Administrative Change to DAFH36-2675, *Information for Designers of Instructional Systems*

OPR: AF/A1D

The OPR for this handbook is hereby changed from HQ AETC/A3KP to AF/A1D. 6 May 25.

BY ORDER OF THE SECRETARY OF THE AIR FORCE

DEPARTMENT OF AIR FORCE HANDBOOK 36-2675

15 APRIL 2022

Personnel

INFORMATION FOR DESIGNERS OF INSTRUCTIONAL SYSTEMS

OPR: HQ AETC/A3KP

Certified by: SAF/MR

Supersedes AFH 36-2235, Volume 1-13; 2 September 2002

Pages: 117

This publication provides information and guidance for Department of the Air Force (DAF) Instructional Systems Development (ISD) in support of DAF Policy Directive (DAFPD) 36-26, *Total Force Development and Management* and aligns with requirements outlined in Department of the Air Force Instruction (DAFI) 36-2670, *Total Force Development*. This publication provides commanders and managers a brief overview of ISD and acquaints users with the principles and concepts of ISD, and provides internal guidance on procedures and methods for applying ISD. This publication applies to all civilian employees and uniformed members of the Regular Air Force, Space Force, Air Force Reserve, and Air National Guard. This publication may be supplemented at any level; all supplements must be routed to the office of primary responsibility (OPR) of this publication for coordination and must be approved by the Human Resource Management Strategic Board prior to certification and approval in accordance with DAFPD 36-81, *Total Force Human Resource Management (HRM) Governance*. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route the AF Form 847 from the field through the appropriate functional chain of command. Ensure all records generated as a result of processes prescribed in this publication adhere to Air Force Instruction 33-322, *Records Management and Information Governance Program*, and are disposed in accordance with the Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System. The use of the name or mark of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

Chapter 1 6
What is Instructional Systems Development (ISD)? 6
1.1. Introduction to ISD. 6
1.2. What is ISD? 6
1.3. Effective and Efficient ISD. 10
1.4. Distinctive Features of ISD. 12
1.5. Responsibilities of Commanders and Managers. 13
Chapter 2 15
Planning 15
2.1. Introduction. 15
2.2. Determine Instructional Requirements / Needs. 15
2.3. Determine Personnel Requirements. 16
2.4. Evaluating Your Development Effort. 17
Chapter 3 20
Analysis 20
3.1. Introduction. 20
3.2. Educational analysis. 20
3.3. Learning analysis. 21
3.4. Resource Analysis. 24
3.5. Target Audience Analysis / How to Evaluate in the Analysis Phase. 26
3.6. ISD Management Plan / Project Management Plan Update. 27
Chapter 4 28
Design 28
4.1. Introduction. 28
4.2. Develop Objectives. 28
4.3. Guidelines for Developing Objectives. 30
4.4. Organization of Objectives. 33
4.5. Developing Tests. 34
4.6. Review and Use Existing Materials. 39
4.7. Design Instructional Plan. 41
4.8. Select Media. 47
4.9. Develop Lesson Plans. 47

4.10. Develop Implementation Plan. 48
4.11. Design Instructional Information Management System. 49
4.12. What to Evaluate in the Design Phase. 50
Chapter 5 51
Development 51
5.1. Introduction. 51
5.2. Develop Instructional Materials. 51
5.3. Validate Instruction. 53
5.4. What to Evaluate in the Development Phase. 57
5.5. Finalize Instructional Materials. 58
Chapter 6 59
Implementation 59
6.1. Introduction. 59
6.2. Implementation of System Functions. 59
Chapter 7 61
Evaluation 61
7.1. Overview. 61
7.2. Levels of Educational Evaluation. 61
7.3. Internal and External Evaluation. 62
Chapter 8 65
Techniques for Instructional Managers / Developers 65
8.1. Introduction. 65
8.2. Techniques for Instructional Managers / Developers. 65
8.3. Managing Instructors. 65
8.4. Managing Student Learning. 66
8.5. Evaluation and Revision. 67
8.6. Imitating the Job Environment. 68
8.7. Maintaining Skills / Knowledge and Student Instructor Ratios. 69
8.8. Informal Learning / Structuring and Sequencing Instruction. 69
Chapter 9 71
Techniques for Instructors 71
9.1. Student Feedback/Activities. 71
9.2. Classroom Leadership. 72

9.3. Learning Strategies. 72
9.4. Testing Student Progress. 74
9.5. Managing Active Learning Time / Cooperative Learning. 75
9.6. Instructor Presentation / Practicing Applications. 76
9.7. Mental Models / Motivating Students. 77
9.8. Student Controlled Learning / Assignments. 79
Chapter 10 81
Techniques for Instructional Specialists 81
10.1. Systematic Instructional Design. 81
10.2. Instructional Objectives / Text Enhancement. 81
10.3. Reading Grade Levels / Building on Existing Knowledge. 82
10.4. Using Examples / Motivating Students. 83
10.5. Designing Effective Illustrations / Formative and Summative Evaluation. 84
10.6. Effective Training / Instructional Objectives and Tests/Assessments. 85
10.7. Time Distribution / Student Cooperation. 86
Chapter 11 88
Instructional Technology 88
11.1. Introduction. 88
11.2. Instructional Technologies. 88
11.3. Technology Insertion. 89
11.4. Distance Learning. 90
Attachment 1 93
GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION 93
Attachment 2 101
TRAINING NEEDS ASSESSMENT (TNA) 101
Attachment 3 102
LEARNING ANALYSIS WORKSHEET - EXAMPLE 102
Attachment 4 103
PROJECT MANAGEMENT PLAN – EXAMPLE 103
Attachment 4 (Cont.) 104
Attachment 5 105
LEARNING OBJECTIVE WORKSHEET – EXAMPLE 105
Attachment 6 106

PROFICIENCY CODE KEY – EXAMPLE 106
Attachment 7 107
LESSON PLAN PART 1 - EXAMPLE 107
PLAN OF INSTRUCTION/LESSON PART I 107
COURSE CONTENT 107
TIME 107
SUPERVISOR APPROVAL OF LESSON PLAN 108
HSIGNATURE AND DATEH 108
HSIGNATURE AND DATEH 108
Attachment 7 (Continued) 109
LESSON PLAN PART II – EXAMPLE 109
Attachment 8 111
VALIDATION PROCESS/CHECKLISTS – EXAMPLE 111
Attachment 8 (Continued) 113
Attachment 8 (Continued) 114
Attachment 8 (Continued) 115
Note: Unless otherwise noted, ALL entries are MANDATORY. For 'No' responses, provide remarks in the 'Student Comments/Suggestions' section below. 115
Student Comments/Suggestions: 115
_____ 115
Attachment 8 (Continued) 116
Attachment 8 (Continued) 117

Chapter 1
What is Instructional Systems Development (ISD)?

1.1. Introduction to ISD.

1.1.1. Education and training are critical to the operational success of the DAF, ensuring personnel are prepared with the knowledge and skills to perform assigned tasks that support the mission. ISD is a systematic process that allows for continuous evaluation and for developers/trainers to have a major impact in the design and re-design of a course or program, thus, reducing costs and providing flexibility.

1.1.2. There is a tendency to assume that instruction/training is the solution for every operational problem. This assumption can result in wasted dollars when training is not planned or organized well. Commanders and managers have a tendency to request more instruction than needed, or to request instruction for non-instructional-related problems. Leaders at all levels should focus on desired human performance. Correctly identifying the performance intervention (training, training aids, non-training solution, environment, motivation, etc.) saves the DAF time and resources.

1.1.3. Since 1965, the USAF has used the ISD process to help commanders and managers create effective training. ISD is a systematic, flexible, proven process for determining whether instruction is necessary for a given situation, defining what instruction is needed, and ensuring the development of effective, cost-efficient instruction. The ISD process must focus primarily on quality and improvement.

1.1.4. DAFPD 36-26 directs the ISD process to be used during the development of DAF education and training programs. ISD concepts, principles, and procedures, with specific applications of the ISD process, are spelled out within this handbook.

1.1.5. ISD is part of the force development process to ensure individuals receive the right education and training at the right time. Education and training should:

- Prepare forces for combat.
- Be as realistic as possible.
- Be conducted for all forms and levels of war.
- Give special attention to training for joint and combined employment.

1.2. What is ISD?

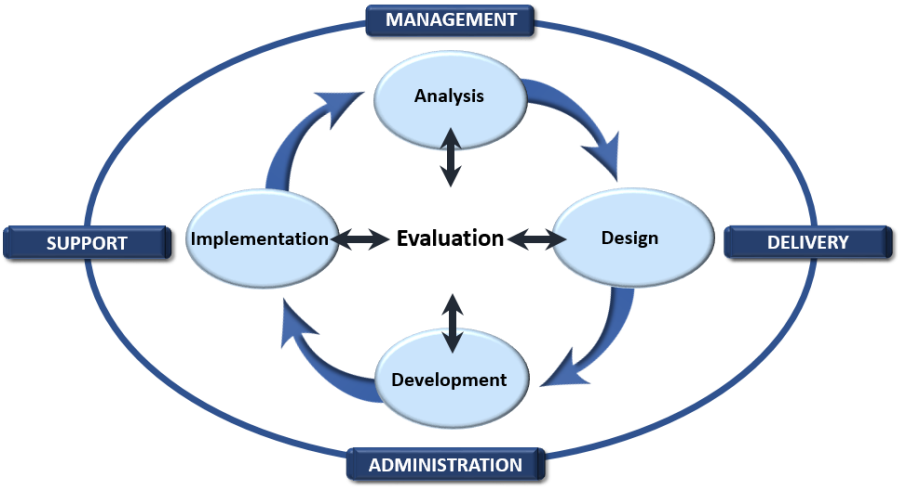
1.2.1. ISD is a conceptual adaptation of the systems engineering process used to design, develop, implement, and evaluate instruction. ISD results in alternative solutions to instructional problems, which may be more or less cost-efficient, depending on the instructional need and environmental constraints. ISD also clarifies that a systems approach, which involves choosing among alternative solutions, will produce the most effective results.

1.2.2. The goal of ISD is to increase the effectiveness and cost-efficiency of education and training, as follows:

- Develop instruction based on job performance requirements.
- Eliminate irrelevant knowledge and skills instruction from courses.
- Ensure that graduates acquire the necessary knowledge, skills, abilities, or attitudes to do the job.

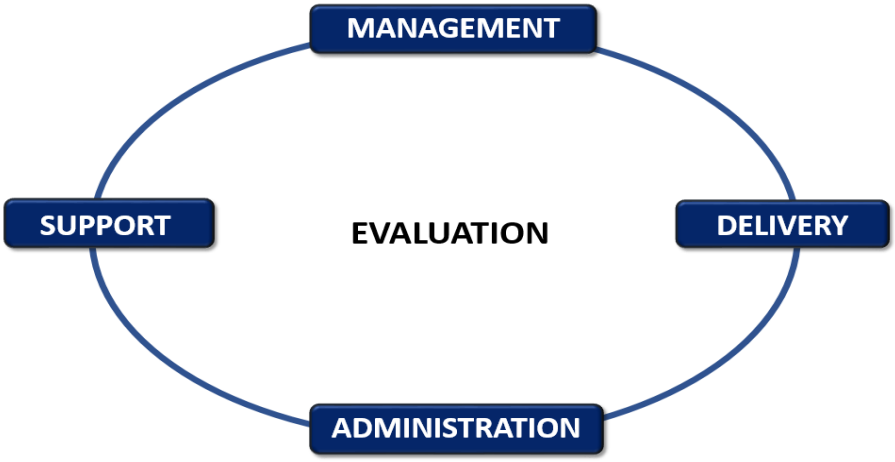
1.2.3. The ISD model is designed to represent simplicity and flexibility so that instructional designers with varying levels of expertise can understand the model and use it to develop effective, cost-efficient instructional systems. The model is composed of two distinct yet interrelated parts. These parts are system functions and ISD phases. The two parts of the model are depicted in **Figure 1** through **Figure 3**.

Figure 1. The ISD Model.



1.2.4. System functions. **Figure 2** shows the basic top-level system functions of the ISD model, which are instructional system management, support, administration, delivery, and evaluation. Evaluation, depicted in the center, is the central feedback network for the total system.

Figure 2. System Functions.



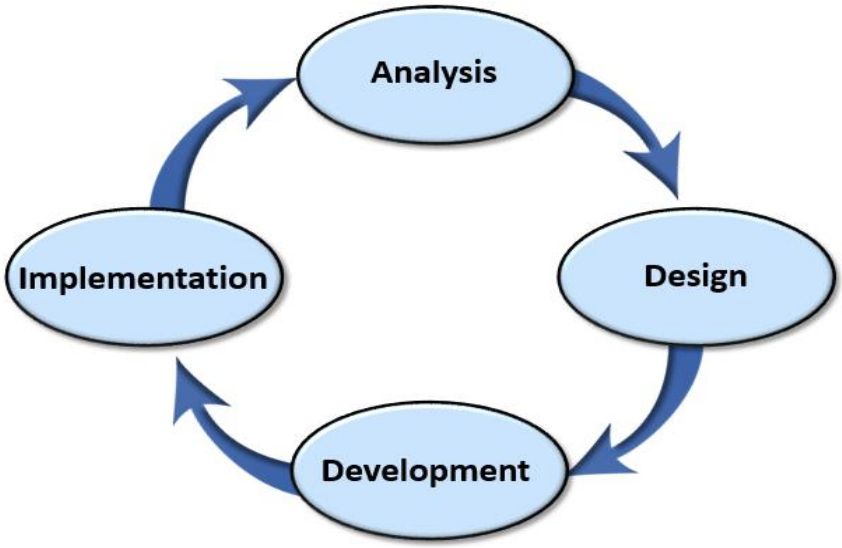
1.2.5. The system functions of the ISD model are defined:

- **Management** is the function of directing or controlling instructional system development and operations.
- **Support** is the function of maintaining all parts of the system on a day-to-day as well as long-term basis. Examples are the resources needed to keep equipment functioning.
- **Administration** is the function of day-to-day processing and record keeping.
- **Delivery** is the function of bringing instruction to students.
- **Evaluation** is the function of gathering feedback data.

1.2.6. Planning, although not a specific phase of the ISD process, is a key event used before any curriculum is created. Planning is a process management function that begins with determining the instructional need along with the evaluation strategy to be applied in developing or revising curriculum. Planning should incorporate training requirements, resources (monetary and personnel), and constraints in the ISD process. Planning cannot be overemphasized.

1.2.7. ISD phases, **Figure 3** depicts the ISD phases embedded within the system functions. As shown, the phases used in the systems approach are analysis, design, development, and implementation, with evaluation activities integrated into each phase of the process.

Figure 3. ISD Phases.



1.2.8. The phases of the ISD model defined:

- **Analysis.** Analyze and determine the instruction needed. In courses that tie the content directly to preparing a student to do a job, the instructional designer analyzes the job performance requirements and develops a task list. Remember, job performance requirements may also include skills such as problem-solving, leadership, and management. The designer then analyzes the job tasks and compares them with the knowledge, skills, abilities, or attitudes of the incoming students. The difference between what they already know and can do, and what the job requires them to know and be able to do determines what instruction they will need. The activities of formative evaluation begin during the analysis phase with process and product evaluations.
- **Design** instruction to meet the need. In the design phase, the instructional designer develops a detailed plan of instruction, which includes selecting the instructional methods, media, and technology needed for determining the instructional strategies. Review existing instructional materials to determine their applicability to the specific instruction under development. In this phase, the instructional designers also develop objectives and tests, as well as design the instruction. The implementation plan for the instructional system is developed, and a Learning Management System (LMS) is designed, if required. Formative evaluation activities continue in this phase with process and product evaluations.
- **Development.** Develop instructional materials to support system requirements. In this phase, both the student and instructor lesson materials are developed as well as the technology that the student and instructor will need to ensure learning is achieved. If the media selected in the design phase included items such as videos, sound/slides, interactive courseware, and training devices, they should be submitted for production during this phase. In addition, if an LMS was developed, installation occurs in this phase. As a final step in this phase, the implementation plan is updated. Instructional designers also validate each unit/instruction module and its

associated materials as they are developed. Validation includes (1) Internal review of the instruction and materials for accuracy (formative evaluation), (2) Individual and small-group tryouts (formative evaluation), (3) Operational (field) tryouts of the "whole" system – meaning all instruction and materials presented (summative evaluation). Revision of units/modules occurs, as validated, based on feedback from the formative and summative evaluation activities. The last step in this phase is to finalize all instructional materials.

- **Implementation.** Implement the instructional system. In this phase, after the instructional system design and development and the validation activities of formative and summative evaluation are completed, it is time to implement the "whole" system. In this phase, the instructional system is fielded under normal operating conditions. To ensure continuing the quality of the fielded system, operational evaluations, including both internal and external evaluations, provide the necessary periodic feedback for the life cycle of the operating system.

Evaluation is a central function that takes place throughout the ISD process.

1.2.9. Evaluation is the central feedback network for the total system. It is a continuous process beginning early in the analysis phase and continues throughout the life cycle of the instructional system. There are three types of evaluation:

- **Formative Evaluation** includes process and product evaluations conducted during the analysis and design phases. It also includes validation, conducted during the development phase and includes individual and small-group tryouts.
- **Summative Evaluation** includes operational tryouts conducted as the last step of validation in the development phase.
- **Operational Evaluation** includes periodic internal and external evaluation of the operational system during the implementation phase.

1.3. Effective and Efficient ISD.

1.3.1. **Mission**. The below information supports principles of continuous improvement to support effectiveness and efficiency in the ISD model:

- Know your mission. ISD depends on mission and job analysis for the necessary data to design, develop, and implement instruction. All instruction is based directly on mission or job requirements. The quality checks in the analysis process help eliminate instruction that is unrelated to the job.
- Job analysis uses data from many sources, including mission statements found in regulations or locally developed statements. Analysts or curriculum developers also make use of management engineering reports, occupational survey data, and direct observation to determine the actual job requirements.
- In order to determine what the actual performance problems are, conduct a training needs assessment (TNA) as part of the job analysis process. In some cases, a problem is not due to a lack of instruction, but to deficiencies within the job structure or environment. Since not all problems are instructional, the ISD process helps ensure that instruction is not developed for non-instructional problems.

1.3.2. **Customers.** Know your customers. The information gained in the mission/job analysis process gives the instructional design team information that defines the customer's expectations.

- The customer defines quality. ISD emphasizes criterion-based instruction, and criteria are directly linked to performance requirements in the field. Field representatives identify education and training requirements, which instructional providers should strive to satisfy through instructional design.
- Set goals and standards. The goals and standards for an instructional development effort come in many variations. First, the job requirements and the impact of the performance deficiency determine the timing required for the development process and the conduct of the instructional program. Second, the content of the instruction is determined by the person's need to do the job. The design team must directly translate the cues, conditions, and performance standards of the job directly into the instructional program.
- Manage by fact. Each phase of the ISD process requires constant evaluation against the job requirements identified earlier in the process. In addition, a myriad of tools is developed to ensure that design and development decisions are made with supporting data considerations. For example, a number of media selection tools are being used which provide managers information that matches training media with the instructional requirements. These matches should meet the desired outcome for the learning objectives. The purpose of ISD is to provide the design team awareness of the factors that affect their decisions.

1.3.3. **Team players.**

- Foster teamwork. Do not design and develop an instructional program in a vacuum. In order to develop effective instruction, the design team must communicate with the work center and evaluation entities on a regular basis. Effective communication ensures that the instruction matches the performance requirements of the job.
- Flexibility is key. ISD uses problem solving, decision-making models. Since ISD is flexible and there are any number of ways to solve a given instructional problem; a design team is given freedom/authority to design, develop, and implement instruction that meets job performance requirements in the most efficient and effective way possible. Enter the appropriate phase depending on your situation.
- Evaluate quality constantly. The ISD process is a cyclical, ongoing process of continuous improvement. As curriculum developers progress through the different phases of ISD, the process and products of each phase are constantly evaluated against the instructional requirements and principles of learning. The results of the evaluations determine which phase of ISD to enter next. Developers can enter at the phase they deem appropriate for their current situation. Constant evaluation identifies changes in instructional requirements due to updates in equipment and personnel, which results in new ISD efforts to provide the best possible instruction for the learner.

1.4. Distinctive Features of ISD.

1.4.1. Instructional development offers great potential for creativity and cost avoidance through application of state-of-the-art instructional technology and advances in management, communication, and behavioral sciences. However, commanders and managers often are forced to make difficult management decisions due to real world resource constraints. Using ISD, the instructional designer is better able to present commanders and managers with various courses of action so they can make timely, effective, and cost-efficient management decisions.

1.4.2. From the description of the ISD process, you can see that developing an instructional system involves considerable effort. You may ask; "Is it necessary to invest all of this effort in every course?" Practical considerations such as time and resources available to develop the system and the number/type of students requiring training dictate the procedures and techniques you should apply. Although the ISD process is flexible, consideration must be given to all phases to produce an effective, cost-efficient instructional system. The minimum requirements in the development process that should be accomplished are:

- Determine the essential job tasks.
- Determine the skills and knowledge required to perform these tasks.
- Determine if there is a need to develop training to provide the required skills and knowledge. If the need exists, proceed with the balance of this list.
- Derive objectives that, when met, successfully result in achievement of the identified skills and knowledge. Develop and utilize test items for these objectives to determine whether or not they are achieved.
- Devise the means for the student to achieve these objectives.
- Determine if technology is needed.
- To the greatest extent possible, determine whether the student has achieved these objectives.
- If objectives are not achieved, revise the system as necessary to improve instruction.

