, therefore, have to be revised. The initial learning needs analysis might be flawed.

Box 8.4. Transfer of learning

Here are some actions that support the transfer of learning into enhanced job performance:
- Pre-learning briefing: the learner and the manager discuss what is involved in the learning event;
- Post-learning briefing: the learner and the manager discuss whether the learning outcomes have been satisfied, and agree on how to use the newly-acquired knowledge, skills and behaviour on the job;
- Support: the learner's manager and other colleagues support the implementation of the new learning;
- Feedback: the learner's manager provides regular feedback about progress;
- Final review: after an agreed period of time, the learner and the manager meet to review the impact of the learning activity on job performance and agree on any further actions.

Level 4: Results

Some organizations already have performance indicators in place for assessing the benefits of an investment in learning. For example, some NMHSs may commission customer surveys that can quantify, at least in part, the impact of a learning activity.

National Meteorological and Hydrological Services may have verification statistics that can measure the impact of a learning activity designed to improve a forecast service (such as warnings of heavy rainfall) or to introduce a new observing system (such as the introduction of Doppler radars to improve the prediction of tornadoes). However, the measure might be biased unless there is a way of comparing forecasters who have and those who have not completed the learning activity, and of considering those who work in very different forecast regimes.

Assessing the impact of specific learning activities on the organization is the ultimate way of evaluating those activities, but it is also the hardest. The United Nations has established standards for evaluation (see Box 8.5). These include standards for conducting evaluations, which cover planning, design, implementation and follow-up. If all stages have worked correctly, the assessment of the impact of the training can be trusted.

8.4 Evaluation procedure

Organizations need to decide what they want to get out of the evaluation process. They might ask questions such as:

– Has participation in a train-the-trainer course improved trainers' performance?

Box 8.5. Standards for evaluation in the United Nations system

The United Nations Evaluation Group has defined norms and standards which aim to the professionalization of the evaluation function. They also provide guidance to evaluation offices in preparing their evaluation policies or dealing with other aspects of their operations. The standards cover:
- Institutional framework and management of the evaluation function;
- Competencies and ethics;
- Conduct of evaluations;
- Evaluation reports.

The standards indicate that all those engaged in designing, conducting and managing evaluation activities should aspire to high-quality and ethical work. This means that they should possess core evaluation competencies. Consequently evaluators should:
- Have relevant educational background, and qualification and training in evaluation;
- Have professional work experience relevant to evaluation;
- Have specific technical knowledge of, and be familiar with, the methodology or approach that will be needed for the specific evaluation to be undertaken, as well as certain managerial and personal skills;
- Be sensitive to beliefs, manners and customs and act with integrity and honesty in their relationships with all stakeholders;
- Ensure that their contacts with individuals are characterized by respect;
- Protect the anonymity and confidentiality of information provided by individuals;
- Take responsibility for their performance and their product(s).

For more information on this topic go to: http://www.uneval.org/.

- Did the new learning activities in support of continuing professional development (CPD) meet their objectives?
- Has replacing conventional training courses with distance learning worked?
- Is the on-the-job training being done effectively?
- Should an external organization run some learning events?
- Is training providing value for money?

When conducting an evaluation it is worth going through the steps illustrated in Figure 8.3.

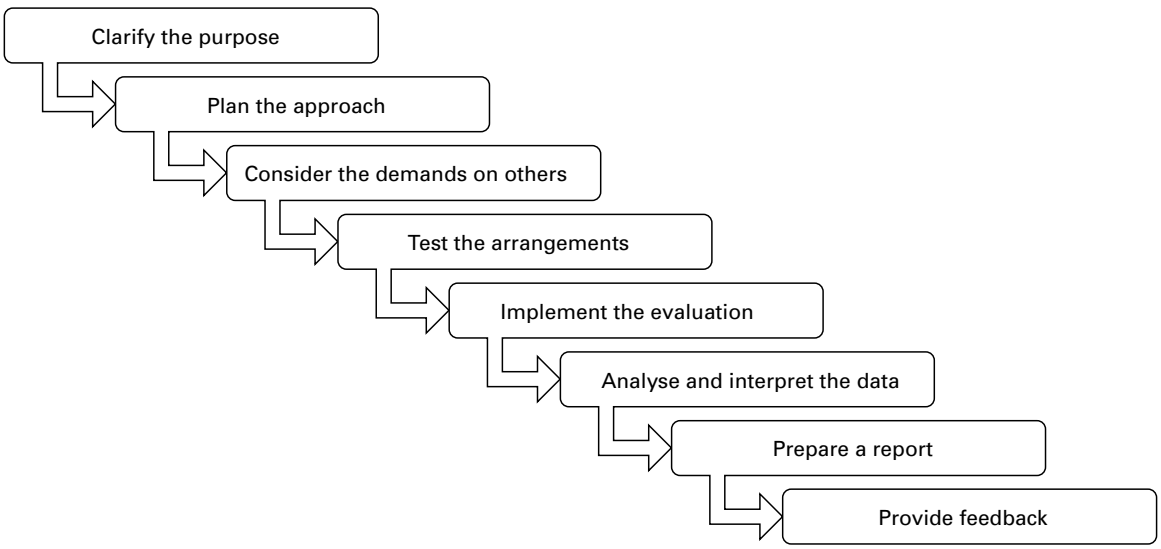

Figure 8.3. The key steps of an evaluation. The emphasis placed on each step will depend upon what an organization expects from the evaluation process.