1.4.3. There are several key concepts that make the ISD process distinctive:

- Job requirements drive instruction.
- Instructional requirements are based on behavioral analysis that results in measurable, observable objectives.
- Instruction focuses only on the portion(s) of the job requirements the student has not already mastered.
- The instruction is student-oriented. Objectives are stated in terms of student performance and instruction is described in terms of student activity.
- The student and the instructor both know the instructional goals and can identify when the goals are attained.
- If the instructional system fails to lead the learner to successful achievement of objectives, it may be a faulty system design (rather than the student). In this case, the system must be evaluated and revised until it is effective.

1.4.4. Based on many years of successful demonstrations, there is empirical evidence that utilization of the ISD process can improve instruction in distinct ways.

1.4.4.1. **Effectiveness**. The effectiveness of instruction is greatly increased through the use of design and development procedures. Design and development includes careful determination of instructional requirements, measurement, and evaluation of instruction, as well as revision of the instructional system until it meets its defined objectives.

1.4.4.2. **Cost Efficiency**. The ISD process indicates that effective instruction can be developed in a highly cost-efficient manner. ISD generally provides a more cost-efficient means of developing instruction. While it is unreasonable to believe the ISD process will *always* result in dollars saved, it is evident that ISD will provide a more cost-efficient means of developing instruction.

1.5. Responsibilities of Commanders and Managers.

1.5.1. Successful ISD relies heavily on commanders, supervisors, and managers to support the application of ISD to ensure the process is used to develop an effective and cost-efficient instructional system while continually improving the quality of the process.

- Direct implementation of the ISD process to develop instructional systems.
- Ensure sufficient numbers of individuals are assigned as instructional designers/developers and managers.
- Provide adequate training for instructional designers/developers and managers.
- Coordinate instructional system requirements through unit ISD managers and base support organizations.
- Provide resources (people, funds, equipment, time, etc.) to support the process.
- Conduct periodic quality checks and eliminate instruction unrelated to the job.

1.5.2. As a commander or manager, you should not:

- Require a course be developed before you have determined that there is a valid education or training problem, that a course is an effective and cost-efficient solution, or that an existing course could fix the problem. For example, don't say, "We need a one-week course in shop safety because the accident rate in our machine shop has been increasing for the past six months." Instead, say, "The accident rate in the machine shop has been increasing for the past six months. I need our ISD specialists to conduct an analysis to determine the root cause of this issue." If education or training is identified as the root cause of the accident rate/issue, then develop the necessary instruction to remedy and remove the root cause.
- Set unreasonable suspense dates for development of the instructional system. Development of instructional systems can be a relatively slow process; however, there are options in the development process that may make a substantial difference in the development time. Imposing an unrealistic suspense date may force the instructional designers to bypass essential parts of the process that can cause the system to be ineffective and inefficient.

- Delay planning for the instructional system if you are managing the acquisition of a defense or support system. Instructional design should begin as early in the acquisition process as possible, and not treated as an afterthought when acquiring defense articles or systems.

Chapter 2
Planning

2.1. Introduction.

2.1.1. Planning the instructional system structure and functions includes determining ISD process management and evaluation strategies, and estimating resource requirements and constraints. The instructional developer may be responsible for accomplishing some of the preliminary planning activities, with input from management or decisions made by another DAF organizational level.

2.1.2. This chapter describes the planning activities that are an inherent part of each step and function, including the three levels or phases in designing instructional systems. The first is the “system level.” Planning and analysis at this level focuses on needs, goals, priorities, resources, constraints, alternate delivery systems, etc. The focus is on determining the scope and sequence of courses and delivery system design — the "big picture." The second level is the “course level.” Planning and analysis at this level is on course objectives, course structure, and sequence. The third is “lesson level.” In most settings, curriculum developers will find themselves working to some degree at all three levels. The key difference in the work done is the number and/or detail of decisions that have already been made when you enter a given level.

2.2. Determine Instructional Requirements / Needs.

2.2.1. An important preliminary activity that takes place before entering the ISD process is to determine that there is a need for formal instruction to achieve a mission goal. Assessing instructional needs is a critical activity that should be taken before any other planning occurs or additional resources are committed to a project. The term “need” has several definitions. The definitions most often used are:

- **Discrepancy view**. A need is the difference between "what is" and "what should be." In this definition, the difference between what "is being taught" and what "should be taught" is the discrepancy.
- **Democratic view.** Needs are identified by a group of experts (instructional designers, project managers, and others) who determine what changes need to be made to the instruction.
- **Diagnostic view.** Need is determined by identifying concepts, principles, and procedures whose absence or deficiency hampers the students in meeting job performance requirements.
- **Analytic view.** Need is determined by accurately predicting the future instructional needs based on the current instructional situation.

2.2.2. **Instructional need** is the lack of knowledge, skills, abilities, or attitudes personnel should have in order to adequately perform an activity. Examples of types of knowledge, skills, abilities, or attitudes personnel may not have are: **Behavioral** – skills in using tools

and test equipment, **Cognitive** – knowledge of information, **Affective** – commitment to a particular belief.

2.2.3. Things to consider for performing an instructional/training needs assessment (TNA):

- Interview and carefully listen to both stakeholders and the learners.
- Gather existing content and training materials.
- Perform an assessment.
- Share key findings with stakeholders and team members.

2.2.4. Instructional needs assessment is the means of identifying whether there is a need to develop or revise instruction to solve an identified problem. The steps of instructional needs assessment are shown below in **Table 2.1**. Also, see **Attachment 2**.

Table 2.1. Steps of Instructional Needs Assessment.

Step	Activity	Purpose
1	Determine and state purpose.	Determine purpose and objective of the assessment. Develop plan for conducting the needs assessment. Document the plan.
2	Identify data requirements.	Identify data that describes the actual performance and the desired performance.
3	Select data collection method.	Select appropriate method of collecting data such as: Literature review. Interview. Questionnaire/survey. Records and reports. Group discussion. Work samples. Observation.
4	Collect and analyze data.	Collect sufficient data to document the performance deficiency. Analyze data to identify the performance deficiency.
5	Develop instruction.	Develop or revise appropriate instruction to solve the deficiency.

2.3. Determine Personnel Requirements.

2.3.1. The purpose of determining personnel requirements is to ensure that you know what personnel you will need to design, develop, implement, and maintain the course. In determining personnel requirements, you will:

- Determine the level/complexity of the course.
- Identify the need for specialists (Distance learning/Interactive Course Ware (ICW), programmer, etc.).

- Define the roles of the specialists.
- Plan adequate education for instructors.

2.3.2. The type of course and level of complexity of the course will determine the personnel requirements. For example, developing an exportable course using interactive courseware (ICW) may require more personnel, using different skills, than print-based materials. Also, levels of complexity within computer-based training (CBT) will impact personnel requirements, since the more complex the material is, the more time it takes to design and develop. Finally, topic integration across the course may require additional personnel or personnel with broader education and experience areas. Define the type and level of the project early in the initial ISD planning stages.

2.3.3. Identifying need for experts. The type of level of the course will drive personnel requirements. For example, you may need:

- Content specialists – Identify the kind and number of experts. List any special skills the specialist may need (types of development software, user experience designer). Estimate when experts will be needed and for how long.
- Graphic artists.
- Videographers.
- Computer programmers.

2.3.4. Define role of experts. Clearly defined roles will:

- Enable you to define more accurately the elements of the project, such as project definition, tasks, and milestones.
- Allow specialists to know what you expect of them.
- Allow work to be scheduled with minimum conflict.
- Allow specialists to be selected who have the needed skills.

2.4. Evaluating Your Development Effort.

2.4.1. The most effective curriculum development effort is one which has a well-planned and deliberate evaluation process built into the design. The evaluation process is something the instructional developer must address early in the development process and continuously throughout the development cycle.

2.4.2. Evaluate progress during each phase of the ISD process. At the end of each ISD phase chapter in this handbook, you will find a section discussing important parts of evaluation during that particular phase. After the instructional program is developed, it needs to be evaluated as a total instructional system to ensure all the parts work together as intended. This evaluation of the total instructional system is known as validation or summative program evaluation. At this point, the course is ready for implementation. Then, after the instructional program is in place, the evaluation phase is invoked at the completion of each course administration. This evaluation allows for data collected during the conduct of the course to be analyzed. This analyzed data is then fed back into the appropriate phase of the ISD process to correct shortcomings of the program and to generally improve the course.

2.4.3. Evaluation plan job aid. **Table 2.2** may be useful to assist in developing an evaluation plan.

Table 2.2. Job Aid for Developing an Evaluation Plan.

Example of Evaluation Plan Job Aid
I. ISD Process and Product Evaluations **II.** Validation A. Course Identification B. Purpose of Course C. System Reviews 1. Identify types of reviews required. 2. Identify who is responsible. 3. Describe what will be reviewed. D. Validation Process 1. Individual Tryout a. Identify who is responsible for tryouts. b. Define parameters for tryouts, such as number of tryouts, materials to be validated. c. Describe individual tryout procedures. d. Indicate what data will be gathered and analyzed. e. State how data will be used. f. Identify revision procedures. *(Note: In large courses, validation may be modified for logistics and cost reasons. Pre-validation in small-group or large-group tryouts may not be possible due to the length of some courses.)* 2. Small-group Tryout a. Identify who is responsible for tryouts. b. Define parameters for tryouts, such as number of students, number of groups. c. Describe small-group tryout procedures. d. Indicate what data will be gathered and analyzed. e. State how data will be used. f. Identify revision procedures. g. Perform operational tryout. 3. Define parameters for large-group tryouts, such as number of students in each group, number of groups. a. Describe operational tryout procedures. b. Indicate what data will be gathered and analyzed. c. State how data will be used. d. Identify revision procedures.

2.4.4. To be an effective tool for managing the process, the evaluation plan must be continually updated with current information. The plan should be updated at the end of each

phase of the ISD process or when significant changes warrant a revision to the plan. Information that may require updating in the evaluation plan includes items such as:

- New or revised milestones.
- Changes in validation procedures.
- Changes in procedures for evaluating the development process.
- Changes in methods of collecting external evaluation data.

Chapter 3
Analysis

3.1. Introduction.

3.1.1. The analysis phase begins when the requirement for instruction has been established. This phase covers a variety of analyses, which may include mission or content analysis, learning analysis, resource analysis, target audience analysis, etc. You will check the results of the analyses against the preliminary evaluation plan for the ISD project and update the plan as needed. The individual(s) charged with managing the instructional development effort must update the initial management plan to reflect any scheduling and other adjustments.

3.1.2. The purpose of the analysis phase is to identify what to teach and how much to teach. At the "big picture" level, some form of analysis establishes the need for instruction. For example, in the mid-1990s, a determination was made that USAF officers required a stronger foundation in USAF Doctrine, especially officers serving on joint staffs. This finding established the educational requirement for a new course to be developed at Air University, the Aerospace Power Course. It also established the initial target population for the course, all Air Force officers holding the grade of major or higher assigned to positions on joint staffs.

3.1.3. Once the big picture analysis is complete and the mission or major objective has been stated, the next step is to investigate factors that will determine the content and how much instruction is needed. These factors include: (1) Why the students will need the information or skills (mission or goal). (2) What knowledge, skills, abilities, or attitudes the students must master and what categories of learning this involves (learning analysis).
(3) Who the students will be and what they already know about the subject (target audience analysis).

3.2. Educational analysis.

3.2.1. The analysis phase normally begins with an educational analysis. The requirement to conduct this form of analysis may depend on the application, scope, and nature of the project. This level of analysis identifies the goals and content area of an educational requirement. The initial analysis of the educational requirement provides you with information needed to begin to determine instructional requirements. Educational analysis is the process of reviewing the educational requirements, developing the educational goals or outcomes, and developing statements of these goals.

3.2.2. Managers are responsible for ensuring necessary analyses are conducted. In most cases, other individuals such as instructional developers, subject matter experts (SME), or system analysts should conduct the actual analyses or at least provide technical assistance. The process of conducting an analysis involves a number of steps. The actual number may depend on the type and scope of the analysis being conducted. During the analysis, you may perform some of the steps concurrently, others sequentially.

- Collect data.

- Determine and state the learning outcomes.
- Determine the learning content, e.g., skills and knowledge.
- Prioritize the outcomes in terms of importance to mission goals.
- Document the results.

Some sources of data are:

- SMEs.
- Subject matter literature.
- Air Force directives.
- Department of Defense directives.
- Previous course evaluation data, i.e. “lessons learned”.
- Inspections/reports.

3.2.3. The results of the educational or mission analysis become statements of the overarching course goals that will be the focal point for developing and organizing the instruction. Statements of learning objectives, learning hierarchies, and measures of success in learning will be directly traceable back to the overall course or program goals.

3.3. Learning analysis.

3.3.1. Learning analysis is the process of analyzing what is to be taught in terms of types of learning involved and level of learning desired (Bloom, B.S. (Ed), Englehart, M.D., Furst, E.J., Hill, W.K. and Krathwohl, D.R. (1956). *Taxonomy of Educational Objectives*, Handbook 1: Cognitive Domain. New York: Longman. When you conduct a learning analysis, you will:

- Identify the types of learning involved.
- Determine the level of learning needed.
- Build a learning hierarchy of knowledge and skills to be taught.
- Identify prerequisite knowledge and skill required.

3.3.2. Conducting a learning analysis. In learning analysis, the curriculum developer looks directly at categorizing type and level of learning needed to satisfy the instructional goal. Statements of outcomes are generally made in terms of cognitive and affective behaviors expected.

3.3.3. The results of the learning analysis should be utilized to design instruction. Identifying the types and levels of learning will help define how the objectives will be stated. The learning hierarchy will support sequencing instruction. Establishing prerequisites will help determine what content must be included in the course. The following two steps are an example of learning analysis procedures provided for your information.

Step 1 – Identify types of learning involved. The procedure is, examine each educational goal and determine which type(s) of learning are expected of the student. Repeat this examination for all educational goals in the course.

Step 2 – Determine level(s) of learning needed. The procedure is, examine each educational goal and determine what level(s) of learning are appropriate to satisfy the goal. Determine whether multiple levels of learning are needed for each goal, or if a single level of learning is sufficient. Multiple levels may be necessary if an educational goal refers to several content areas. For example, if the goal is to comprehend some complex concept, and if the students are not assumed to possess the required background factual knowledge to ensure their comprehension, then you must teach the necessary factual knowledge at a low level of learning (knowledge level), followed by instruction on the complex concept at the comprehension level of learning. Multiple levels may also be necessary if an educational goal refers to different learning domains. For example, if the goal is to comprehend some concept and to value that concept, then it will be necessary to recognize two different levels of learning, one in the cognitive domain (comprehension) and one in the affective domain (value). In line with the above example, you must intentionally consider both cognitive and affective purposes for instruction. The combination of cognitive and affective components in the instructional process is one of the attributes that distinguishes education from training. **See attachment 3,** for learning analysis worksheet example.

3.3.4. Types of learning. There are many ways to categorize types of learning. Some of the most common are briefly discussed below.

- **Intellectual skills** – Intellectual skills consist of discrimination (classify objects by one or more of their characteristics), concept, rule using (how to play a game) and problem-solving capabilities.
- **Cognitive strategies** – Cognitive strategies are thought of as executive control mechanisms for learning. There are different types of cognitive strategies, such as clustering items into similar groups to reduce memory loss, or reading strategies to increase comprehension.
- **Verbal information** – Verbal information is the learning of names and labels that can be verbalized. It is also called declarative knowledge. Verbal information learning requires some basic language skills. It is most readily learned and retained when situated within a larger context.
- **Psychomotor skills** – Psychomotor skills are learned behaviors that involve the smooth, coordinated use of muscles. Motor skills most often involve a sequence of activities that is first learned verbally to provide guidance for learning execution of the motor skill. When the learner has acquired the motor skill, the verbal routine is no longer needed and the skill is performed in a smooth and continuous manner.
- **Attitudes** – Attitudes are an area where affective and cognitive learning overlap. The acquisition of particular attitudes may require prior learning of intellectual skills and particular sets of information.

Other learning categories. Other means of categorizing learning have been in common use in curriculum development. Some of these are listed below.

- **Forming associations** – Associate, name, or respond to a specific input (stimulus). The person associates the response with a specific input only. The response may be vocal, sub-vocal (say it to yourself), written, or motor.
- **Forming chains** – Recall sequences of actions or procedures that must be recalled in a specific order. In a chain, the response to one input becomes the input to the

next response. This may involve chains of verbal responses or chains of motor responses.

- **Making discriminations**. Used in conditioning when a subject is expected to respond to a specific stimuli. Being able to behave differently when given different, or unique stimuli.
- **Making classifications**. Respond in a single way to all members of a particular class of observable or abstract events. This involves recognizing the essential similarity among a class of objects, people, events or abstractions, and recognizing the differences that separate those objects, people, events, or abstractions which are not members of the class.
- **Using rules.** Apply rules to a given situation or condition in which the optimal rule is relatively easy to describe. Categorizing items based on shapes for example. Round objects belong to one group and square objects belong to another group.
- **Problem solving.** Compare previously learned rules to create a higher order rule. For higher-level education, you may have to: Evaluate conflicting information, and synthesize disparate data or perspectives.

3.3.5. Levels of learning. The following categories of learning levels are in common use for cognitive and affective learning. With cognitive learning, concern is focused on what is going on in the learner's mind. Affective learning has to do with attitudes and motivation.

Cognitive:

- **Knowledge:** Recall previously learned material (facts, theories, etc.) in essentially the same form as taught.
- **Comprehension:** See relationships, concepts, and abstractions beyond the simple remembering of material. This typically involves translating, interpreting, and estimating future trends.
- **Application:** Use learned material in new and concrete situations, including the application of rules, methods, concepts, principles, laws and theories.
- **Analysis:** Break down material into its component parts so that the organizational structure may be understood. This includes identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved.
- **Synthesis:** Put parts together to form new patterns or structures, such as a unique communication (a theme or speech), a plan of operation (a research proposal), or a set of abstract relations (schemes for classifying information).
- **Evaluation:** Judge the value of material for a given purpose. Learning in this area is the highest in the cognitive hierarchy because it involves elements of all the other categories, plus conscious value judgments based on clearly defined criteria.

Affective:

- **Receiving:** Be aware that a thing exists and pay particular attention to it.
- **Responding:** React to a particular phenomenon in some way, such as acquiescing (reading assigned material), willingness to respond (voluntarily reading beyond assignment), or satisfaction in responding (reading for pleasure).

- **Valuing:** Attach worth or value to any object, phenomenon, or behavior ranging from accepting a value to a commitment.
- **Organizing:** Bring together different values, including conflicts between them, and then begin to build an internally consistent value system.
- **Characterizing:** Pervasive, consistent, and predictable behavior (life style) developing from a value system which controls behavior for a significant period of time.

3.3.6. Identify skills and knowledge. After categorizing the type and level of learning, you may also analyze to identify skills and knowledge content of the course. You will determine the results and activities that applying the new skills and knowledge enables the students to achieve. Such an analysis will help you list samples of behavior to test in order to demonstrate that students have learned. Examples of such activities and results are:

NEGOTIATE……..…to reach an…….AGREEMENT

WRITE…….…..….to develop a……....POLICY STATEMENT

ANALYZE DATA……..……to make…….…..…DECISIONS

ANSWER QUESTIONS…….to provide……...INFORMATION

DISCUSS EXPERIENCE……...to improve……..UNDERSTANDING

SUPERVISE OTHERS……...to ensure…….WORK MEETS STANDARDS

COORDINATE RESOURCES……...to develop……PLANS

3.3.7. Identify prerequisite knowledge and skills. The last stage of learning analysis is the thorough analysis of goal statements. This analysis will allow the instructional designer to identify any prerequisite learning that may be necessary in order for students to learn what will be taught in a course of instruction.

3.4. Resource Analysis.

3.4.1. Resources are *critical* factors in the instructional system from the initial planning, through instructional development, to operation and maintenance of the system. In the analysis phase, it is unlikely that the exact resource requirements can be defined, but if you consider resource requirements in early planning efforts, you should be able to estimate the requirements and have enough time to secure the resources. Resources for the instructional system include:

- Equipment/Supplies.
- Facilities.
- Funds.
- Personnel.
- Time.

- Maintenance/Services.
- Technology/Media/software.

3.4.2. What you need to know. Resources should be analyzed in order to identify: the type of resources you will need to develop the course, such as instructors, equipment, facilities, and designers; quantity of resources required, such as number of instructors, number of work-hours (i.e., faculty/student ratios); when resources will be needed in order to meet scheduled delivery date; total cost of resources for in-house or contract development; resource constraints; the scope of resource analysis includes both long-range and day-to-day concerns.

3.4.3. Conducting resource analysis. The resource analysis results in an estimate of resource requirements for the instructional program for both development and operation. One of the simplest ways to conduct the initial resource analysis is to ask a series of questions to determine what resources will be needed to support the objectives, understanding that this is an estimate. Example resource categories and questions are suggested in **Table 3.1**.

Table 3.1. Example Resource Categories and Questions.

Resource	Questions
Equipment	What specific equipment will you need (e.g., computers)? How will the equipment be used in the course? What quantities will be required?
Facilities/Services	How much space will be required? What type? Are facilities available? Are there special environmental requirements?
Funds	What will the initial personnel, equipment, and facilities cost? What are the recurring costs associated with the system?
Personnel	How many instructional designers, computer programmers, videographers, are needed to develop the course? Will instructors be needed? If so, how many? What are the student work-year requirements?
Time	What is the scheduled delivery date? How much time will be required to develop the instruction? What is the estimated module or course length?
Media/Software	Is media or software needed? How will the media or software be used in the course? What is the cost? Are there system limitations?

Finding answers to these and other questions will help you estimate the resource requirements for the instructional program. In addition to the examples listed, don't forget to account for equipment/supplies and maintenance/services that may require base support.

3.4.4. Resource constraints. If you are faced with a resource constraint, you will need time to select an alternative to some planned strategy or delivery approach. Remember that any instruction, whether a topic within an existing course or a complete course, is always a sub-element of a larger system. In addition, most courses have constraints, such as maximum course length, manpower, budget, and student minimum/maximum class size, all of which are

driven by the agencies that receive the graduates of the course. Ignoring these constraints may lead to an instructional package that is either too large for the time allotted, or one that requires too large a share of resources compared to the relative importance of the course to the overall missions of the DAF.

3.4.5. Updating resource requirements. During initial planning and analysis, it is unlikely that you can completely and accurately identify all resources you will need. As the instructional development process continues, there will be a continuing need to update the resource requirements to ensure that adequate resources are available for your instructional program.

3.5. Target Audience Analysis / How to Evaluate in the Analysis Phase.

3.5.1. Conducting an analysis of the target audience allows you to design the instructional system based on the knowledge and attitudes the target audience is likely to bring to the course. This reduces the likelihood of a mismatch between the students and the level of course content. Target audience analysis produces various data depending on the nature and scope of the analysis. Examples of the data produced are:

- Range of aptitudes.
- Previous background and experiences.
- Previous education.
- Interests.
- Physical characteristics.
- Size of target audience.
- Digital literacy.
- Supervisory experience.
- Grade.
- Command experience.
- Subject matter experience.
- Writing proficiency.
- Psychological suitability.

3.5.2. Use of the data. The data produced during analysis of the target audience results in a typical student profile and is used by the instructional designer to determine:

- Course content.
- Level of course content.
- Media.
- Delivery methods.
- Course length.
- Equipment needs.
- Affective strategies.

3.5.3. Evaluating in the analysis phase. Take into account the following points:

- Ask someone who is not involved in the course development effort, but who is knowledgeable in the content to be taught, to review the data sources used in the learning analysis to ensure all relevant subject matter experts and appropriate directives have been consulted.
- Ask someone who is not involved in the course development effort, but who is knowledgeable in learning theory, to review your learning analysis as an additional review.
- Review the resource analysis with one or more individuals not involved in the course development effort who have expertise in resource requirements to validate the assumptions on which your analysis was based.
- Review your target audience analysis to ensure you have given appropriate credit to your audience for previous knowledge, skills, abilities, and attitudes they bring into your instructional situation. Take into account competencies, badges, and credentials they already possess.

3.6. ISD Management Plan / Project Management Plan Update.

3.6.1. Project management. During the initial planning of the ISD project, an **ISD management plan** is developed to serve as a road map for managing the instructional development process. As the analysis phase of the ISD project is completed, the management plan may need to be updated based on information gathered. **See attachment 4**, sample project management plan.

3.6.2. The ISD management plan should be updated after each phase of instructional development, as applicable. Update the plan to include the latest information, such as:

- New or revised milestones.
- Refinements to project definition.
- Changes in project resource requirements or constraints.
- Revisions to support requirements.
- Identification of new taskings.
- New information resulting from analysis that impacts project management.

Chapter 4
Design

4.1. Introduction.

4.1.1 Once the required analysis is complete and evaluation and management plans are updated, the **design phase** of ISD may begin.

4.1.2. The design of instruction defines:

- What exactly your course will contain.
- How you will measure what the students learn.
- How you will teach the material.
- How the school will implement the course.
- How you will collect and maintain student and course data.
- How the design affects the evaluation/management plan adjustments.

4.2. Develop Objectives.

4.2.1. The first activity in the design phase is to develop objectives. Objectives are the cornerstones of learning. Objectives are developed at all levels of instruction where evidence of learning is required.

4.2.2. An objective is a statement of what students are expected to demonstrate as a result of instruction. Objectives are usually used to identify outcomes of units, blocks, modules, and instructional periods. Some of the purposes of an objective are to:

- Serve as the foundation for instructional design.
- Provide the basis for instructional strategy decisions.
- State expected student behaviors.
- Determine content of the instruction.
- Serve as a basis for developing test items and performance appraisals.
- Demonstrate student accountability.
- Validate instruction.

4.2.3. Goals vs. objectives. Educational objectives are not to be confused with educational goals, which are published outcomes of instruction in terms of broad intent, state, or condition. When educational goals are published, there are usually several educational objectives published that serve as evidence of achievement of the broadly stated goal.

4.2.4. Types of objectives. **Terminal objectives** are usually designed to identify required learning outcomes at the end of major divisions of a course, such as a module, unit, or block. However, terminal objectives may be written for stand-alone periods of instruction such as, something that is a specific requirement/certification within either a block or unit or separate from it. Objectives for short courses are usually stated as terminal objectives. Terminal objectives are also known as primary objectives.

Developmental/Enabling objectives are prerequisite outcomes that form the building blocks necessary to achieve a terminal objective. These objectives provide the opportunity to evaluate student progress toward the terminal objective, but do not serve as proof of achieving the terminal objective. Developmental objectives are also known as enabling, secondary, supporting, and/or subordinate objectives.

4.2.5. Formats for objectives. **Level-of-learning objectives** contain a specific level of learning and a clearly stated subject expressed in terms of what students are expected to achieve. Level-of-learning objectives represent a large domain of behaviors at a specific level of proficiency. Curriculum designers must carefully select representative, **measurable samples of behavior (MSB)** from the domain of behaviors that will serve as evidence of objective achievement. MSBs are the basis for constructing written test items or performance appraisals. They may be written in the format that possesses all the criteria of a criterion objective, such as behavior, conditions, and standards, or published as behavioral statements only.

4.2.6. Criterion objectives are statements that specify precisely what student behavior is expected. Complete criterion objectives are made up of three parts:

- **Behavior(s)** – What the students will be able to do (for example, list the names of the Joint Chiefs of Staff).
- **Condition(s)** – Environment in which they will do it (for example, using student manuals, list the names of the Joint Chiefs of Staff).
- **Standard(s)** – How well they will do it in order to demonstrate that they have learned (for example, "…list the names…within two minutes").

4.2.7. Activity statements or expressive outcomes are planned activities that have no explicit or precise objectives. These statements are appropriate, especially in short, standardized programs, for presentations where the content is changing so rapidly that formalized objectives, lesson plans, and measurement devices are inappropriate. An activity statement might read. "Participate in an interchange with company grade officers to discuss problems and perceptions in today's military environment." The use of activity statements must be fully justified and occupy a very small percentage of the total curriculum. These types of statements are usually used for large group presentations, but may be used in small group settings also.

4.2.8. The three major categories of learning outcomes (cognitive, affective, and psychomotor) require somewhat different approaches to stating objectives.

Cognitive level-of-learning objectives require measurable samples of behavior verbs that serve as observable, measurable evidence of a more general mental activity such as *know, comprehend, or apply.*

Affective level-of-learning objectives require measurable samples of behavior verbs that serve as observable, behavioral evidence of a more general feeling state such as *receive, respond, or value.*

Psychomotor objectives use measureable samples of behavior verbs that describe observable actions usually associated with a process or procedure involving manipulative skills, such as *assembles, measures, alters, and dissects.*

4.2.9. Objectives in education. Instructional objectives in the educational area usually fall in the cognitive or affective taxonomy of learning. Cognitive objectives focus on basic knowledge, concepts and principles, and cognitive skills which include the application, analysis, synthesis, and evaluation of principles or generalizations. Affective objectives focus on voluntary student receiving, responding, and valuing, organizing, and characterizing levels. However, few educational objectives are published at the receiving or responding level for adults.

Affective objectives at the characterizing level of valuing and higher levels are seldom published except for courses or schools of several years in duration, or when concepts or principles are threaded through several schools over many years across a continuum of education, such as ethical principles, leadership concepts, etc. Since cognitive and affective objectives in education cover a large domain of behaviors, a sampling of behaviors from the larger domain is accepted practice. Careful consideration should be given to selection of behaviors that provide significant evidence of achievement of a more general and abstract outcome.

4.3. Guidelines for Developing Objectives.

4.3.1. The process. When the overall course goal or mission statement has been agreed upon, that statement becomes the focal point for all course development that follows. **Also, see attachment 5**, learning objective worksheet.

4.3.2. Goals or objectives. G**oals or objectives** divide the curriculum at the top level (course outcomes). Goals describe expected outcomes in terms of broad, general intent. Goals do not generally use specific levels of learning in order to avoid confusion with educational objectives. Objectives, when published, should exhibit the characteristics of a level-of-learning objective or criterion objective. Objectives published as level-of-learning outcomes should be followed by an adequate number of measurable samples of behavior.

Block objectives. Block objectives, also known as module objectives, are major subdivisions of an area and the first level of detail beneath the area goal or objective. Block objectives published as level-of-learning objectives should be followed by an adequate number of measurable samples of behavior.

Unit objectives. Each block objective and unit objective (if used) is, in turn, divided into a series of instructional periods. Unit objectives are more specific than block objectives. In the unit objectives, you decide on the learning activities. Unit objectives published as level-of-learning objectives should be followed by an adequate number (three or four) of measurable samples of behavior to state specific desired student outcomes.

Selecting the behavioral performance statement appropriate for a given level of learning will enable students to demonstrate clearly the desired observable behavior. You need to look at the **total** context of the behavioral statement to determine the level of the sample, not just at the verb used. Cognitive and affective levels of learning with corresponding behavioral verbs for stating specific learning outcomes are listed in the following tables.

4.3.3. Level-of-learning objective verbs. Cognitive.

Note: The same verbs, may be used to describe multiple learning levels or learning tasks, because they identify what the learner is to do with the content. The nature of the content to be learned helps determine the learning level or task. For example, see the verb "describe" identified in levels 1 and 6, or "relate" in levels 3, 4, 5 and 6, or "differentiate" in levels 3 and 4, etc. Verbs listed are not all inclusive. Additional verb list can be found in MIL-HDBK-29612-2A, Table 13.

Knowledge. The recall of previously learned material (facts or theories) in essentially the same form taught.

Acquire	Define	Describe	Detect
Identify	Label	List	Mark
Match	Name	Outline	Recall
Recognize	Reproduce	Select	State

Comprehension. Seeing relationships**,** concepts, and abstractions beyond the simple remembering of the material. Typically involves translating, interpreting, and estimating future trends.

Compare	Contrast	Convert	Defend
Distinguish	Estimate	Explain	Extend
Generalize	Give Examples	Illustrate	Infer
Interpret	Paraphrase	Predict	Rephrase
Represent	Summarize	Transform	Translate

Application. The ability to use learned material in new and concrete situations, including the application of rules, methods, concepts, principles, laws, and theories.

Administer	Change	Compute	Demonstrate
Develop	Differentiate	Discover	Employ
Identify	Manipulate	Modify	Operate
Predict	Prepare	Produce	Relate
Restructure	Solve	Transfer	Use

Analysis. The ability to breakdown material into its component parts so the organizational structure may be understood, including identification of the parts, analysis of the relationships between parts, and recognition of the organizational principles involved.

Break Down	Categorize	Classify	Deduce
Diagram	Differentiate	Discriminate	Distinguish
Identify	Illustrate	Outline	Plot
Point Out	Relate	Select	Separate

Synthesis. The ability to put parts together to form new patterns or structures, such as a unique communication (a theme or speech), a plan of operation (a research proposal), or a set of abstract relations (schemes for classifying information).

Combine	Compile	Compose	Create
Derive	Design	Develop	Devise
Explain	Formulate	Generate	Modify
Organize	Produce	Rearrange	Reconstruct
Relate	Rewrite	Tell	Write

Evaluation. The ability to judge the value of material for a given purpose. Learning in this area is the highest in the cognitive hierarchy because it involves elements of all the other categories, plus conscious value judgments based on clearly defined criteria.

Appraise	Assess	Conclude	Criticize
Decide	Describe	Interpret	Judge
Justify	Relate	Summarize	Validate

4.3.4. Level-of-learning affective verbs.

Note: The same verbs may be used to describe multiple learning levels or learning tasks, because they identify what the learner is to do with the content. The nature of the content to be learned helps determine the learning level or task. For example, see the verb "describe" identified in levels 1 and 3, or "explain" in levels 3 and 4, etc.

Receiving. The getting, holding, and directing of the student's attention, from the simple awareness that a thing exists to selective attention on the part of the learner.

Ask	Choose	Describe	Follow
Give	Hold	Identify	Locate
Name	Point to	Reply	Select

Responding. The student not only attends to a particular phenomenon, but also reacts to it in some way such as acquiescence (reads assignment), or satisfaction in responding (reads for enjoyment). Includes instructional objectives related to "interests."

Answer	Assist	Comply	Conform
Discuss	Greet	Help	Label
Perform	Practice	Present	Read
Recite	Report	Select	Tell

Valuing. The worth or value a student attaches to a particular object, phenomenon, or behavior ranging from acceptance of a value to commitment. Includes instructional objectives related to "attitudes" and "appreciation."

Complete	Describe	Differentiate	Explain
Follow	Form	Initiate	Invite
Join	Justify	Propose	Report
Select	Share	Study	Work

Organizing. The bringing together of different values, resolving conflicts between them, and beginning to build an internally consistent value system. Includes instructional objectives related to a "philosophy of life."

Adhere	Alter	Arrange	Combine
Compare	Complete	Defend	Explain
Generalize	Identify	Integrate	Modify
Outline	Organize	Prepare	Relate

Characterizing by a Value or Value Complex. Pervasive, consistent, and predictable behavior (lifestyle) developing from a value system, which controls behavior for a significant period of time. Instructional objectives focusing on personal, social, and emotional adjustments are in this category.

Act	Discriminate	Display	Influence
Listen	Modify	Perform	Practice
Propose	Qualify	Question	Revise
Serve	Solve	View	Verify

4.4. Organization of Objectives.

4.4.1. Organizing objectives. In organizing objectives, you may work from general statements or goals to specific objectives to produce an objective hierarchy of the course structure and organization. Organizing produces a developmental structure that allows you to tell the students, what they will achieve overall and the enabling outcomes that will contribute to this learning.

4.4.2. Levels of objectives. A learning outcomes hierarchy consists of two or more levels. Terminal outcomes describe the end result of the instructional experience. These outcomes may be published as goals and/or objectives. Developmental objectives are a series of enabling outcomes that increase the probability of achieving a complex terminal outcome. This approach makes it possible to check learner performance in the developmental stage and provide feedback and remediation as necessary.

4.4.3. Terms for objective levels. Learning hierarchies use various terms to describe educational outcomes. The most common terms used to distinguish these levels are:

- Terminal outcome.
- Goal and/or objective.
- Terminal objective.
- Primary.
- Developmental level.
- Interim.
- Enabling.

4.4.4. At the course goal or mission level, the outcome is a broad, general statement. However, as the course outcomes are analyzed and organized systematically into smaller units, the objectives become more specific. This systematic arrangement provides a learning hierarchy for the course.

Course Outline Hierarchy – A learning hierarchy of objectives provides the structure for a course outline, as shown below.

1.1 Course Goal (Mission Statement) or Objective (Specific Outcomes)
1.1.1 Block Objective
1.1.1.1 Unit Objective

2.1 Level-of-Learning Hierarchy Objectives:
2.1.1 Course Goal (Mission Statement)
2.1.1.1 Block Objective
2.1.1.1.1 Measureable Samples of Behavior
2.1.1.2 Unit Objective
2.1.1.2.1 Measureable Samples of Behavior

4.5. Developing Tests.

4.5.1. An effective measurement program is essential for all instructional systems and tests are good tools to use to gauge student achievement of the objectives. To ensure that tests adequately measure the objectives they support, the performance required in the test must match the performance required in the objective. To the greatest extent possible, tests should reflect the performance and conditions DAF personnel would experience in the workplace. A good way for you to develop tests that measure the objectives is to develop tests immediately after you have developed the objectives and before starting to develop instruction. Ensure you are meeting the correct learning level/outcome. **See attachment 6**, proficiency code key.

4.5.2. Tests serve several purposes:

- Identify problems or weaknesses in the instruction.
- Indicate whether a class is performing up to standards on specific objectives.
- Indicate instructor proficiency.
- Diagnose problems in the instructional program.

DAF educational measurement measures individual student performance with respect to standards that are specified in the objectives. To attain acceptable performance, the student must meet or exceed the standards specified for the test.

4.5.3. Characteristics of tests. There are six basic characteristics that should be considered when developing tests to ensure they measure what is intended each time they are administered.

Table 4.1. Characteristics of Tests.

Characteristics	Refers to
Validity	Degree to which a test measures what it is intended to measure.
Reliability	Degree to which a test yields the same results consistently.
Objectivity	Ability of a test to be free from variations due to factors other than the behavior being measured.
Comprehensiveness	Adequacy of a test to sample what is being measured. This characteristic relates to content validity.
Differentiation	For a criterion-referenced test, the ability of the test to distinguish between students who have mastered the knowledge or skill being tested and those who have not mastered it. For a norm-referenced test, the ability of the test to distinguish between the level or amount of acquired knowledge or performance ability each student has attained.
Usability	Test that is easy to administer, score, and interpret.

4.5.4. Classification of tests. Most tests can be classified into two main groups: written tests and performance tests. There are two types of written tests:

Selection – Requires the student to choose the correct answer from several provided. Examples are:

- Multiple choice.
- True-false.
- Matching.

Supply – Requires that the student supply the answer from recall. Examples are:

- Essay.
- Completion (short answer).
- Labeling (identification).

There are two types of performance tests:

Product tests, evaluate students' product that is tangible, permanent, and observable.

Process tests, evaluate observable processes or procedures where verbal skills are observable.

4.5.5. Test construction factors. Several key factors should be considered when constructing tests.

What to measure. Determine what to measure from the objectives created for desired learning outcome. For selection-type test items, two to four test items may be needed to adequately measure each sample of behavior. Tests should measure application of principles, knowledge of factual information, ability to perform tasks, and transfer of knowledge and skills to solve similar problems. The higher the level of learning, the more demanding, complex, and abstract is the performance expected. Supply-type test items may be designed such that one item measures several samples of behavior simultaneously. Thus, the number of supply items needed to address all samples of behavior depends on the item's complexity.

Test length. Adequate coverage of the course objective is one of the major factors in determining the length of the test. Another important factor is the time available for testing. If time available for testing does not allow for administering a test large enough to measure all course objectives, consider creating several smaller tests that could be administered sequentially throughout the course. Longer tests are considered more reliable than shorter tests because they cover more material, more completely. However, the overall content validity of a series of short, related tests can be considered equivalent to the content validity of a single, large test containing items from all the smaller tests.

Selection and arrangement of test items. Select test items that cover the most important points of the material. Test items should be clear, concise and well written to minimize misunderstandings. Items of the same type should be grouped together in a test. Individual test items should also be arranged in approximate order of difficulty, which allows the students to progress as far as they can without spending excessive time on difficult items at the first part of the test.

4.5.6. Constructing written tests. Tests must be well written in order to measure what students have learned or can do. Following is information on preparing the most common types of written tests. For more info on testing, refer to MIL-HBK-29612-2A.

Multiple choice. Multiple choice tests are probably the most-used written test. They are used for testing problem-solving skills, application of facts and principles, and understanding. A multiple-choice item consists of a stem (a question or uncompleted statement), a correct response, and distractors (incorrect responses). They can be written at higher comprehension levels but can be very difficult to construct, especially for novice test writers. Construction guidelines are:

- Do not use the articles "a" and "an" at the end of the stem; this can tend to indicate the correct answer.
- All responses should follow grammatically from the stem.
- All responses should be of approximately the same length.
- All responses should have a similar grammatical structure.
- All responses should use similar terminology.
- Provide as many responses as necessary, but normally no less than three.
- Position the correct response randomly throughout the final test.

- Limit the use of responses such as “none of the above” or “all of the above.”
- Distractors should be plausible, but incorrect.
- Responses should be arranged in order so that they increase or decrease in length.

True-False. True-false tests are often used when you desire students to identify a completely true or false statement. True-false tests should be used sparingly, since the chance of random guessing is high. Construction guidelines are:

- Include only one idea in each statement.
- Place the crucial element at or near the end of the statement.
- Avoid using negatives such as “not,” as they tend to confuse students.
- Do not use absolutes such as “all,” “every,” “none,” and “never.”
- Do not use statements containing “some,” “any,” and “generally.”