Now consider in more detail the steps identified in Figure 8.3:

– *Clarify the purpose of the evaluation*: ensure that the person commissioning the evaluation and those carrying it out agree on its purpose and the deliverables. Identify all stakeholders in the evaluation and their needs as well;

– *Plan the approach*: decide what resources are available to do the evaluation, what data is required and how to get the data;

– *Consider the demands on others*: ensure that the size and scope of the evaluation matches the learning activities, and that it places reasonable demands on respondents and those analysing the information;

– *Test the arrangements*: check the evaluation before rolling it out. A small evaluation might need just someone to check whether a questionnaire is logical and understandable. For a more wide-ranging evaluation, it may be necessary to pilot the whole process;

– *Implement the evaluation*: carry it out, monitoring whether there are any problems and adjusting it as required. Do not draw early conclusions and take care with sensitive data;

– *Analyse and interpret the data*: use the data collected to answer the original questions;

– *Prepare a report*: use the analysis to prepare a report that covers the scope and purpose of the evaluation, the methods used, findings and recommendations;

– *Provide feedback*: give feedback about the outcome of the evaluation to all those who have contributed to it.

The evaluation report and recommendations are a key part of the process. The recommendations might be supported by:

– *Quantitative information*: statistical information that can be used to provide an overview of the evaluation results and make comparisons with similar events;

– *Qualitative information*: comments, observations, suggestions and recommendations from learners and other stakeholders.

To get the recommendations implemented, make sure that the report contains only information that is relevant to the recipients and that the recommendations are clear and concise.

Ideally an evaluation should be built into the design of a learning event rather than treated as an add-on. An evaluation is only worthwhile if there is commitment to act on its findings. Otherwise the cost of the evaluation will outweigh its benefits.

8.5 Evaluating training departments

Organizations may wish to evaluate their training department periodically. The question could be: "do the benefits provided by the training department outweigh the costs?"

Such questions can be answered by using a cost/benefit analysis or an investment appraisal which depend upon:

– The cost of the training department – for example, for staff and facilities;

– The benefits in monetary terms of the training department – for example, cost savings, increase in productivity and more income generation.

Usually the costs are relatively easy to identify, but putting the benefits in monetary terms is much more difficult and inevitably subjective.

An alternative approach is to use benchmarking based on a comparison of costs and benefits of the training department with that of another organization. The following gives an indication of the type of information that could be used:

– The proportion of employees participating in learning activities as part of their CPD;

– The average number of days allocated yearly to learning activities per employee;

– The proportion of people working in the training department compared to the total number of employees in the organization;

– The time taken to train new recruits;

– The expenditure on learning activities per employee.

Organizations vary in the way they put together such information. For example, in some organizations expenditure on training activities might cover only formal learning activities whereas in others all types of learning activity are included. Organizations might also vary in the way they account for the cost of learners. Comparisons should only be made when the data provided by another organization is compatible.

8.6 Next step

The information and insights gained from evaluations should be used at the beginning of the next learning cycle, when the process of developing training policies, processes and procedures, and identifying learning needs starts again.

8.7 You and your organization

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

– Why is it important to evaluate training and to what extent is the evaluation of training considered important in your organization?

– In the past, how have you modified your training processes based on evaluation results?

– To what extent are line managers in your organization involved in the evaluation process?

– How is reaction to training assessed in your organization and what processes are there to act upon the resulting information?

– What techniques are used in your organization to assess changes in knowledge, skills and behaviour resulting from training?

– In your organization, to what extent are changes in job behaviour assessed as a result of training?

– To what extent does your organization have a systematic approach to designing, implementing, analysing, reporting and taking action on the evaluation of training?

GLOSSARY OF THE TERMS USED IN THIS PUBLICATION

Accreditation. The process through which an external body evaluates an institution or programme against a specified standard. In essence, this is a form of quality assurance.

Assessment. A way of measuring what individuals have learnt as a result of a learning activity – for example, by testing a learner's knowledge, skill or behaviour – or of determining current knowledge or competency. The assessment should be based upon the objectives of the learning situation or job requirements.

Blended learning. A combination, in any proportion or sequence, of distance-learning and classroom elements.

Certification. The process attesting that a person has satisfied a particular academic standard or professional qualification, or has the competencies required for a particular job or task.