Matching. Matching tests are used to measure the students' ability to identify and discriminate among related or similar items. Matching items normally use two columns of related items, and students are required to match a series of items listed in one column with related items in the other column. It provides a way to test multiple knowledge levels simultaneously. Construction guidelines are:

- Provide clear, concise directions on how to match the items in the two columns.
- Indicate whether the responses may be used more than once or not at all.
- Limit test items to a single area and the choices to a single subject matter category.
- Arrange the responses in the same logical order.

Completion. The completion test item requires the students to recall and supply one or more key words that have been omitted from the statement. The word(s), when placed in the appropriate blanks, make the statement complete, meaningful, and true. Construction guidelines are:

- Leave blanks for key words only.
- Keep items brief.
- Make all blanks approximately the same size.
- Grammatical cues to the correct answer, such as the articles “a” and “an” right before the blank, should be avoided.
- Ensure that only one correct answer fits each blank.

Labeling or Identification. These tests are used to measure a student's ability to recall and label parts in pictures, schematics, diagrams, or drawings. This form of testing is most often used to measure recognition of equipment components or other concrete objects. Construction guidelines are:

- Make all sketches, drawings, and illustrations clear and of sufficient size. If possible, use the actual parts of equipment.
- Provide sufficient information to indicate what the equipment is and which part is to be labeled.
- Parts to be labeled or identified should be clearly pointed out by using lines or arrows.
- Ensure that only one definite answer is possible.

Essay. Essay testing should be used when students are required to think reflectively or creatively, to organize knowledge in the solution of a problem, and to express their solutions in writing. The essay test encourages a wider range of study and learning than other test items. Essay tests are not the same as written papers and/or electronic papers. Although some essay tests may be rather comprehensive, they do not generally require the student to develop an extended logical or factual argument for more than a few hundred words. Papers, on the other hand, require students to extend their arguments typically over several thousand words. Construction guidelines are:

- Test several objectives in an essay.
- State the item clearly so the student will know exactly what is expected.
- The essay item should ask for comparisons, decisions, solutions, cause-effect relationships, explanations, or summaries. All of this should be in the rubric for grading the essay.
- When possible, use more essay items and limit the discussion on each.
- Set limits on essay questions, such as time or number of words.

4.5.7. Performance test items. Performance test items are used to measure knowledge of a subject as well as the ability to perform the skills. Knowledge at each of the learning levels (e.g. fact, rules, procedures, discriminations, and problem solving) may be required to successfully perform the skill. Perception, gross motor, continuous movement, and readiness may all be required to achieve performance at the mechanism level. Understanding each learning level for both knowledge and skill types is required for precise evaluation of a performance and pinpointing error. When developing performance test items, use the following steps:

- List steps/activities/behaviors (process) or characteristics (product).
- Note common errors that are made when using the checklist.
- Arrange activities or steps and characteristics in correct order. Identify activities, steps and characteristics critical to achievement and those less critical. When appropriate, develop a hierarchy of must perform and must have steps to pass the performance test, skills and steps of lessor importance (nonessential) will carry less weight for rubric scoring.
- Review the checklist for accuracy and completeness. For mastery performance, some steps and activities are critical and others are not. Identify essential steps/tasks/activities necessary to complete the basic performance tasks (pass). Some steps in the task are nonessential or/and could be skipped while still reaching the threshold of performance mastery.

4.5.8. Constructing performance test items/checklist. Performance test items, which require the student to perform a task, usually have the format of a checklist. The checklist is developed to correspond to the steps or activities of the task being performed and the underlying knowledge and skill elements. This may help identify precisely what occurred during performance. During the performance test, an evaluator observes the student performing a series of steps or activities while rating the steps on a checklist (process evaluation). An evaluator may also rate the end product of a performance on a checklist (product evaluation). The checklist rubrics should include if any assistance is allowed and if

any errors are acceptable and the number allowed. Clearly state the pass/fail criteria so the student is aware of how many errors if any are allowed and which ones are critical.

4.6. Review and Use Existing Materials.

4.6.1. Developing instructional materials is an expensive, time-consuming task regardless of the medium used. After developing the objectives and tests, one of the first tasks is to determine if materials already exist that will support the objectives. It is possible that some of the material found during the review may not totally satisfy the need. In this case, don't hesitate to modify the materials to fit the need. Even the use of some portions of existing materials will be economically advantageous. In every case, time spent reviewing existing material will be time well spent.

4.6.2. Does material already exist that will support the objectives? Several benefits to be gained from using existing material are:

- Time – Developing instructional materials is time-consuming; therefore, using existing materials will save time.
- Personnel – Using existing materials saves man-hours that can be spent developing other portions of the instruction.
- Material – Valuable materials will be saved.
- Funds – Time, personnel, and materials cost money.

Materials exist that cover almost every aspect of instruction such as leadership, mathematics, weather, and management. Several sources of existing materials are:

- DoD.
- Other federal agencies.
- Industry/commercial.
- Colleges and universities.
- Defense Video and Imaging Distribution System (DVIDS).
- Web-based resources.

Types of existing material. Existing materials can be found in many different types of media. For example, materials may exist in one or more of the following:

- Textbooks/publications/technical orders/handbooks.
- Video.
- Computer-based systems.
- Job aids.
- Training aids.

4.6.3. How to select materials. In order to select the appropriate materials, a deliberate and thorough review of existing materials must be conducted. After it has been determined what instructional materials are needed to support the objectives and materials and have been gathered for review, the review process is ready to begin. A good way to conduct a review is to use a job aid. The job aid helps to standardize the process and allows a comparison

between materials under review. The following is an example of a job aid that can be constructed to aid in the selection or review of existing materials.

Existing Material Checklist	
	Yes/No
Does the material meet the requirements of the objective(s)?	
Is the content level of the material appropriate?	
Is the material accurate?	
Is the material current?	
Is the material copyrighted?	
Does the material address motivational factors?	
Is the material properly sequenced?	
Does the material provide sufficient guidance?	
Are sufficient practice exercises provided?	
Are the measurements adequate?	

Other types of job aids or forms can be used to review and select materials. Keep the job aids or forms as simple as possible. Another example of a job aid that can be adapted for use is provided below.

Material Review Rating Form		
Evaluator: _____	Date:_____	
1. Objective		
2. Type of Media		
3. Evaluation of Material	Poor Good Excellent	
Content:	1 2 3 4 5	
Accuracy		
Currency		
Level		
Structure:	1 2 3 4 5	
Organization		
Sequence		
Suitability:	1 2 3 4 5	
Support objective		
User-friendly (readability)		
Pace		
Guidance		
Feedback		

Motivational
Measurement
Conditions of release or use
4. What do I like about the material?
5. What do I dislike about the material?
6. Can the material be modified to improve its utility? If so, what should be done?

4.6.4. Making existing material usable. The materials you need may or may not exist. If they do, they may require modification before they can be used in course development. If this is the case, consider modifying or updating the material (unless it is copyrighted), since it is normally cost-effective and efficient to do so. Modifications of existing materials may include the following:

- Adding new material.
- Expanding existing material.
- Deleting material.
- Updating material.
- Resequencing material.

If existing material is copyrighted, you should obtain permission from the publisher before using it.

4.7. Design Instructional Plan.

4.7.1. Once the objectives and tests/assessments have been developed and existing instructional materials have been reviewed for usability, you are ready to start designing instruction. Designing quality, cost-effective instruction is the ultimate goal in this phase of ISD.

4.7.2. Select instructional material. In the design phase, one of the first and most important tasks is that of selecting the **instructional method**. In order to select the most appropriate method, several key factors must be considered which have a direct impact on the effectiveness and efficiency of the instructional system. Instructional method is the procedure or process used to attain an objective(s). Examples of instructional methods are:

- Lecture.
- Team learning and teaching.
- Demonstration.
- Self-study.
- Discussion.
- Cooperative Learning.
- Case Study.
- Experiential.

4.7.3. Continuum of instructional methods. "Method" is the primary way a learning experience will be conducted. One consideration in selecting a method is the degree of learner control desired.

Below are factors for instructor-centered learning and learner-centered (also known as student centered) learning

Table 4.2. Factors for Instructor-centered and Learner-centered Learning.

Instructor-Centered Learning	Learner-Centered Learning
Dependence on instructors	Dependence on each other and self
High stimulus control by: Instructor Information Knowledge Cognitive Intellectual Formal Passive learner role	Low stimulus control by: Instructor Behavior Attitudes Self-insight Experiential Informal Active learner role

4.7.4. Traditionally, most DAF instruction has been instructor-led. The instructor's role in the classroom placed the instructor in control. Students had little control over what they learned, how they learned it, or how much time they spent. It became very easy to develop instructional programs for the instructor rather than the student. Emphasis is now being placed on students controlling the learning situation. Emerging technologies, combined with adult learning theories, are changing the emphasis from instructor-controlled to learner-controlled instruction. The first effort in learner-controlled instruction goes back many years to programmed text, which had limited application. However, with the new technologies, the possibilities are almost unlimited. Interactive technologies, such as ICW, can allow the learner to control what objectives to work on, how to sequence the lessons, the pace of the instruction, and how many and what kind of examples to review. In many cases, adults learn better when they can control the learning situation according to their individual needs.

4.7.5. Other factors to consider in method selection:
Subject:

- Is direct information needed?
- Are there different points of view to be presented?
- Is this a controversial subject, which will stimulate discussion?
- Is there a problem-solving dimension?

Facilities:

- Does the room lend itself to functional use?
- How can the setting be adapted to facilitate discussion?
- Is equipment available?

Target audience:

- How large is the class?
- What is the level of education, aptitude, background, and interests of the class?

Some traditional methods of instruction are discussed below in **Table 4.3**.

Table 4.3. Application of Traditional Methods.

Method	Definition	Advantages	Disadvantages	Appropriateness
Lecture.	Discourse given before a class or an audience for instructional purposes without questions (Formal) or interaction with the students (Informal).	Useful if time is short. Many ideas can be presented. Useful where subject matter changes frequently.	Limits student participation. Lecture becomes a "telling session" for instructor. Checking Student learning before testing is difficult. Student attention and interest may wander.	On-the-job instruction. Formal course. Correspondence course (on video or web). Distance learning. Knowledge building.
Demonstration.	Accurate portrayal of the precise actions necessary to perform skills or processes – may be presented directly (classroom instructor) or indirectly (video/online).	Useful in teaching motor skills, simple manual skills or processes. Sets standards of performance. Focuses attention upon basic procedures.	Demonstrator must be skilled performer. Since student does not perform during demonstration, student learning cannot be evaluated except through questioning. Number of student observations may be limited.	On-the-job instruction. Formal course. Knowledge and skill building.
Questioning.	Discourse by the student before an instructor in which the student relates what has been learned through previous study.	Useful for assessment of learning by instructor. Useful for providing feedback to student. Useful for verbal content and concepts.	Participation of other students not reciting is limited and their attention and interest may wander.	On-the-job instruction. Formal course. Knowledge building. Motivation.

Method	Definition	Advantages	Disadvantages	Appropriateness
Guided Discussion.	Instructor-controlled interactive process of sharing information and experiences related to achieving a lesson objective.	Useful as an extension of existing knowledge or to clarify and amplify familiar material. Useful when students must learn to identify and solve problems and to frame their own decisions. Useful when students need to be exposed to a variety of approaches, interpretations and personalities. Useful when teamwork is needed.	Time-consuming and limited by class size. Requires that participants have sufficient background so that they can talk about subject.	On-the-job instruction. Formal course. Knowledge building. Motivation.
Performance.	Student interacting with things, data, or persons, as necessary to attain objectives – includes all forms of simulations and interaction with actual equipment or materials.	Permits student to apply learning to actual situations. Allows practice with job-similar conditions, under supervision and guidance.	Time-consuming because students must be given the opportunity to practice until they reach proficiency. May require special facilities and equipment, which may be expensive and difficult to obtain. Once obtained, equipment must be constantly maintained.	On-the-job instruction. Formal course. Skill building.
Self-Directed.	Readings or document research, which students undertake on their own without special	Useful as an adjunct to other methods of instruction. Useful as an improvement to individual's present job performance. Useful to prepare an individual for a	Student must be motivated and have initiative. Completion rates significantly lower. Students object to lack of social interaction.	Correspondence course. Formal course. Knowledge and skill building.

	guidance or instruction.	promotion. Allows a student to pursue a special interest not shared by other students.		
Method	Definition	Advantages	Disadvantages	Appropriateness
Programmed Self-Instructional.	Instructional materials are prepared specifically to employ techniques of programming. Classical programmed instruction variables include "small steps," carefully sequenced and cued to reduce error; immediate feedback; and freedom on the part of students to vary their own rate of learning.	Useful in accommodating individual differences in rate of learning, background, and experience. Useful if scheduling is a problem as students may work through materials when convenient. Provides uniformity of instruction. May be sole source of instruction or supplementary.	Development cost is comparatively high. Development time and revision time are comparatively long because of validation. Students using programmed instruction object to lack of social interaction.	Correspondence course. Formal course. Knowledge and skill building.
Case Study.	A carefully designed description of a problem situation, written specifically to provoke systematic analysis and discussion.	Can extend existing knowledge. Promotes concept exploration and discussion. Useful when teamwork is needed.	Can become outdated quickly. Development time and revision time can be relatively long. Can be time-consuming in a discussion format.	Formal course. Seminar.
Method	Definition	Advantages	Disadvantages	Appropriateness
Games and Role-Playing.	(Games) Win/lose situations,	Students can "practice" taking the responses to	Students may be inhibited about participating.	Formal course. Knowledge and skill building.

	which dramatize certain principles. (Role-playing) Active process in which learners "act out" selected situations.	various situations, which are similar to the real job. Active participation. Expansion or compression of real time. Allows focus on more subtle and less easily defined human relationships.	Students may become so involved in simulation that they fail to observe processes. Evaluation is difficult because behaviors affected by process are difficult to measure.	Motivation.
Experiential.	Life experiences, (professional and personal) that provide context within which to internalize and assimilate new learning.	Gives student a "vested interest" in learning. Virtually guarantees student will internalize new learning if it is tied to his/her previous experiences.	Not very effective for students with little or no experiential base.	Formal course. Seminar.

4.7.6. Matching methods to desired learning outcomes. Methods of instruction can determine success or failure in reaching desired learning outcomes. One should match methods to the type of learning, as listed below.

Table 4.4. Learning Outcomes.

Type of Learning Outcome	Appropriate Methods
KNOWLEDGE (Generalizations about experience and internalization of information)	Lecture, television, debate, dialogue, interview, symposium, panel, group interview, colloquy, recording, video, book-based discussion, reading.
UNDERSTANDING (Application of information and generalizations)	Audience participation, demonstration, motion picture, dramatization, Socratic discussion, problem-solving discussion, critical incident process, case method, games.
SKILLS (Incorporation of new ways of performing through practice)	Role-playing, in-basket exercise, games, action mazes, participative cases, T-group, nonverbal skill practice exercises, drills, coaching.
VALUES (Adoption and priority arrangement of beliefs)	Television, lecture (sermon), debate, dialogue, symposium, colloquy, video, dramatization, guided discussion,

	experience-sharing discussion, role playing, critical incident, process, games, T-group.

4.8. Select Media.

4.8.1. As you have seen, selection of instructional methods and media are discussed separately. However, in many applications they can't be considered separately. Regardless of whether they are considered together or separately, media selection is of no less importance to the design process. No single medium is the most appropriate choice for every instructional situation. Selecting the appropriate media ensures the information to be learned is presented to the students by the most effective and efficient means possible.

4.8.2. Media are the means, instruments, or materials used to communicate information. In other words, a means of giving information to the students. The following are examples of instructional media.

Table 4.5. Instructional Media.

Instructional Medium Group	Representative Examples
Classroom instructor with Classroom aids Classroom instructor Instructional aids	Lecturer Demonstrator Tutor/coach Smartboard Computer Visuals
Multimedia	Pre-narrated PPT slides Workbook Combinations Interactive Courseware
Print	Books Computers Programmed instruction booklets Student guides
Peer (or peer group)	Role playing Discussion groups Debates Case studies Problem or resolution scenarios
Training devices and simulators	Actual equipment trainers Gaming Interactive computer (simulation) Flight training simulators

4.9. Develop Lesson Plans.

4.9.1. Steps in lesson planning. The individual lesson plan is the plan you produce to organize what you present in a lesson, as well as when and how. Recommended steps to use in the planning of new lessons include:

- Determine the objective.
- Create rough draft of the evaluation instrument(s).
- Finalize the evaluation instrument(s).
- Research the topic defined by the objective.
- Select the instructional method.
- Identify your planning format.
- Decide how to organize the lesson.
- Choose the support material.
- Prepare the lesson from beginning to end.
- Prepare a final outline.

Your hierarchy of objectives should provide an adequate starting place for building individual lessons. You may find it useful to attach learning planning products to your objectives as you proceed. **See attachment 7** for an example lesson plan.

4.9.2. Specify learning content. Identification of lesson content specifies the inputs (materials, information, instructions) the learner will use to achieve the objective. Attaching the input specifications to the objective enables the planner to identify what resources and materials must be prepared or obtained and provided to learners in order to help them achieve behavioral objectives.

4.9.3. Design presentation sequence. Once the objectives/content selection is complete, the presentation sequence can be designed for the entire course. The following guidelines are offered for the sequencing of content. Also see Gagne's Nine Instructional Events for additional info.

- Place easily learned material early in the sequence.
- Introduce broad concepts and technical terms early in the sequence.
- Place the practical application of concepts and principles close to the point of initial development.
- Place prerequisite knowledge and skills in the sequencing prior to the points where they must be combined with subsequent knowledge, skills, and application.
- Provide for practice and review skills and knowledge, which are essential parts of later lessons.
- Introduce a skill concept in the lesson in which it is most frequently used.
- Do not overload any lesson with elements that are difficult to learn.
- Provide for practice of required skills and review of concepts and principles in areas where transfer of identical or related ability is not likely to occur unaided.
- Place complex or cumulative skills late in the sequence.
- Design curriculum in a way to motivate student learning.

4.10. Develop Implementation Plan.

4.10.1. An implementation plan documents the design of the instructional program and the plan for implementation. Plans may include, but not be limited to, information such as:

- Student information such as rank, age, service, etc.

- Parameters of the instructional system such as number of classes, start and grad dates, etc.
- Type of instruction.
- Instructional methods.
- Instructional content.
- Resource requirements.
- Design, development, and implementation milestones.

4.10.2. Implementation plans may include resource and control documents such as:

- Tasking letters or messages.
- Equipment lists.
- Personnel documents.
- Facility requirements.
- Course maps.
- Course charts.
- Resource constraints.
- Lesson plans.

4.10.3. Purpose of implementation plan. Implementation plans that are well developed have several purposes. Some of the purposes are:

- Document the instructional system.
- Identify resource requirements/constraints such as manpower, equipment, or facilities.
- Set the design, development, and implementation milestones.
- Serve as the approval document for operation of the instructional system.

4.10.4. Curriculum maps. The use of curriculum maps to document the relationship between every component of the curriculum is encouraged. Curriculum maps serve as an analysis, communication, and planning tool, allowing educators to review the curriculum to check for redundancies, inconsistencies, misalignments, weakness, and gaps. (Bick Har Lam & Kwok Tung Tsui (2014). *Curriculum mapping as deliberation-examining the alignment of subject learning outcomes and course curricula, Studies in Higher Education*, DOI: 10.1080/03075079.2014.968539.)

4.11. Design Instructional Information Management System.

4.11.1. The purpose of an automated instructional information management system is to enable those responsible to better manage system information in real time. Not everyone will need an instructional information management system, but for those who do, let us briefly cover some items. The automated system can be used by:

- Instructors to update student status.
- Registrar to track student status.
- Instructional designers to update instructional materials.
- Managers to manage resources.

4.11.2. Responsibility for designing an instructional information management system normally falls on a project manager. However, course managers have the responsibility to ensure that the instructional information is adequately managed for their instructional system. Course managers will typically be required to utilize an existing instructional information system. However, if given the opportunity to assist in modifying or developing an instructional information system the following should be taken into account.

- What is the cost?
- What are the hardware capabilities?
- Are there any special environmental requirements for the hardware?
- What are the software capabilities?
- Is the system documentation adequate?
- Who are the system users?
- Is the system's hardware and software user-friendly?
- Does this system have proven reliability?
- Is the system maintainable?
- Will the system interconnect/interface to existing systems?
- Is the system software compatible with other software?
- Does the hardware have expansion capability?
- Can the software be upgraded or modified easily?
- What instructional information will the system be able to manage?

4.12. What to Evaluate in the Design Phase.

4.12.1. Review the course objectives developed in this phase and ensure they are stated at appropriate levels of learning for the intent of the instruction.

4.12.2. Review test questions/assessments and ensure they are capable of measuring the instructional objectives at the stated levels of learning.

4.12.3. As this phase of the ISD process may be the most time-consuming part of the development effort, be sure to make a final check for existing course materials that may be useful in your program.

Chapter 5
Development

5.1. Introduction.

5.1.1. Once a detailed course design is established, the **development phase** may begin. Some of the tasks in this phase include writing materials, producing media, developing interactive courseware, and developing tests from test items created during the design phase.

5.1.2. Preparing a course syllabus. The course syllabus contains all details needed to implement the course. Although a course syllabus can be in different formats, it is normally organized by units or modules, with each unit containing information such as:

- Course identification such as title, number, security classification.
- Objectives.
- Preferred sequence.
- Hours and approximate allocations of hours to objectives.
- Standards that the unit supports.
- Instructor requirements.
- Methods such as lecture, discussion, and demonstration.
- Necessary support materials.
- Media utilization.
- Equipment utilization.
- Instructor guidance.
- Lesson plans.
- Copyright permission letters.
- Guest speaker invitations.

5.2. Develop Instructional Materials.

5.2.1. In the design phase, the method and medium best suited for the instructional need were selected. At this point, you are ready to start developing the course materials. Developing materials is a time-consuming and exacting task regardless of the medium you use.

5.2.2. Media are the means, instrument, or materials used to communicate information to the student. Examples of media include, but are not limited to, instructor lesson plans, study guides, CBT, satellite training, interactive video, web-based, etc. Instruction can be delivered using the following media:

- Slides, infographics, and micro-learning modules.
- Print-based material.
- Video.
- Interactive video.
- Training devices/aids.

5.2.3. Development activities. Development of materials for presenting instruction requires many activities. Some of the most common development activities are listed below.

Table 5.1. Development Activities.

Medium	Development Activity
Print	Draft/write material. Edit material. Publish material. Copyright release or payment.
Video	Storyboard/script. Shoot and edit video. Develop audio.
CBT	Storyboard/script. Develop graphics. Program/code computer.
Interactive Video	Storyboard/script. Shoot and edit video. Develop graphics. Develop audio. Program/code computer.
Internet (Web-based instruction)	Draft/write material. Edit material. Develop graphics if necessary. Take photographs (if necessary) and convert digital images. Shoot video (if necessary) and convert to digital video stream. Develop audio (if necessary). Convert to web-based language (Hyper Text Markup Language [HTML], Server-parsed Hyper Text Markup Language [SHTML], Dynamic Hyper Text Markup Language [DHTML], etc.) Develop additional control programming, if necessary (Java, Java Script, etc.)

Developing materials normally involves teamwork and requires various skills. Curriculum developers are responsible for planning, scheduling, and ensuring the materials are produced and correlated with the evaluation instrument. Additional help may be needed from subject matter experts, graphic artists, photographers, E-learning specialist, etc.

5.2.4. Guidelines for developing materials. When developing course presentation materials, make sure they:

- Support the objectives.
- Are student-centered.
- Meet the design that was specified in the design phase.
- Use techniques that are consistent with the principles of effective learning.

- Are appealing to the students.
- Are constructed so students will be attentive. Focus on making the material interesting and meaningful to the students.
- Require the students' attention. One way to accomplish this is to require specific responses or actions.
- Lead the student in the direction of the behavior specified in the objective. Desired student behavior is shaped by integrating the proper stimuli and reinforcement.
- Are developed using experts such as programmers, photographers, graphic artists, scriptwriters, and editors in order to develop high-quality materials.
- Are checked for such items as technical accuracy, completeness, programming errors, and blurred pictures prior to publication or production.
- Have the appropriate level of vocabulary for the target population.
- Are properly paced; not too fast or too slow.
- Are easy to understand.
- Include the appropriate safety precautions.

5.3. Validate Instruction.

5.3.1. Validation is a process that assesses the effectiveness of a course as it is being developed. Its purpose is continuous improvement. It is a process of repetitive cycles of development, tryouts, and revisions until evidence shows that the instruction is effective. It is important that validation be conducted during, not after, development. The purpose is to correct mistakes or problems *before* you spend too many resources on a flawed product. Validation should be done as segments, units, or blocks are being developed.

5.3.2. Develop validation plan. As with any other plan, a validation plan provides curriculum developers and instructors with a road map for validating the course. A validation plan adds structure and credibility to the validation process. **See attachment 8** for a sample validation process. Validation plans should contain the following information:

- Description of course to be validated (objectives, method, media).
- Validators (personnel assisting to validate the course).
- Validation procedures.
- Validation schedules.
- Number of tryouts to be conducted.
- Number of students to be used in small-group and field tryouts.
- Sources and how results will be documented.
- How problems will be resolved.

5.3.3. Conduct internal reviews. The first step in the validation process is to conduct internal reviews. These reviews identify content inaccuracies, instructional weaknesses, grammatical soundness and resource shortfalls. Individuals who perform internal reviews include:

- Content experts (normally a subject matter expert in the topic) ensure content is accurate and the coverage is adequate.

- Curriculum developers ensure the material follows sound instructional principles and the methods and activities are appropriate for the content and specified target population.

Materials should be reviewed as they are developed. **Table 5.2** lists materials to be validated for each type of media.

Table 5.2. Materials to be Validated.

Media Type	Materials To Be Validated
Print-based materials	List of objectives. Test items. Drafts of printed materials.
Classroom	List of objectives. Test items. Plans of instruction. Lesson plans. Objective time. Drafts of support materials.
Traditional audiovisual materials (etc.)	List of objectives. Test items. Storyboard/script.
Interactive courseware, CBT	List of objectives. Instructional design/strategies. Test items. Storyboard/script. Graphics/video produced. Screens developed.
Internet (Web-based instruction)	List of objectives. Instructional design/strategies. Test items. Program (HTML, Java, Java Script, etc.) code to ensure it functions properly on the various web "browsers" students are likely to use. If interactive, synchronous communication is desired, ensure "chat room" software functions properly and can support the number of students expected to participate. Ensure all hyperlinks connect, test every three months.

Some common problems that you may identify in the material during the internal reviews are:

- Lack of agreement between content and objectives.
- Inaccuracies in subject matter.
- Incomplete material.
- Weakness in objective supporting material.
- Lack of continuity.

- Lack of timeliness in preparation and/or review.

Upon completion of the internal reviews, you should:

- Determine the changes needed to improve the materials.
- Decide the best way to make changes to the materials.
- Make the needed changes to the materials.

5.3.4. Conduct individual tryouts/internal testing. During the individual tryouts, the curriculum developer tests the materials on individual students. Use several students for comparison in order to gain valid and reliable results. In long-term education courses this may not be practical, and other testing methods may have to be adapted.

5.3.5. The intent of individual (one-on-one) tryouts is to determine the effectiveness of small segments or units of materials as they are developed. When selecting students for individual tryouts, consider these issues. Students selected should represent the target population in:

- Aptitude.
- Attitude.
- Prior knowledge.
- Background experience.

Select students for the first tryouts from the upper percentage ranges in aptitude and background. The reasons for selecting these students include:

- Above average students often point out and analyze weaknesses in the materials.
- If better students cannot learn the material, less capable students will not be able to.
- If lower-level students are used in the individual test and they do well, there is no way to tell if the material is at the right level.
- It is easier to work down from a known point of difficulty than to work up from an unknown point of difficulty.

You should prepare the students for the tryout by explaining:

- Purpose of the tryout.
- Their role in the tryout.
- That students are not being evaluated – only the training is being evaluated.
- That their feedback is necessary to determine the quality of the material.

During the individual tryouts, the curriculum developer should:

- Use a pretest to identify entry behavior/subject knowledge.
- Use a post-test to assess learning as a result of the tryout.
- Observe where each student seems to have difficulty learning.
- Give assistance only when essential.
- Note where errors occur, type of errors, and how many students make the same error(s).
- Obtain student views about difficulties encountered during the tryout.
- Ask each student for suggestions.

Some common problems that you may identify during individual tryouts are:

- Improper sequencing of instruction.
- Inadequate content.
- Inadequate explanation of content.
- Wrong assumption about target population's prerequisite knowledge.
- Confusing test items.
- Test items that do not measure objectives.

After individual tryouts, analyze the data to determine if there are problems. Change the material as appropriate.

5.3.6. Conduct small-group tryouts. The purpose of conducting small-group tryouts is to determine if the instruction is appropriate for the average target students. Before a small-group tryout, you should:

- Determine the number of students and groups to be used in the tryouts.
- Select representative students from the target population.
- Ensure that instruction has been revised in accordance with results from individual tryouts.
- Ensure that student materials are available in adequate quantities.
- Establish the number of trials a student will be permitted to achieve the criterion performance.

5.3.7. During a small-group tryout, you should:

- Record the time each student takes to complete the material. This information will be used to validate unit time, course lengths, and course content.
- Record student responses. This information will help determine any weaknesses in the materials.

Do not supplement the materials. This will skew the results of the tryout.

After a tryout, analyze the results to:

- Identify the average completion time for each segment or unit. This information determines the exact time for lessons, segments, units, or modules.
- Revise the materials.

5.3.8. Conduct operational (field) tryouts. The final stage of validation may be called field, or operational, tryouts. All of the materials should be complete and ready to go. These tryouts serve several purposes:

- Determine if the instruction actually accomplishes the objectives.
- Provide feedback from a large sample of the target population for final revisions.
- Identify implementation problems, such as equipment and facilities.

For field tryouts, students are assigned to the tryout group using the normal class assignment process. In many respects, a field tryout is like the normal day-to-day operation of a course, in that you should:

- Present the instruction in a normal environment.
- Collect validation data such as time requirements, measurement results, instructor and student comments, problem areas.
- Use adequate class samples to ensure that the data are both valid and reliable.

You may collect data from students before, during, and after the training, as depicted in **Table 5.3** below.

Table 5.3. Data Collection.

Stage	Data To Be Collected	Data Collection Methods
Before	Student entry. Skill/Knowledge level.	Pretest. Oral examination. Student interviews.
During	Numbers of errors students make. Questions raised by students.	Observations. Recording student questions. Student critiques.
After	Student learning gains. Student views about the course.	Post-test. Student interviews. Student critiques.

5.4. What to Evaluate in the Development Phase.

5.4.1. This phase of the ISD process includes validation of the instruction you have created. Evaluation of this phase takes place during the internal reviews and individual, small-group, and operational tryouts, as described earlier in this chapter. The data you collect from these validation trials should be fed back into the most appropriate phases of the development process to effect improvements. For example, if test questions/assessments need improvement, return to the Design Phase. Another example would be if data indicated that your initial analysis of the course's target audience was in error, you should return to the Analysis Phase.

5.4.2. Carefully develop an appropriate feedback mechanism between the evaluator and the instructor and course developer. In this feedback mechanism, the program evaluator will analyze and interpret the curriculum data received through the evaluation system (tests, critiques, surveys, etc.). The evaluator should provide the analysis and interpretations, along with recommendations for curriculum improvement, through a formal channel to course supervisors, instructors, and developers so they may consider the evaluator's recommendations for improvement. Not all of the evaluator's recommendations have to be accepted by management or instructional personnel. Whether or not the recommendations are accepted, management and instructional personnel should formally respond to the recommendations indicating how they will be incorporated or the rationale for not incorporating them. This formal feedback mechanism from evaluator to manager/instructor and back to evaluator provides an audit trail of curricular decisions and their supporting data and rationales. Such audit trails are much more than mere paperwork drills. They constitute the corporate decision trail for the entire instructional program, which is something that both accreditors and auditors look for as evidence of a mature instructional program.

5.4.3. This evaluation feedback mechanism should be incorporated into the final course revision when it is officially implemented in the final phase of the ISD process.

5.5. Finalize Instructional Materials.

5.5.1. The purpose of finalizing materials is to ensure that they:

- Have been revised to include the most current and accurate information.
- Are complete.
- Are ready for implementation.

5.5.2. The following list of questions may help to ensure that everything is ready for implementation. Use it to develop your own personalized checklist as you desire.

Course Syllabus:

- Has the course syllabus been updated?
- Is the course syllabus complete?
- Has the course syllabus been approved?
- Has the course syllabus been published and distributed?

Lesson Materials (Print Materials/Audiovisual/Interactive Courseware):

- Have the student workbooks been updated?
- Are the student workbooks complete?
- Have the student workbooks been published?
- Have the instructor lesson plans been updated?
- Are the instructor lesson plans complete?
- Have the instructor lesson plans been approved and published?
- Have copyright permissions been obtained?
- Have the slides been updated?
- Are the slides complete?
- Are the slides ready for use?
- Have software programs been updated?
- Is the programming complete?
- Has the Interactive Courseware been operationally tested?

Chapter 6
Implementation

6.1. Introduction.

6.1.1. At this point in the ISD process, the course has been validated and instruction is ready to be implemented. Prior to actual implementation, ensure all support documents and mechanisms are ready as well. For example, are the system functions in place, are adequate resources available, and is the instructional system itself ready?

6.2. Implementation of System Functions.

6.2.1. As a curriculum developer, it is unlikely that you will be required to implement the system functions (management, support, etc.). Your job will be to ensure that these functions are being performed to support, operate, and maintain courses.

6.2.2. Evaluation is an ongoing function that is discussed in the next chapter. To this point, considerable time has been spent planning the instructional system, securing resources, managing the development process, and arranging for system support. Curriculum developers have analyzed, designed, developed, and validated instruction. Now the course is ready to implement. During implementation, you will continually evaluate its effectiveness.

6.2.3. Preparations for conducting instruction. Although preparations for conducting instruction started in initial planning and have continued throughout the analysis, design, and development phases of ISD, final checks need to be made prior to implementing the course. Sufficient preparation is essential to successful instruction.

What should be checked? The type of instruction being implemented will determine what should be done to get ready. For example, an exportable course will not have the same items to be checked as a course taught in a classroom environment. See **Chapter 11** for things to consider with an exportable course. Some of the last-minute preparation may include checking the following:

- **Equipment** – Is available in adequate numbers and in operational condition. Equipment support is available.
- **Facilities** – Appropriate facilities are available. Facility modifications, such as electrical and air conditioning, are complete.
- **Human Resources** – Personnel are ready, including instructors and students. Students have been scheduled for the classes.
- **Funds** – Adequate funds are available to meet implementation costs and the costs associated with daily operation of the course.
- **Time** – Curriculum developers have had adequate time to develop the materials.
- **Materials and Supplies** – Materials are available in adequate quantities to support instruction. Supplies are available in adequate quantities to support implementation.

- **Copyright Approvals** – Copyright permissions have been obtained as necessary. Coordinate with a copyright specialist to determine if legislation permits the use of desired materials.

6.2.4. Implementing instruction. If adequate preparations have been made throughout the development process and a last-minute check of each system component was made, there should be few problems, if any, encountered with implementation.

6.2.5. Once the course is implemented and becomes operational, it will normally remain so until there is no longer a need. The focus will be on conducting effective and efficient instruction.

6.2.6. Ongoing activities that ensure system integrity are described below.

Resource management is probably the single most critical issue. Resources must be well managed to gain maximum benefit.

Faculty development is an activity that goes on continually while instruction is being conducted. Curriculum developers as well as other staff and faculty should periodically attend courses, conferences, and workshops that help them develop professionally in curriculum development.

Conducting instruction is at the center of system integrity. No matter what has been done to this point, the program can fail if the course is not properly conducted. Some helpful items to remember are:

- Instruction should be student-centered.
- Instruction should follow the course syllabus.
- Curriculum developers or instructors should always perform professionally in the teaching-learning environment.
- Teaching staff should be qualified to perform their duties.

Evaluation maintains the quality of instruction. During the life of the course, evaluation is continually performed to ensure the quality of the program.

Chapter 7
Evaluation

7.1. Overview.

7.1.1. Evaluation is a function of the ISD process that requires the continuous design, collection, and analysis of data from an instructional program or a course to determine its value or worth as outlined by the institution's mission and goals.

7.1.2 Evaluation focuses its attention in four basic areas: (1) Did learning take place (in terms of a change in cognitive knowledge); (2) Were students' attitudes affected by their learning experience; (3) Did a change in behavior take place; and (4) Did the learning (cognitive and behavioral changes) cause the student's organization to become more efficient and/or effective?

7.2. Levels of Educational Evaluation.

7.2.1. Levels of educational evaluation. Educational program evaluation consists of four levels. These levels provide instructional managers (course/content developers) with an overall perspective of how well the instruction achieved the established goals and objectives of the school or organization. Program evaluation is an ongoing process that begins when the instructional program is activated and continues through the life of the program. The nature and scope of the program evaluation will depend, to a great degree, on the type of course being evaluated. Courses exported to the field, or taught via distance learning methods, may not have the same evaluation requirements as courses taught in-residence, but the basic four levels of program evaluation should still be addressed.

7.2.2. Program evaluation is the continual process of evaluating an instructional program to identify and correct problems and to maintain and improve the quality of the program. Most schools have personnel designated as course/program evaluators. In lieu of such personnel, curriculum developers are typically responsible for evaluation of their courses. Other organizations or activities, such as inspection teams or other command evaluation programs, may also provide input for evaluating your course.

7.2.3. What should you look for? When conducting a program evaluation, look for both strengths and weaknesses in the course, with special emphasis on:

- Effectiveness and efficiency of the course.
- How well the graduates are performing in their jobs.
- If instruction is being provided that is not needed.
- If needed instruction is not being provided.

7.2.4. Levels of program evaluation (Bloom, B.S. (Ed), Englehart, M. D., Furst, E.J., Hill, W.K. and Krathwohl, D.R. (1956). *Taxonomy of Educational Objectives*, Handbook 1: Cognitive Domain. New York: Longman). Program evaluation consists of four levels, each of which characterizes a different aspect of the instructional program.

Level 1 – Student Learning – focuses on whether or not learning took place.
Level 2 – Student Attitude – regarding the course, did the student see a benefit and the value in participating in the program/course.
Level 3 – Behavioral Change – did the student modify his or her behavior as a result of having attended the program/course. Is the student using the concepts and principles taught during the course on the job?
Level 4 – Performance Change – as a result of having attended the program/course, did the student's job performance become more effective or efficient?

7.3. Internal and External Evaluation.

7.3.1. There are two major divisions in program evaluation: internal and external evaluations. The internal evaluation component is composed of the first two levels of the program evaluation process. These levels focus attention on maintaining the quality of the course. Sometimes internal evaluations are referred to as course reviews where the evaluation component is looking specifically at whether or not learning took place and how the students perceived their learning experience, i.e., did the student see value in attending the course?

The external evaluation component is composed of the last two levels of the program evaluation process. The last two levels focus attention on determining if the knowledge, skills, and attitudes acquired in the course enhanced the graduate's job proficiency.

7.3.2. Internal evaluation is the periodic, ongoing process of gathering and analyzing internal feedback and management data from within the school environment in order to assess the success of the instruction.

7.3.3 External evaluation is the periodic, ongoing process of gathering and analyzing feedback data on graduates of the course.

7.3.4. Who is responsible? Curriculum developers are responsible for periodically conducting internal and external evaluations of their courses. If you do not have curriculum developers, then the person who developed the curriculum is responsible for evaluation. Other organizations or agencies will normally be involved in the evaluation by providing input data in the form of inspection reports or critiques.

7.3.5. What is required? Three basic stages are involved in accomplishing any type of program evaluation:

- Data collection.
- Data analysis.
- Interpreting results and revising the curriculum.

Stage 1 – Data collection. The first stage of program evaluation is made up of several facets:

- Identify who is responsible for gathering the evaluation data.
- Decide when and where the data will be collected.
- Determine data collection sources.

- Pre and post test data.
- Self-inspections.
- Formal reports.
- Student critiques.
- Direct observations.
- Faculty evaluations.
- Surveys.
- Questionnaires.
- Field visits.
- Job performance evaluations.

Establish procedures for collecting the evaluation data prior to collecting the data.

Stage 2 – Analyze data. Before beginning this stage, the evaluator will need to ensure that sufficient data samples have been collected in order to validate the reliability of the findings and to ensure that there is generalizability from the sample to the population. There is no easy or obvious way to determine how many samples are enough to ensure a representative sampling. Realistically speaking, time and money often are limiting factors in the sampling process. Regardless of how large or small the sample is, however, you should strive to collect enough data from a variety of sources to ensure you feel confident that the sample you have collected is as representative as possible. Data analysis consists of several activities:

- Identify who is responsible for analyzing the data.
- Decide when the data will be analyzed.
- Determine validity of the data.
- Establish procedures for analyzing the data.
- Analyze the data.
- Publish the results of the analysis.

Stage 3 – Interpreting results and revising the curriculum. The evaluator makes recommendations for curriculum improvement based on the interpretations of his/her data analysis. This activity often brings the evaluator and the curriculum developer together to discuss the importance of the interpretations and what they mean for curriculum revision. This is a crucial stage in the evaluation process, because it is where the ISD system "closes the loop" on the curriculum development process. To adequately complete the cyclic ISD process, the curriculum developer must respond to all of the evaluator's recommendations for curriculum improvement. This does not mean that all of the evaluator's recommendations must be adopted. However, it does mean that the curriculum developer must respond with a justifiable rationale if a recommendation is not accepted. This channeling of evaluation data back into the curriculum revision process not only defines the ISD model’s cyclic nature, it also ensures that improvements in the instructional program can be tied directly to decisions based on evaluation of the program’s success. This stage of program evaluation consists of the following activities:

- Determine what revisions are required, based on the data analyses.
- Identify what components of the system are affected.
- Assess the impact of the revisions.