Coaching. A systematic process where a more experienced person helps a learner develop expertise through a structured or semi-structured programme of guidance, feedback, demonstration, or collaborative work experience, primarily to improve performance (often short-term) in a specific area or skill. While the learner has primary ownership of the learning goal, the coach has primary ownership of the coaching process.

Competence. The knowledge, skills and behaviour needed to perform a specific job to the required standard.

Continuing professional development (CPD). Additional education or training that people go through in order to improve or update their knowledge and skills, or develop new knowledge and skills for a change of job, career progression or taking on more responsibility.

Criterion-referenced assessment. An assessment that compares the learning of individuals with a standard, such as job competencies, or specified learning outcomes (an absolute measure).

Curriculum. The inventory of outcomes associated with designing, organizing and planning a formal learning opportunity (for example, course sequence, learning outcomes, topics, learning activities, schedules, assessment process and learning resources).

Distance learning. A formalized approach to learning in which learners are far from the trainer. There are two modes of distance learning: (a) synchronous, in which all learners are involved in a learning activity at the same time, even though they are far from each other, and (b) asynchronous, in which learners access the learning material according to their own schedule and pace.

Education. A learning process aimed primarily at developing knowledge, transferable skills and critical thinking. For adults, this often provides preparation for follow-on professional development or professional practice.

Evaluation. The measuring of the worth of providing a learning opportunity – for example, by judging whether the learning opportunity met its objectives, made a difference to the organization or was good value for money – with the aim of improving the learning process.

Formal learning. Learning based on a structured programme of study, which is explicitly designated as learning and has well-defined learning outcomes. The learning is acquired through, for example, participation in courses and workshops. Formal learning is usually trainer-led.

Formative assessment. Gathering information during training to provide feedback to both learners and trainers about progress and to identify any alterations that might be required.

Informal learning. Learning embedded in activities not explicitly designated as part of a learning

programme, so there are no specified learning outcomes. The learning is unstructured and often experiential, and is acquired by interacting with colleagues, undertaking self-study and performing tasks. Trainers, coaches or mentors are not involved.

Knowledge. The body of facts, principles, theories and practices related to a particular field of study.

Learner. A person participating in a learning opportunity.

Learning. A cumulative process through which individuals acquire knowledge or skill, or modify behaviour.

Learning activity. A component of a learning session which has a well-defined purpose and uses a specific learning method – for example, a practical exercise.

Learning event. A learning occurrence, with a start and an end, aimed at meeting a narrow set of learning outcomes – for example, a one-week or a one-day workshop.

Learning method. A technique or strategy, such as a lecture or a small group discussion, used to help individuals learn.

Learning needs analysis (or training needs analysis). The systematic gathering of information about any gaps in the knowledge, skills and behaviour of staff, taking into account current and future organizational requirements and the capabilities of individuals.

Learning outcomes. The set of knowledge, skills and behaviours an individual is able to demonstrate as a result of participating in a learning opportunity.

Learning opportunity. Any experience that provides individuals with the opportunity to develop their expertise; this can refer to a programme, event, session or activity.

Learning programme. A structured sequence of learning events, with a start and an end, aimed at meeting a set of high-level learning outcomes – for example, a series of courses with a common purpose.

Learning session. A part of a learning event, which concentrates on a specific learning outcome and might include several learning activities – for example, a half-day portion of a workshop that starts with a lecture, has a period of questions and answers, and ends with a practical exercise.

Mentoring. A process by which a respected, trusted and competent individual provides guidance and advice to assist less experienced people maximize their potential, develop their skills and improve their performance, often based on a long-term relationship. The learner owns both the learning goals and the learning process.

Norm-referenced assessment. An assessment that compares the learning of individuals and ranks the learners (a relative measure).

Qualification. The recognition by a competent body that an individual's learning has reached a specified standard of knowledge and skills, based on the successful completion of a programme of study. A qualification is often the outcome of a certification process based on one or more assessment processes.

Reliability. The extent to which an assessment process yields consistent results each time it is used in similar circumstances.

Semi-formal learning. Learning associated with ongoing activities with specified learning outcomes, but which also encourage and support learning that might go beyond the specified outcomes. Trainers are not usually directly involved, but coaches or mentors might contribute.

Skill. The ability to perform a particular mental or physical activity.

Summative assessment. Determining the knowledge and skills acquired, in terms of the learning outcomes, as a result of a learning event, or the gain in learning since the initial assessment.

Training. The process aimed at achieving performance objectives associated with a specific job.

Transferable skills or core competencies. Skills applicable to many jobs such as analytical, problem solving, communication and people management skills, and the ability to work in a team.

Validity. The extent to which an assessment process measures what it claims to measure. Internal validation is concerned with assessing whether learners have met the required learning outcomes; external validation determines whether the learning outcomes were based on an accurate assessment of the learning needs.

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