- Coordinate and/or get approval to revise.
- Revise the course materials.
- Update documentation.

7.3.6. When is it done? Internal evaluations are conducted while the student is attending the course or program. These data points provide the school with immediate feedback as to how well the students met the educational objectives of the course or program.

External evaluations are conducted after the students have graduated from the course or program, usually within 6 months or so. These data points provide the school with input regarding how effective and efficient the course or program is to the user's organization.

Both internal and external evaluations are ongoing processes and will continue for the life of the course or program.

Chapter 8
Techniques for Instructional Managers / Developers

8.1. Introduction.

8.1.1. Education and training involves a diversity of personnel working in various capacities. This section will look at the instructional techniques that relate to all education and training personnel; however, for ease in reference, three major categories are used: instructional managers, instructors, and specialists/developers.

8.1.2. Many of you will find the information presented in this chapter to be common sense. The information serves as a reminder and guide to implement improvements within the constraints of current education and training situations.

8.2. Techniques for Instructional Managers / Developers.

8.2.1. Effective instruction. Effective schools focus sharply on students and learning. Instructional managers and instructors can increase instructional quality by implementing policies that encourage effective instruction, such as:

- Emphasizing frequent testing, testing of job-like performance, critical job skills, and safety practices.
- Encouraging effective time management to reduce or eliminate time spent on activities irrelevant to training objectives.
- Maximizing interaction between students and instructors, learning materials, and learning tasks.

8.2.2. Students. Students must be psychologically and physically comfortable. Long lectures requiring prolonged periods of sitting without opportunities for practice inhibit effective learning.

Managers must work with instructors, students, and the operational community to develop and establish a positive learning environment that will become a lasting part of the school's tradition.

Instructors must collaboratively develop goals, share teaching advice and emphasize student achievement, in order to improve instruction and student performance.

8.3. Managing Instructors.

8.3.1. Effective managers should:

- Scrutinize existing practices to ensure instructor training contributes to the quality of instructional programs.
- Provide instructors with the opportunity to improve their instructional and classroom management techniques as well as recurring professional development activities.

- Develop policies to support instructor requirements by encouraging new ideas.
- Ensure the availability of instructional materials and assistance instructors may need.
- Work to raise instructor morale and create a climate of achievement.
- Allow instructors to participate in policy development processes.

Managers enhance instructors' teaching skills by:

- Making frequent and systematic classroom observations.
- Providing relevant, timely feedback that includes suggestions for correcting weaknesses and praising strengths.
- Ensuring instructors know the subject matter and can teach it well.
- Providing new instructors opportunities to practice under supervised conditions.

Supervision that strengthens instruction has the following elements:

- The supervisor and instructor agree with specific skills and practices that characterize effective teaching.
- The supervisor observes the instructor frequently to verify use of these skills and practices.
- The supervisor and instructor discuss supervisory observations.
- The supervisor and instructor agree on areas for improvement.
- The supervisor and instructor jointly develop specific improvement plans.

Student ratings. Managers can use student ratings of instructors to improve the overall instructional processes as:

- Ratings may provide useful, constructive feedback.
- Ratings during a course, rather than only at the end, provide the opportunity to modify teaching with the same groups of students.
- Fellow instructors or education/training specialists/developers can help individual instructors plan how to improve their teaching based on student feedback.

8.4. Managing Student Learning.

8.4.1. Performance-oriented leadership improves formal (intentional) and informal (incidental) learning.

8.4.2. Manage learning. To manage learning effectively both inside and outside of the classroom, managers should:

- Develop formal learning with systematic procedures.
- Stress the importance of each student's learning.
- Specify the roles of all personnel in managing learning.
- Personally evaluate the learning environment i.e., who is doing what, when, where, why, and how? How does the physical learning environment affect learning? What is happening in the school that should not be happening?

Outside learning. Students learn a lot outside of formal education and training. For example, some students adopt behaviors from instructors during instruction; others acquire skills from peers.

8.4.3. Monitoring and tailoring. Instruction improves when managers monitor achievement indicators, detect when the value of any indicator moves into an unacceptable range, and then take focused, corrective action (tailoring). Monitoring and tailoring instructional systems are similar to controlling physical systems such as heating or cooling systems. However, education and training system indicators are not as apparent as physical system indicators.

Education and training system indicators are determined by:

- Examining the goals and management practices of the school.
- Obtaining objective information about students and instructors.

Monitoring focuses on improvement of instructional quality. Training managers can monitor direct and indirect student performances to establish priorities for improving the system:

- Monitoring requires access to effective record keeping and considerable information processing.
- Monitoring with a computer-based information system, managers can identify student indicators with values that are in an unacceptable range.
- Monitoring will reveal whether the quality of instruction has improved.

Monitoring indicators. The following indicators are helpful in the monitoring process:

- Direct indicators include student attrition, and comprehensive and performance test scores.
- Indirect indicators include student-instructor ratios and background variables.

Tailoring. Focused corrective action or tailoring requires a deployable resource to respond to the indicators. For example, an instructional supervisor or curriculum specialist might visit a classroom or school to confirm (or refute) that a problem exists, diagnose the situation, and propose corrective action.

8.4.4. The monitoring and tailoring approach assumes that fine-tuning the instructional system can improve the system significantly. The system may require fundamental changes due to changes in technology, resources, or society.

8.5. Evaluation and Revision.

8.5.1. Tryouts during instructional development help identify and correct inadequacies. Evaluating and revising instruction are important processes. The developer accomplishes this by delivering segments of material to a sampling of students for tryout. This developer goes through the material with each student. During tryouts, ask students about:

- The quantity and quality of examples in the instruction.
- The adequacy of practice opportunities.
- The suitability of media selected for a given education and training domain.

- The compatibility of the reading grade level of the materials and the student audience.
- The time required to complete the instruction compared to the allotted training time.

8.5.2. The developer then revises the materials to address problems uncovered in tryout and conducts another tryout with different students.

8.5.3. Instructional development rarely includes this evaluation-revision cycle. Tryout of the materials in nearly final form is more common. At this late stage, it is difficult to diagnose instructional problems unless a gross failure makes them apparent.

8.5.4. The lack of evaluation during development makes revision of instruction a major undertaking. Looking at the ISD process as continuous evaluation will help resolve this dilemma. The lesson learned is that managers who plan and allocate adequate resources for early evaluation make the revision process and instruction more effective.

8.6. Imitating the Job Environment.

8.6.1. Students learn and retain knowledge and skills best when the learning environment incorporates the critical, functional features of the working environment.

8.6.2. For maximum transfer from the education and training environment to a work environment:

- The learning environment should include the context, tasks, procedures, and materials of the job.
- Education and training should relate to the specific job environment, as well as the knowledge the student already has (competencies).
- Training should involve the same operations, tools, and machines (or their functional equivalents) as the actual job.

8.6.3. New knowledge builds on the foundation of old knowledge/competencies. Facilitating learning requires that training relate to the students' existing knowledge. Students can use existing knowledge/competencies to facilitate learning and correct any misunderstandings of how and why things work the way they do. This will help bridge the gap on what new knowledge needs implementing.

8.6.4. Another important aspect of imitating the job environment is training students to the level of the job performance requirements. If the job requires much supervision, then students should not be trained to a high level. Minimal on-the-job supervision requires higher levels of training. If training and working environments differ in their skill expectations and closeness of supervision, tailor instruction for the expected assignment.

8.6.5. Effective education and training managers should solicit graduate feedback to detect inconsistencies between training levels and job performance requirements. Training to a

higher level/competency in some cases can require more time and funding. Be sure to train at the level needed for the student at this point in their career

8.7. Maintaining Skills / Knowledge and Student Instructor Ratios.

8.7.1. Maintaining critical skills requires planned and monitored on-the-job training and testing. Points about skill loss:

- Performance of some procedural skills declines rapidly without systematic refresher training.
- The rate of skill loss differs for different tasks. The decline suggests the need for systematic practice to maintain skills.

8.7.2. Preventing skill loss. Normally, schools provide sufficient training for initial job competency. Proficiency requires development on-the-job. The following applies to maintaining proficiency:

- Ensure on-the-job practice of rarely used skills do not diminish.
- Long lapses in training promote losses, not improvement of skills and knowledge.
- Provide frequent training to retain and improve skills and knowledge.
- Retraining must occur at intervals.

8.7.3. Estimating skill loss. There is no way to make accurate, quantitative predictions about the rate of skill loss, how fast relearning occurs, or how often retraining should occur. The bottom line is that planning and scheduling refresher training is essential.

- Base the spacing of refresher practice sessions for novices on how often trainees perform the skill or task.
- More than minimal learning needs to occur during the original course when refresher training is difficult or too costly to arrange.
- In the current digital age, refresher training could be arranged for a smaller cost and at unit level.

8.7.4. Student/instructor ratio. Instructional settings with smaller student/instructor ratios tend to promote interactions more frequently between students, instructors, and materials. Students tend to have a greater interest in learning, have more opportunities for participation, and perform better. However, during one-way instruction (lectures) small class sizes are not necessarily beneficial due to limited interactions. In these instructional settings higher student/instructor ratios saves manpower and/or frees up staff for lab training, tutoring, or counseling.

8.8. Informal Learning / Structuring and Sequencing Instruction.

8.8.1. Aggressive management of learning can improve the incidence and quality of informal learning. Students obtain much of their knowledge and skills outside of formal training:

- Managers can positively influence informal learning by placing instructional information in areas where students frequent (dormitories, cafeterias, YouTube, etc.).

- Design instructional information to foster learning as well as create awareness and motivation.
- Place instructional materials at job sites; making education and training materials accessible during low production or down time will promote completion of instructional requirements during free time.
- Students should be encouraged to set aside “read and think” time during duty hours. This will help them to think about what they do, and how to do it better.
- On-demand learning can really shine in this area.

8.8.2. Students learn as well from structured materials and self-study as from conventional classroom procedures. Structuring materials requires you to:

- Divide instructional materials into learnable segments (chunking material).
- Determine their presentation order.
- Require students to pass tests to demonstrate comprehension before allowing them to progress to new instruction.

8.8.3. Structuring advantages. Structured instructional materials provide:

- Students the opportunity for self-paced study.
- Considerable training time savings.
- Distribution to remote locations as alternatives to lectures.
- Simulation or gaming techniques.

Instructional sequencing is designed to require an active response from students before new information is presented.

8.8.4. Sequencing advantages. Some of the advantages of sequencing to consider:

- Students get immediate feedback.
- Students may omit material they already know.
- Students may identify segments where errors require further study.
- Students may receive instruction on various media such as computers, workbooks, or lectures.

Chapter 9
Techniques for Instructors

9.1. Student Feedback/Activities.

9.1.1. Instructors can improve their performance through careful analysis of student feedback. When schools require students to rate instructors, they expect instructors to use the ratings for improving instructional techniques. Evaluation studies show that feedback from student ratings improves instructor performance:

- Research on college teaching revealed instructors who received feedback from mid-semester ratings received substantially higher end-of-course ratings than instructors who were only rated at the end of the semester.
- Ratings improved more when instructors discussed the mid-semester ratings with consultants.
- Instructors and managers can use ratings during a course to modify and improve teaching with the same groups.

9.1.2. Feedback timing. Timing and content influence the effectiveness of feedback. Peers can help instructors improve by reviewing student feedback with the instructor.

9.1.3. Student activities are more important to learning than the instructor's presentation. Instructors can aid student achievement by getting students to engage in activities that are likely to result in learning:

- Effective instructors not only present facts, ideas, or information but also get students actively involved in appropriate learning activities to attain desired outcomes.
- Learning is an active process, and instructors should provide students with as many learning strategies as possible to help students achieve the objectives.

9.1.4. Prior knowledge. During the learning processes, instructors should consider students' prior knowledge. Students' understanding of new information depends on how well they relate it to their prior knowledge.

- Students often begin learning with substantial misconceptions about the material they are studying and its intended use.
- Even students who get high grades have these misconceptions.
- Students make systematic errors based on misconceptions and erroneous procedures from prior knowledge.

9.1.5. Instructional intent. Students should never begin learning without understanding the intent of the instruction:

- Instructors need to explain the instructional intent (course objectives) and its relationship to the knowledge, skills, and attitudes the students already possess.
- Instructors must understand how current and prior knowledge determines what the students will learn from new material that conflicts with their existing beliefs/knowledge.

- Ask students to reveal their misconceptions so that the instructor can address them.

9.2. Classroom Leadership.

9.2.1. Effective classroom leadership promotes effective student learning. Instructors lead students by focusing on the following:

- Presenting well-conceived learning objectives.
- Conducting regular and comprehensive evaluations of student learning.
- Having high expectations of all students.
- Providing a purposeful learning environment.
- Concerning themselves with student performance.

9.2.2. Diversity of opinion. Instructors should encourage diversity of opinion by:

- Pointing out relationships between various opinions and ideas.
- Stressing the variety of potential solutions to a problem.
- Protecting minority opinions.
- Keeping disagreement under control.

9.2.3. Instructor Peer feedback. Instructor peer-feedback improves instructional effectiveness. Instructors can observe each other's classroom procedures and provide constructive feedback.

9.2.4. Classroom discipline. Student grades should be based on objective attainment. Grades should not be used to correct disciplinary problems. Disciplinary problems are reduced when students actively participate in learning. Instructors must accomplish the following:

- Help students perceive education and training as relevant and interesting.
- Use techniques to reinforce good behavior.
- Seek friendly relationships.
- Encourage students to cooperate with other students and staff.

9.3. Learning Strategies.

9.3.1. Study skills and strategies can influence what and how students learn. They affect learner motivation or the way they select, acquire, organize, or integrate new knowledge. Examples of these strategies would be:

- Learners may coach themselves to reduce anxiety.
- Learners may use imaging to relate vocabulary words and meanings.
- Learners may summarize and take notes to memorize written material.

9.3.2. Above average students use learning strategies to acquire, organize, or integrate new knowledge. Students may use imaging to relate vocabulary words and meanings, or summarize and take notes to memorize written material. Average and below average students use effective study strategies infrequently. Teach students how to use these strategies. Once they have learned the strategies, all students can study and learn more efficiently. They must be encouraged to do so.

9.3.3. Factors in student study. Students can monitor and adjust the way they study based on:

- Whether they understand difficult material.
- How much time they have for studying.
- How much they know about the material.
- The standards they must meet.

9.3.4. Instructor's role for improving study skills. Instructors can help improve study skills by:

- Adjusting students' study methods according to content difficulty, time allowed for studying, familiarity with content, and standards required.
- Spreading study sessions on a topic over available time so students do not work continuously on a single topic.
- Using study strategies appropriate for learning a task.
- Using rehearsal and self-testing to memorize ordered lists, take notes that paraphrase a lecture, organize information in text by identifying main ideas and relating to current knowledge.
- Allowing students to assess their progress and modify the strategies as needed.

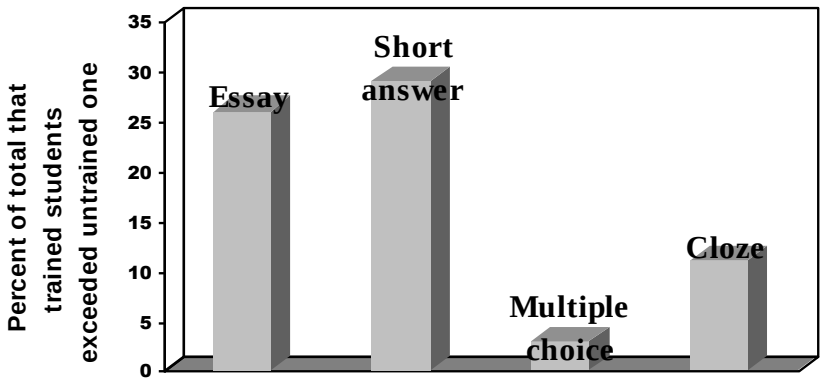
9.3.5. Effect of training. Teaching learning techniques from materials has a substantial effect on test performance covering the content studied. In the following example, students were taught:

- How to make a network map of the information in a text.
- How to make a spatial representation of the information.
- How to paraphrase.
- How to draw pictorial representations of ideas and concepts.

Four different measures were used to examine the effect of the training. **Figure 9.1** below, taken from Montague and Knirk, shows that trained students substantially outperformed untrained ones on essay and short-answer tests. The histogram bars show how much the scores of the trained students exceeded those of untrained students.

On a "cloze" test, for example, every fifth word in the material is deleted, and the student tries to fill in the correct word from memory. Trained students also showed superior performance on that type of test. On a multiple-choice test, trained students' superiority was slight. This type of test is not as useful a test for examining student learning and understanding.

Figure 9.1. Effectiveness of Training Students to Learn from Text.



Conclusion to **Figure 9.1**. Students given training in how to study outperform students not given training in how to study.

9.4. Testing Student Progress.

9.4.1. Frequent, systematic testing and assessing of student progress informs students about their learning. Instructors, managers, and developers/training managers learn about strengths and weaknesses in student learning and the instruction.

9.4.2. Advantages of student assessment. The following are advantages of student assessment:

- Student errors on tests and in class could alert instructors to potential learning problems that may need to be corrected.
- Feedback must be very objective and prompt, while avoiding any subjective words by directly connecting it to the content provided, and removing words that make the feedback subjective in any manner.

9.4.3. Types of tests/assessments. Students are tested to determine what they know and what they need to learn. Various types of tests can be used including observing laboratory exercise performance, giving oral quizzes and tests, assigning homework, asking questions in the classroom, and giving comprehensive performance tests. Students generally take either knowledge or performance tests.

9.4.3.1. Knowledge tests/assessments. Knowledge tests help instructors find out if the students have learned information important for safety and knowledge important for performance.

9.4.3.2. Progress checks. Progress checks are normally performed throughout the course to test student knowledge in smaller increments to gauge progress towards objectives. They can be written or performance based.

9.4.3.3. Performance tests/assessments. Performance tests enable instructors to determine student competence and ability to perform a skill. The instructors' biggest concern with testing is to identify what the students do not know and whether they can actually perform the skill.

9.4.3.4. Job-like tests. In technical training, assessment should be as job-like as possible. The following should be applied:

- Emphasizing hands on performance tests.
- Limiting pencil and paper/electronic tests to safety and knowledge critical for job performance.
- Testing with open-book where students use manuals and other references normally available on the job.

9.4.4. Performance difficulties. Performance difficulties often indicate gaps in student knowledge. Student explanations of their actions or answers to questions can help instructors identify knowledge gaps.

9.5. Managing Active Learning Time / Cooperative Learning.

9.5.1. Students who are actively engaged in learning learn more than those passively involved. During hands-on training, the lack of available equipment sometimes causes students to spend time observing others. This can cause the time allocated for learning to differ from the time students are actually engaged.

9.5.2. Laboratory settings are an active learning environment. Instructors should use techniques to engage all students in learning.

9.5.3. Effective instructors determine learning time accurately and use techniques that increase the time students spend on learning activities. The following techniques are helpful:

- Instructors minimize time for breaks and interruption of individual students. Students can help instructors analyze their classroom by identifying distracting events and procedures that could be changed.
- Instructors can increase students' attention to learning and increase learning time and achievement. Questions can focus on material or problems in texts or manuals.
- Instructors who summarize important information prepare students for studying.
- Students who are easily distracted may profit from out-of-class assignments that focus on overcoming the distractions and processing relevant content.
- Students who receive explicit feedback about their performance learn what is required of them and how to correct their actions.

Instructors who supplement a well-planned training program with these learning activities can capture the student attention, make the best use of available time, and encourage academic achievement.

9.5.4. Cooperative learning. Cooperating with other students during learning often improves learning. Some advantages of cooperative learning are:

- Organizing students into small study groups improves performance on achievement tests.
- Arranging students into small groups promotes positive attitudes toward each other and learning.
- Organizing students into groups of two or three assists “team” activities and crew training.

9.5.5. Single student domination eliminated. It is important that one student does not limit opportunities for learning by dominating others. This can be achieved by testing them separately or by instituting other procedures that ensure each student spends an appropriate amount of time actively learning.

9.5.6. Cooperation versus competition. Students tend to avoid activities that they believe will result in failure. A competitive situation arouses the need to either achieve success or avoid failure. Encouraging cooperation, rather than competition, among students promotes effective achievement and productivity. Students competing for grades or other extrinsic goals focus on beating other students rather than on understanding the course material and learning how to work as a team member.

9.5.7. Identifying poor performance. Instructors should demonstrate a cooperative spirit by not singling out poor performers. Self-esteem and ego are "on the line" when students are asked to perform in front of classmates. Bad experiences in traditional education, feelings about authority, and the preoccupation with events outside the classroom all affect experiences in class. Singling out poor performers leads to negative attitudes toward the instructor and the students.

9.6. Instructor Presentation / Practicing Applications.

9.6.1. Students learn best when instructors inspire them to take an active role in their learning. Good instructors are not only subject matter experts in what they teach but know how to teach. They are prepared to answer student questions and stimulate student interaction.

9.6.2. For effective presentations, instructors should keep the following concepts in mind:

- Present the material in a logical structure which can help students learn and remember. Students can remember only a small amount of material presented orally or visually.
- Present no more than two or three main ideas in a 15-minute segment.
- Use techniques to stimulate students to assume an active role in understanding what is taught.
- Present summaries to reemphasize main ideas, illustrations, tables, and charts.
- Use lesson enhancements that foster retention. Students are likely to remember an illustration used to teach a concept or practice.

9.6.3. Instructors who maintain a questioning atmosphere force students to think and solve problems. Instructors can use the following techniques to stimulate learning:

- Ask students to summarize lessons.
- Challenge students by providing incorrect information to determine if they can provide the correct information.
- Divide students into small groups for discussions.
- Ask questions randomly during lectures.
- Relate directly to relevant events/stories from the instructor's field experience or anecdotes and explain their relevance clearly.

9.6.4. Demonstrate task steps. Students learn best when instructors demonstrate steps to accomplish a task. Instructors should systematically demonstrate tasks, explaining the purpose and result of each activity. This is particularly effective in teaching basic skills, and in helping experienced students master complex materials.

9.6.5. Practice promotes learning of new skill. Most education and training programs involve too much talking, presenting, and demonstrating on the part of the instructor. With procedural tasks, listening and watching are not good enough if you have the option of doing. Remember that doing requires some initial level of learning.

9.6.6. The following key points contribute to successful practice:

- Students learn best by doing and should have opportunities to practice.
- Students should practice a variety of tasks representative of the job.
- Instructors should emphasize key points to increase retention.
- Explicit feedback helps students identify and correct performance difficulties.

9.6.7. The amount of practice required to correctly perform a task usually increases with task complexity. In very complex tasks, small segments of a task should be practiced before the entire task. Removing a jet engine is a complex task, which might require practice on individual engine components (task activities) before the engine is actually removed.

9.6.8. Appropriate techniques. Using the wrong learning strategy inhibits learning during practice. Instructors should always use practice techniques appropriate for each task. In seemingly simple tasks such as memorizing strings of digits, students can practice for hours without improving their performance unless a proper learning strategy is used. Grouping or coding schemes may be the best way to learn a string of digits.

9.7. Mental Models / Motivating Students.

9.7.1. Mental models promote understanding of concepts. Learning involves the development of qualitative conceptual structures that are called "mental models." A person uses mental models to understand, explain, and predict things about the world. Mental models allow people to describe a system's structure, explain its present state, and make predictions about future states.

9.7.2. Mental models evolve naturally through the interaction of the learner and particular environments. Methods can be devised to promote their development as follows:

- One method is representing the functionality of the work environment and the devices and equipment in it. Providing external guidance or directions allows the buildup of acclimated experience. This, coupled with cognitive information, will guide performance.
- An accurate mental model develops from the way actual events flow on-the-job, and how devices function and can malfunction. This serves as the scheme to guide personal action when new problems are encountered.
- Students should describe in detail the steps they are using in performing a task. This will help identify errors. Student comprehension develops faster and transfers readily to the work environment with this procedure.

9.7.3. As an example, take the task of training the students to solve problems in electric circuits, thermodynamics, or mechanics. By guiding students through the steps, explaining why they are taken, and then having students describe the factors and their interactions as they solve subsequent problems, they learn rapidly and accurately. Instructors can check the accuracy of a student's initial representation of all facets of the problem and provide basic correct solutions.

By concentrating on accurate initial description of the problem, students learn to internalize the procedures as part of their mental model to which they use habitually in approaching later problems.

9.7.4. Learning improves when students set their own goals and determine how to achieve them. Students who control their own learning experience believe they can handle most training challenges. However, not all students can take charge of their own learning without encouragement and help.

9.7.5. Students can learn to set daily goals, monitor progress toward these goals, and chart progress to provide reinforcement. Instructors should always check students' progress and provide positive verbal encouragement and reinforcement. Extrinsic rewards (grades, etc.) may not motivate students as much as goals and rewards based on direct involvement with the ongoing education and training. Instructors should focus attention on the long term aptitude rather than extrinsic rewards. The following techniques are useful in promoting this focus:

- Provide feedback that informs.
- Encourage persistence in learning.
- Point out instructional relevance.

9.7.6. Instructors frequently reward learner effort so that they may concentrate on working hard and fast rather than on the quality of their work. Instructors should examine their reward system and place more emphasis on the following to encourage effort and performance:

- Instructors should explain when rewarding for effort or performance, so students do not confuse the two.
- Students generally consider the quality of their work more when performance is emphasized.

- Instructors should never tell students that a failure is because of a lack of ability. Students who feel they do not have the ability to learn may develop a pattern of hopelessness and stop trying. Instructors should encourage a growth mindset.
- Instructors should help students overcome training obstacles and devote effort to learning if there is any chance the individuals can succeed.

Instructors should focus on motivating their students, and on relevant learning tasks. Less capable students should be rewarded for progress; high achievers should always be challenged according to their abilities.

9.8. Student Controlled Learning / Assignments.

9.8.1. Student perception of who controls key events in learning significantly affects their academic achievement. Students generally attribute learning success to a combination of ability, effort, and luck. Students believe if they significantly control their learning, they can also organize their environment for maximum success; that is, they can "make their own luck."

9.8.2. Out-of-class assignments. Students' performances improve significantly when instructors regularly give out-of-class assignments, ensure they are completed, and provide objective and prompt feedback on performance quality. Students in courses requiring out-of-class assignments learn more than students in courses without such assignments.

9.8.3. The time students spend on relevant out-of-class assignments benefits them as much as in-class learning time. Instructors should always grade assignments to inform students of their performance. The following are benefits from out-of-class assignments:

- Instructors can use out-of-class assignments to increase practice, a technique especially helpful for low achievers.
- Low achievers doing out-of-class assignments often obtain grades as high as students do with greater ability that do not do extra assignments.
- Out-of-class assignments boost student achievement through increasing total study time.
- Out-of-class assignments can be helpful for all students, but especially for slower students.

9.8.4. Students are more willing to do assignments they consider useful. Instructors should give the same care in preparing out-of-class assignments as classroom instruction. Out-of-class assignments must be an integral part of instruction. Evaluate them, and count them as part of the course requirements.

Most of all, right up front, you must care about your students and let them know you are excited about teaching them. If the students are convinced you care, areas of discussion up to that point will matter to them.

The manager and instructor are clearly important elements to ensure the student learns what is important, and the student feels good about what is learned. The specialist is the third element needed for the successful delivery of education and training.

Chapter 10
Techniques for Instructional Specialists

10.1. Systematic Instructional Design.

10.1.1. Systematic training design models provide methodologies for planning, analyzing, designing, developing, implementing, and managing instruction. They are important for limiting content to what is clearly needed.

10.1.2. System approaches to instructional design all require the same general steps or phases necessary to produce instruction that supports the intended learning. System approaches share these positive characteristics:

- System models make sure every piece of instruction has recognizable elements and is tied to an analysis of needs and tasks.
- They assist the management of training development by:
    - Making education and training congruent with job-tasks without irrelevant content.
    - Evaluating effectiveness and revising inadequate materials.
    - Making media development more efficient.
    - Promoting efficient use of time.
    - Allowing for structured resource management and planning.

10.1.3. The quality of training programs applying systems approach models usually depends on the knowledge and skills of the personnel using the procedures. Most DAF instructors receive only brief training in the use of these procedures.

10.1.4. Due to the different levels of expertise involved in developing instruction, empirical tryouts of the instructional materials and system with students is very important. Much of the research in this handbook provides useful information for designing instruction. Developers need to become aware of these proven methods and learn how to incorporate them into the instruction they design and develop.

10.2. Instructional Objectives / Text Enhancement.

10.2.1. Objectives that directly reflect education/training requirements are easiest to test. Measurable, observable education/training objectives ensure consistency among job tasks, course content, and test items. When education/training include objectives, student confidence improves and anxiety decreases.

10.2.2. Objectives are useful for all content. Objectives may be easier to write for concrete procedures rather than for more academic content areas such as history. There is no evidence to suggest that objectives are more useful for one content area than another.

10.2.3. Objectives have three elements. Expanding the task statements into objectives requires the following:

- Clarifying the behaviors.
- Identifying the relevant conditions under which the behaviors are to be displayed.
- Specifying standards used to determine adequate performance.

10.2.4. Text enhancement. Texts are prepared to serve as a basis for student learning by providing facts, examples, and explanations. Text can be enhanced through effective introductions, summaries, examples, and diagrams, which aid student comprehension.

10.2.5. To learn, students must understand the materials and how they can apply the information. Descriptions, instructions, and explanations are often difficult to understand because of terminology, inadequate connections to student knowledge, or a "topic-orientation" that tells all about a subject, but not "what a person does" or "how to do it".

10.2.6. Performance oriented writing. Writing should be performance oriented rather than topic oriented. Topic oriented writing looks like reference material aimed at a general, unspecified audience, telling all about a subject, the knowledge aspect, yet not how to apply the information. Performance oriented writing focuses on specific users; it describes their roles, tasks, and responsibilities and gives them the information they need about how to perform. The advantage of performance oriented text is that readers do not have to infer and conceptualize what to do; it is stated explicitly.

10.2.7. Writing techniques to improve student comprehension. Techniques for improving text comprehension include:

- Providing pre-presentation summaries outlining learning requirements.
- Inserting pictures showing spatial relationships, object form, or internal structures.
- Using concrete examples clarifying abstract ideas or depicting how principles work.
- Using methods that put demands on the student in reading and "processing" the text.
- Inserting questions before or after text segments to identify important information, or make desired inferences.
- Asking students to construct a diagram or "map" depicting the relationship of ideas in text to aid comprehension and recalling the information.

10.3. Reading Grade Levels / Building on Existing Knowledge.

10.3.1. A student's reading grade level affects how well they understand instructional materials. Readability formulas predict how well personnel of varying reading ability can recall text they have read or heard. Readability is of limited usefulness for predicting comprehension of instruction. Readability is limited because it does not:

- Provide precise estimates of difficulty.
- Estimate the difficulty of non-text materials such as tables and figures that make up much of the instruction in technical training courses.
- Take into account how the materials will be used, whether they are studied or read while performing.

- Take into account students' background knowledge in the area and related areas. Students with a lot of background knowledge can attain high comprehension while having reading ability several grade levels lower.

10.3.2. Issues other than readability should be considered in developing instruction. Performance oriented text is recommended in manuals over topic orientation. Topic oriented text tells the reader everything about the topic, but it does not tell what actions are to be performed. A reader must infer what to do. Surprisingly, technical manuals and texts are often topic oriented. Performance-oriented text explicitly tells the reader what actions are expected.

10.3.3. Building on existing knowledge. Students learn best when instruction is adapted to existing knowledge, skills, and background. Students can learn much from the life experiences they bring into the classroom. Education and training materials should consider students' existing knowledge and experiences.

10.3.4. It is not critical for educators and students to cover all topics and subjects equally well. Human energy and time are finite. Trying to master a little of everything may sacrifice efforts to focus on crucial information and issues. As instruction is being developed, education and training specialists should reference target population data to determine students' entry knowledge, skills, attitudes, and proficiencies so that instruction can be designed based on entry behaviors.

10.4. Using Examples / Motivating Students.

10.4.1. Providing students with good representative examples and contrasting them with bad ones are effective instructional strategies. It is necessary to collect a variety of examples that are not ambiguous or confusing.

10.4.2. Illustrate the task so that the student will understand the problem being studied and not acquire misconceptions. Each example must be complete and self-contained. Each example should contain the necessary critical features or attributes so that the student can observe their presence or absence. The student should be able to construct adequate generalizations or representations of the tasks from a good example.

10.4.3. Good examples must possess the following characteristics:

- The form and fidelity of each example must adequately represent the critical features of the task.
- Examples should be as divergent as possible while belonging to the task being taught. This will prevent the formation of misconceptions.
- Examples using extreme variations are avoided. They make examples difficult to understand or demand skills the students may not have.
- Easier examples should be provided early in the lesson with a gradual increase in difficulty.

10.4.4. Use attention-focusing devices to direct student attention to critical features, confusing features, and the absence of critical features. Students tend to respond to similar sets of stimuli in similar ways even when the response may be incorrect in one situation.

10.4.5. Focus on critical differences. Exposing students to good examples paired with appropriate bad examples facilitates student discrimination. Focusing on the critical differences between good and bad examples, so they may be easily identified, will assist the student in better discrimination. Just as students learn from their mistakes, they learn from good examples and bad examples.

10.4.6. Motivating students. When instruction gets the students' attention, students work hard, achieve more, and enjoy learning. Four classes of factors influence student motivation to learn and determine their achievement. Including these factors in the design and development of instruction can have beneficial effects on student outcomes.

Class 1: Exciting instruction. Instruction that is attractive and exciting is especially useful to gain a student's attention or interest. Instruction should include material that stimulates their curiosity and makes them eager to learn the material.

Class 2: Relevant instruction. Students understand the relevance of instruction when objectives are explained to them and new learning is related to their past experience and knowledge. Presentations need to explain the goals of the instruction, how the knowledge is to be used, and the role students will play in the work assignment when training is finished.

Class 3: Progressive sequencing. Providing instruction that allows students to proceed through a sequence of graded steps maximizes the likelihood of learning and develops confidence. By facilitating problem solving early, students tend to reduce effort in learning when failure is repeatedly experienced. Presenting simpler materials and problems first, arranging objectives in a progressive and logical sequence, and explaining adequate performance all motivate learning behavior.

Class 4: Objective feedback. Praise for accurate performance and informative feedback work better than threats or negative comments. Feedback given soon after performance should emphasize acceptable aspects of performance. Information correcting errors or guiding performance may be most useful when given just before another opportunity to perform.

10.5. Designing Effective Illustrations / Formative and Summative Evaluation.

10.5.1. Diagrams, graphs, photographs, and illustrations improve student learning. The following benefits from utilizing illustrations are:

- Illustrations enhance instructional text and help students remember content.
- Color illustrations encourage students to closely examine materials; color should be used especially to cue important material.

Good illustrations should have the following characteristics:

- Illustrations should be as simple as possible to reduce confusion.
- Illustrations should be directly related to the lessons. Those which are not are often more distracting than helpful.
- Illustrations with highlighted or labeled information aid learning by making critical items more apparent.
- Illustrations to show a complex system are a way to avoid clutter.

10.5.2. Animation is the use of several visuals in rapid succession to simulate motion. Animation may increase student attention. This technique is useful when the content is not appealing.

10.5.3. Formative and summative evaluation. Trying out instruction determines its overall effectiveness and efficiency. A formative evaluation is performed while an instructional program is being developed. It identifies and removes the most obvious errors in the instruction, obtains initial reactions to the content from the students, and prevents compounding errors. The evidence collected is used to "form" the instructional program.

10.5.4. Questions answered in formative evaluation. Questions in a formative evaluation should identify the students' perceptions of strengths and weaknesses of the instructional materials:

- Is the instruction interesting?
- Do the students understand what they are supposed to learn?
- Are the materials directly related to the stated objectives?
- How long do the students take to complete the material provided? Does this confirm planning?

This type of student feedback can be extremely useful for the developer.

10.5.5. Summative evaluation, on the other hand, is usually undertaken when instructional development is complete using a larger sample of students. Its purpose is to provide "summed" evidence about how well an instructional program works.

10.6. Effective Training / Instructional Objectives and Tests/Assessments.

10.6.1. Testing needs to be geared closely to the goals of an education and training program. Testing during and after instruction is used to indicate student progress, determine what students find difficult, and tailor individual assignments to overcome the difficulties.

10.6.2. The testing should be focused on performance requirements which are derived from analysis of the work trained individuals are expected to do. Various means of testing are used, including laboratory exercise performance, oral and written quizzes and tests, out of class assignments, classroom questions, and comprehensive performance tests.

10.6.3. Assessment needs to be as job-like as possible. Performance tests should be hands-on. Pencil and paper tests of knowledge should be restricted to safety and knowledge critical

for job performance. If workers use manuals and books to find the information needed to carry out a task on-the-job, open-book testing should be used.

10.6.4. Well-designed, performance oriented tests inform students about job requirements and guide their learning. Frequently tested students outperform less frequently tested ones. Students generally take two kinds of tests, knowledge and performance tests.

- Knowledge tests help instructors find out if the students have learned information important for safety and knowledge important for performance.
- Performance tests indicate student competence and provide information about both student and instruction inadequacies.

10.6.5. Prompt testing and feedback. Errors that students make on tests and in class identify learning problems that need to be corrected. Instructors need this information to provide prompt feedback to students on their performance and assignments and to help correct any difficulties they may have.

10.6.6. Instructional objectives and tests. Objectives and tests must correlate with each other. Objectives are derived from the job performance and instructional requirements.

10.6.7. Tests should be composed of the behaviors, conditions, and standards referenced in the objectives.

10.6.8. Performance and knowledge. Performance objectives and tests emphasize hands-on requirements while knowledge objectives and tests focus on information critical to job performance.

10.7. Time Distribution / Student Cooperation.

10.7.1. Spacing training over several sessions separated by other activities makes training more effective than masses of concentrated practice. Students can absorb only a limited amount of information at one time.

10.7.2. Designing shorter distributive segments. Training can be made more effective by designing shorter, distributed lesson segments with periods of varied interspersed activities. Drills for certain skill enhancements can be made effective by using short sessions of one particular drill separated by other drill activities.

10.7.3. Distributive better than successive. Two distributed sessions are twice as effective as two successive sessions. Students' achievements following mass practices are not as high as achievements in shorter, distributed sessions.

10.7.4. Promoting cooperation among students in training facilitates academic achievement. Some advantages of promoting student cooperation are:

- It is more effective than promoting interpersonal competition and individual effort to outshine others in class.
- It may also assist subsequent team activities as students learn to work together.

- It promotes positive feelings of personal worth and positive attitudes toward the course content.
- It promotes stronger interpersonal connectedness among students, which facilitates a stronger social support network outside the classroom.

10.7.5. Arranging peer interaction in small groups to supplement regular classroom and laboratory teaching helps slower and underachieving students learn and succeed.

10.7.6. Forms of peer cooperation. Peer cooperation can take a variety of forms:

- Discussion groups, seminars, or tutorial groups led by teaching assistants.
- The proctor model, where senior students may assist individual students.
- Student learning groups that do not have an instructor or are self-directed, or senior students teaching entering students.

10.7.7. Benefit of student coaching. Student coaching is useful in raising achievement in the following ways:

- The coaches benefit because they learn more about the material by preparing and giving lessons to others.
- The effort of coaching usually raises achievement test scores.
- The effects are greatest in long cognitive courses and extensive drill-in-practice courses.
- Short courses that stress test-taking show the least improvement from coaching methods.
- Classes that use tests at the start of the course report stronger coaching effects than classes giving tests only at the end.

10.7.8. Utilizing life experiences. Students bring many life experiences into the classroom, which should be acknowledged, tapped, and used. They can learn well through cooperative study with respected peers.

Chapter 11
Instructional Technology

11.1. Introduction.

11.1.1. Technology insertion is the use of appropriate instructional technology in instructional programs. Distance learning is structured learning that links a teacher and students in several geographic locations via technology.

11.2. Instructional Technologies.

11.2.1. Numerous technologies are available for delivering instruction. Most often, these technologies are used in combination with each other to meet education and training requirements at an acceptable cost. **Table 11.1** lists the instructional technologies that can be utilized in both the resident classroom and for the non-resident distance learning process.

Table 11.1. Instructional Technologies.

Instructional Technology	Types
Traditional Media	Print Print, Audio, and Slide Digital Audio Files Digital Video Files Audioconferencing Television and Cable Models and Mock-ups
Computer Mediated Communications	Audio graphics Computer Mediated Conferencing Collaborative Computing
Interactive Multimedia Instruction	Interactive Courseware Computer Based Instruction/Training Intelligent Computer Assisted Instruction Electronic Performance Support Systems Computer Simulation
Internet Based Instruction	Text Only Multimedia Virtual/Collaborative Conferencing
Support Technology	Electronic Testing Computer Managed Instruction Advanced Distributed Learning (ADL) Course Management Systems Electronic Help Desk Electronic Publications Interactive Electronic Technical Manuals E-mail, Bulletin Boards/Fax Conferencing Voice Mail

11.2.2. Benefits of incorporating instructional technology. Instructional technology is more than just applying information technology to the learning environment; it is making use of technology to promote learning by creating interactive, structured, and integrated units of instruction.

11.2.3. When appropriately employed, instructional technology can increase the effectiveness and efficiency of instruction. When inappropriately employed, the insertion of technology in instructional courses can result in:

- Ineffective instruction and substandard learning.
- Increased learning time.
- Excessive costs for course development, logistics, and maintenance.
- Increased personnel requirements.
- Unacceptable changes in, operating structure, functions, and resources.

11.2.4. To make appropriate instructional technology choices, apply a disciplined process to selecting the training solution. Using the ISD process helps structure the analysis and design processes to facilitate selection of the most resource-effective media solution.

This means that instructional designers must understand the benefits and costs associated with each technology option, as well as the learning needs of the students, and the impact of the learning environment on the selection of presentation media and course design.

11.3. Technology Insertion.

11.3.1. While the instructor may or may not be present at the time the student is actually using the instructional technology, technology insertion applies ONLY to the use of technology to support training instructional programs. Instructional technologies can be integrated directly into a traditional classroom or laboratory course of instruction, used for remediation and self-study to reinforce learning in a resident course, or used to augment or refresh training received through a resident program.

11.3.2. Background. Technology insertion is not new. The use of language laboratories where students use headphones to listen to foreign language tapes and then repeat phrases into a microphone so the instructor can monitor their progress represents one example of technology insertion that has been employed for more than 30 years. A more recent example is the use of computer-generated presentations to reinforce learning concepts. Today, more and more training programs are incorporating advanced technologies such as augmented and virtual reality.

Everything from flip charts to mock-ups to simulators as well as augmented/virtual reality can be used to enhance traditional instruction. As technological options evolve at an ever-increasing rate, project managers, instructional designers, and instructors must understand how these technologies work and how they can help or hinder the learning process. Participants in the development process must understand the roles they play, the infrastructure requirements, and how to coordinate the resources necessary to employ the new technologies effectively.

11.3.3. Technology insertion, appropriately applied, can include:

- An increase in levels of interactivity with instructional materials.
- An effective method of providing performance measurement tools for assessing student progress and mastery of learning objectives.
- An increase in student retention of instruction over time.
- Reduction in training time.
- Reduction in instructor requirements.
- An increase in the transfer of learning to the job environment.

11.3.4. Impact of technology insertion. Technology insertion impacts instructional programs from planning the training project through implementation and evaluation of the course of instruction. Quality technology insertion decisions rely on a structured ISD approach, solid project management, and a thorough understanding of the impact of each media alternative, the impact on learning, instructional staff, project development and delivery, and life cycle cost of the training program.

11.4. Distance Learning.

11.4.1. Distance learning (DL) is structured learning that links a teacher and students in several geographic locations via technology. The following key attributes are essential for any DAF DL program:

- Physical distance between learner and instructor.
- Academic institution or functional organization sponsorship.
- Part of a structured curriculum with stated objectives.
- Two-way communication and feedback between sponsor and learner.
- Deployment outside the confines of the resident schoolhouse.
- Includes process to evaluate program effectiveness.

11.4.2. Effectiveness of DL. There seems to be an assumption that unless a learner is in a classroom to receive face-to-face instruction, the quality of the learning will be compromised. Exhaustive research overwhelmingly suggests otherwise.

Analysis of more than 600 courses spanning more than 40 years proves there is no significant difference in learning outcomes for courses offered at a distance when courses are properly designed and the best medium is selected. Learning outcomes often increase with DL because the student is more actively engaged in the learning process. Thus, there is no direct correlation between face-to-face interactivity and student performance. What is important is the quality of instruction, not location.

The key to success in distance learning is the teacher. If the teacher on the system is good, the technology itself can become almost transparent. Conversely, no technology can overcome poor teaching; poor teaching is actually exacerbated at a distance.

11.4.3. Application. DL programs are packaged into units of instruction then delivered to users at non-resident education and training sites. These sites range from DL centers to learners' own homes. The instruction can be delivered to the user by:

- Satellite networks.
- Terrestrial networks (e.g., computer networks, telephone lines, and routers).
- Mail.

11.4.4. There are two modes of delivery for DL instruction: **Synchronous instruction**: Consists of real-time interaction and transmission of instruction, and requires simultaneous participation of all students and the instructor. **Asynchronous**: Consists of other than real-time interaction and the transmission of "stored" instruction or files that do not require participation of all students and instructors at the same time.

11.4.5. Existing resident methods for instructing large groups of individuals generate student travel costs and overhead expenses such as facility operating and maintenance costs. The primary objectives of DL are to extend the learning environment (instructor and/or instructional media) to the students at their location or remote site, increase learning opportunities, and ensure mission readiness in a cost-effective manner. Downsizing and reductions in military budgets have required the Department of Defense (DoD) to develop cost effective methods such as DL to educate, train, and certify personnel. Additionally, events that prevent members from being present in the physical classroom can hinder training as well. For example, the COVID 19 restrictions have made DL even more important in education and training. Some of the benefits of DL are:

- Increased training opportunities.
- Timely instruction to multiple or individual students at many locations.
- Real-time access to widely dispersed subject matter experts.
- Increased flexibility in instructional media and methods.
- Increased instructor and instructional media resource sharing.
- Increased productivity by providing instruction at student's work area.
- Reduced student travel and facility expenses.
- Decrease in loss of training time due to physical constraints.

11.4.6. DAF DL. DAF DL goals are to:

- Create an environment that recognizes the value of DL.
- Ensure availability of resources to meet education and training requirements.
- Ensure Total Force interoperability for all distance learning instructional technology.
- Capitalize on appropriate leading-edge technology.
- Improve educational and training efficiencies where practical and cost effective.

11.5.9. While DL is not a cure-all, it is a viable means to expand the impact of training instructional programs, increase readiness, and assist in the development and maintenance of critical skills. Deciding to develop a DL course impacts the traditional development processes. It requires designers to look again at how information is organized. It requires special instructor skills and constant attention to implementation issues.

JOHN A. FEDRIGO, SES, SAF/MR
Principal Deputy Assistant Secretary
(Manpower & Reserve Affairs)

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

DAFI 36-2670, *Total Force Development*, 25 June 2020
AFPD 36-26, *Total Force Development and Management*, 18 March 2019
DAFPD 36-81, *Total Force Human Resource Management Governance*, 23 October 2020
AFI 33-322, *Records Management and Information Governance Program*, 23 March 2020
MIL-HDBK-29612-1A, *Guidance for Acquisition of Training Data, Products and Services,* 31 August 2001
MIL-HDBK-29612-2A, *Instructional System Development/Systems Approach to Training and Education,* 31 August 2001
MIL-HDBK 29612-3A, *Development of Interactive Multimedia Instruction (IMI),* 31 August 2001
MIL-HDBK 29612-4A, *Glossary for Training,* 31 August 2001
MIL-HDBK 29612-5, *Advanced Distributed Learning Products and Systems,* 31 August 2001
Bick Har Lam & Kwok Tung Tsui (2014). *Curriculum mapping as deliberation-examining the alignment of subject learning outcomes and course curricula, Studies in Higher Education,* DOI: 10.1080/03075079.2014.968539.
Bloom, B.S. (Ed), Englehart, M.D., Furst, E.J., Hill, W.K. and Krathwohl, D.R. (1956). *Taxonomy of Educational Objectives*, Handbook 1: Cognitive Domain. New York: Longman.

Adopted Form

AF Form 847, Recommendation for Change of Publication

Abbreviations and Acronyms

ADL—Advanced Distributed Learning
AETC—Air Education and Training Command
AF—Air Force
AFH—Air Force Handbook
AFI—Air Force Instruction
AFPD—Air Force Policy Directive
AR—Augmented Reality
AU—Air University
CAI—Computer-Assisted Instruction
CBI—Computer-Based Instruction
CBT—Computer-Based Training
CMI—Computer-Managed Instruction
CRT—Criterion Referenced Test
DAF—Department of the Air Force
DL—Distance Learning
DHTML—Dynamic Hyper Text Markup Language
DVIDS—Defense Video and Imaging Distribution System

HRM—Human Resource Management
HTML—Hyper Text Markup Language
ICW—Interactive Courseware
IMI—Interactive Multimedia Instruction
ISD—Instructional System Development
IT—Instructional Technology
LMS—Learning Management System
MEAS—Measure
MIL-HDBK—Military Handbook
OPR—Office of Primary Responsibility
POI—Plan of Instruction
SHTML—Server-parsed Hyper Text Markup Language
TNA—Training Needs Assessment

Terms

Association—The connection made between an input (stimulus) and an action (response).

Attitude—(a) The emotions or feelings that influence a learner's desire or choice to perform a particular task. (b) A positive alteration in personal and professional beliefs, values, and feelings that will enable the learner to use skills and knowledge to implement positive change in the work environment. Also, see **Knowledge** and **Skill.**

Augmented Reality—A technology that superimposes a computer-generated image on a user's view of the real world, i.e., adds digital elements to a live view of the camera of a smartphone.

Behavior—Any activity, overt or covert, capable of being measured.

Cognitive Strategies—The capability of individuals to govern their own learning, remembering, and thinking behavior.

Computer-Assisted Instruction (CAI)—The use of computers to aid in the delivery of instruction. A variety of interactive instructional modes is used including tutorial, drill, practice, gaming, simulations, or combinations. CAI is an integral part of computer-based instruction (CBI) and computer-based training (CBT).

Computer-Based Instruction (CBI) and Computer-Based Training (CBT)—the use of computers to aid in the delivery and management of instruction. CBI and CBT are synonymous and are used interchangeably. CAI (the delivery of instruction) and CMI (computer-managed instruction) are both elements of CBI and CBT.

Computer-Managed Instruction (CMI)—The use of computers to manage the instructional process in CBI. Management normally includes functions such as registration, pretesting, diagnostic counseling, progress testing, and post-testing. CMI is also used to schedule and manage educational resources and actual equipment.

Constraints—Limiting or constraining conditions or factors, such as policy considerations, time limitations, equipment, environmental factors, personnel, budgetary, or other resource limitations.

Cooperative Learning—An instructional strategy that enables small groups of students to work together on a common assignment.

Course—(a) Logically grouped instruction on a subject, designed to achieve predefined learning objectives. It usually concerns a single job or task (job-skills-type training) or a section of organized knowledge (information-type training). (b) A complete series of instructional units identified by a common title or number. (c) An ordered arrangement of subject matter designed to instruct personnel in the knowledge, skills, or attitudes required for the performance of tasks in a designated area of specialization. A course consists of one or more modules.

Course Chart—A qualitative course control document that states the course identity, length, and security classification, lists major items of equipment, and summarizes the subject matter covered.

Course Control Documents—Specialized publications used to control the quality of the instructional system.

Courseware—Training materials such as technical data, textual materials, audiovisual instructional materials, and computer-based instructional materials.

Criterion— (a) The standard by which something is measured. (b) In test validation, the standard against which test instruments are correlated to indicate the accuracy with which they predict human performance in some specified area. (c) In evaluation, the measure used to determine the adequacy of a product, process, behavior, and other conditions.

Criterion-Referenced Test (CRT)—A test to determine, as objectively as possible, a student's achievement in relation to a standard based on criterion objectives. During instructional development, the CRT can be used to measure the effectiveness of the instructional system. The test may involve multiple-choice items, fill-in items, essays, or actual performance of a task. If given immediately after the learning sequence, it is an acquisition test; if given considerably later, it is a retention test; if it requires performance not specifically learned during instruction, it is a transfer test.

Discrimination—The process of making different responses to a stimulus. A discrimination requires a person to determine the differences among inputs and to respond differently to each.

Distance Learning—Training that is exported, such as from a resident course to a field location.

Duty—A large segment of the work done by an individual; major divisions of work in a job.

Education—The formal academic instruction offered by institutions of higher learning that focuses on the study of the nature and principles of a given discipline.

Evaluation—A judgment expressed as a measure or ranking of trainee achievement, instructor performance, process, application, instructional material, and other factors (see DoD Inst. 29612). It includes **Formative Evaluation**; **Operational Evaluation**; and **Summative Evaluation**.

External Evaluation—The acquisition and analysis of feedback data from outside the formal training environment to evaluate the graduate of the instructional system in an operational environment. Also called **Field Evaluation.** Also, see **Operational Evaluation.**

Feedback—Information that results from or is contingent upon an action. The feedback does not necessarily indicate the rightness of an action; rather, it relates the results of the action from which inferences about correctness can be drawn. Feedback may be immediate, as when a fuse blows because a lamp is incorrectly wired; or delayed, as when an instructor provides a discussion pertaining to an exam taken the previous week, or when completed graduate evaluation questionnaires are reviewed.

Fidelity—The degree to which a task or a training device represents the actual system performance, characteristics, and environment.

Field Evaluation—See **External Evaluation.**

Formative Evaluation—An activity that provides information about the effectiveness of educational materials to meet learning objectives and the student acceptance of instructional materials as they are being developed. It is conducted while the instructional system or course is still under development, to gather data on lessons, units, or modules of instruction as they are completed. The purpose is to make improvements to the system or course while development is still in progress. Also, see **Evaluation.**

Generalization—Learning to respond to a new stimulus that is similar, but not identical, to one that was present during original learning. For example, during learning, a child calls a beagle and spaniel by the term "dog"; a child who has generalized would respond "dog" when presented with a hound.

Instructional Objective—See **Objective.**

Instructional Strategy—An overall plan of activities to achieve an instructional goal.

Instructional System—An integrated combination of resources (students, instructors, materials, equipment, and facilities), techniques, and procedures performing effectively and efficiently the functions required to achieve specified learning objectives.

Instructional System Developer—A person who is knowledgeable of the instructional system development (ISD) process and is involved in the analysis, design, development, implementation, and evaluation of instructional systems. Also called Instructional Designer, Instructional Developer, Curriculum Developer, Curriculum Development Manager, and other terms.

Instructional System Development (ISD)—A deliberate and orderly, but flexible, process for planning, developing, implementing, and managing instructional systems. ISD ensures that personnel are taught in a cost-efficient way the knowledge, skills, and attitudes essential for successful job performance.

Interactive Courseware (ICW)—Computer-controlled instruction designed to allow the student to interact with the learning environment through input devices such as keyboards and light pens. The student's decisions and inputs to the computer determine the level, order, and pace of instructional delivery, and forms of visual and aural outputs. (May include CAI, CMI, and CBI).

Internal Evaluation—The acquisition and analysis of feedback and management data from within the formal training environment to assess the effectiveness of the instructional system. Also, see **Operational Evaluation.**

Job—The duties, tasks, and task elements performed by an individual. The job is the basic unit used in carrying out the personnel actions of selection, training, classification, and assignment.

Job Aid—A checklist, procedural guide, decision table, worksheet, algorithm, or other device used by a job incumbent to aid in task performance. Job aids reduce the amount of information that personnel must recall or retain.

Job Analysis—The basic method used to obtain salient facts about a job, involving observation of workers, conversations with those who know the job, analysis questionnaires completed by job incumbents, or study of documents involved in performance of the job.

Job Performance Requirements—The tasks required of the human component of the system, the conditions under which these tasks must be performed, and the quality standards for acceptable performance. Job performance requirements describe what people must do to perform their jobs.

Job Task Analysis—A process of examining a specific job to identify all the duties and tasks that are performed by the job incumbent at a given skill level. Also called **Task Analysis.**

Knowledge—Use of the mental processes that enable a person to recall facts, identify concepts, apply rules or principles, solve problems, and think creatively. Knowledge is not directly observable. A person manifests knowledge through performing associated overt activities. Also, see **Attitude** and **Skill.**

Learning—A change in the behavior of the learner because of experience. The behavior can be physical and overt, or it can be intellectual or attitudinal.

Lesson Plan—Plan that organizes what is presented in a lesson, as well as when and how.

Media—The delivery vehicle for presenting instructional material or basic communication stimuli to a student to induce learning. Examples are instructors, textbooks, slides, interactive courseware (ICW), and TV.

Mission Analysis—A process of reviewing mission requirements, developing collective task statements, and arranging the collective tasks in a hierarchical relationship.

Motor Skill—Physical actions required to perform a specific task. All skills require some type of action.

Objective—A statement that specifies precisely what behavior is to be exhibited, the conditions under which behavior will be accomplished, and the minimum standard of performance. Objectives describe only the behaviors that directly lead to or specifically satisfy a job performance requirement. An objective is a statement of instructional intent.

Operational Evaluation—The process of internal and external review of system elements, system requirements, instructional methods, courseware, tests, and process guide revision as needed to enhance the continued training effectiveness and efficiency of the training system during full-scale operations. The process begins at the training system readiness review and continues throughout the life of the training system. It includes **Internal Evaluation** and

External Evaluation—Also, see **Evaluation.**

Performance—Part of a criterion objective that describes the observable student behavior (or the product of that behavior) that is acceptable to the instructor as proof that learning has occurred.

Plan of Instruction (POI)—A qualitative course control document designed for use primarily within a school for course planning, organization, and operation. Generally, criterion objectives, duration of instruction, support materials, and guidance factors are listed for every block of instruction within a course. Also called **Syllabus.**

Posttest—A criterion-referenced test designed to measure performance on objectives taught during a unit of instruction; given after the instruction. Also, see **Criterion-Referenced Test.**

Pretest—A criterion-referenced test designed to measure performance on objectives to be taught during a unit of instruction and performance on entry behavior; given before instruction begins. Also, see **Criterion-Referenced Test.**

Psychomotor—A major area of learning that deals with acquiring physical skills requiring dexterity, coordination, and muscular activity.

Reliability—(a) A characteristic of evaluation, which requires that testing instruments yield consistent results. (b) The degree to which a test instrument can be expected to yield the same result upon repeated administration to the same population. (c) The capability of a device, equipment, or system to operate effectively for a period of time without a failure or breakdown.

Skill—The ability to perform a job-related activity that contributes to the effective performance of a task. Skills involve physical or manipulative activities, which often require knowledge for their execution. All skills are actions having specific requirements for speed, accuracy, or coordination. Also, see **Attitude** and **Knowledge.**

Subject Matter Expert (SME)—(a) An individual who has thorough knowledge of a job, duties/tasks, or a particular topic, which qualifies him/her to assist in the training development process (for example, to consult, review, analyze, advise, or critique). (b) A person who has high-level knowledge and skill in the performance of a job.

Summative Evaluation—The overall assessment of a program at the completion of the developmental process. It is designed and used after the instructional system has become operational. Also, see **Evaluation.**

Syllabus. See **Plan of Instruction.**

System Approach to Training (SAT)—Procedures used to develop instruction. Each phase requires input from the prior phase and provides input to the next phase. Evaluation provides feedback, which is used to revise instruction. Also, see **Instructional System Development.**

Target Audience—The total collection of possible users of a given instructional system; the persons for whom the instructional system is designed.

Task—A unit of work activity or operation, which forms a significant part of a duty. A task usually has clear beginning and ending points and directly observable or otherwise measurable processes, frequently but not always resulting in a product that can be evaluated for quantity, quality, accuracy, or fitness in the work environment. A task is performed for its own sake; that is, it is not dependent upon other tasks, although it may fall in a sequence with other tasks in a duty or job array.

Task Analysis—See **Job Task Analysis.**

Terminal Objective—An objective the learner is expected to accomplish upon completion of the instruction. It is composed of enabling (support or subordinate) objectives.

Training—A set of events or activities presented in a structured or planned manner, through one or more media, for the attainment and retention of knowledge, skills, abilities, or attitudes required to meet job performance requirements.

Training Needs Assessment (TNA)—The study of performance and the environment that influences it in order to make recommendations and decisions on how to close the gap between the desired performance and the actual performance.

Validation—The process by which the curriculum materials and instructional media materials are reviewed for instructional accuracy and adequacy, suitability for presentation, and effectiveness in providing for the trainees' accomplishment of the learning objectives.

Validity—The degree to which a criterion test actually measures what it was designed to measure.

Virtual Reality—The computer-generated simulation of a three-dimensional image or environment that can be interacted within a seemingly real or physical way by a person using special electronic equipment, such as a headset and/or gloves with sensors.

Attachment 2

TRAINING NEEDS ASSESSMENT (TNA)

Problem Analysis	Job Analysis	Learner Analysis
Determine if training is the appropriate vehicle to solve a problem, and if so, how to do it.	Gather information on how, where, and with what information a job is done in order to define the knowledge, skills, abilities, or attitudes (S/K/A) required for good job performance.	Determine what the individuals to be trained (the target population) already know, and in turn, which K/S/A requirements are to be developed.
Sample questions: - What exactly is the problem that training is expected to solve? - What causes it? - What could be the training solution?	Standards of job performance are defined that will later enable developer to evaluate whether the training was effective at the job performance level.	Gather information on the trainee's social and cultural background, and their preferred modes of learning to guide the choice of training strategies/methodologies.

Attachment 3

LEARNING ANALYSIS WORKSHEET - EXAMPLE

<table>
<tr><td colspan="2">Training Event
Duty Description:</td></tr>
<tr><td colspan="2">Training Event
AFSC (if applicable) Date:</td></tr>
<tr><td colspan="2">Task: Task Code:</td></tr>
<tr><td colspan="2">Behavior:</td></tr>
<tr><td colspan="2">Condition(s):</td></tr>
<tr><td colspan="2">Standard(s):</td></tr>
<tr><td>Performance Steps:</td><td>Knowledge, Skills, Attitudes (KSA):</td></tr>
</table>

Attachment 4

PROJECT MANAGEMENT PLAN – EXAMPLE

Project Management Plan			
Milestone(s)	Start Date	Est Comp Date	Actual Comp Date
Team projected Man-hours for Project = ##			

Deliverable(s)	Start Date	Est Comp Date	Actual Comp Date

Estimated Costs			
TDY	Supply	Contract	Total

Attachment 4 (Cont.)

<table>
<tr><th colspan="4">Project Closure</th></tr>
<tr><td colspan="4">Number of team meetings:</td></tr>
<tr><td colspan="4">Actual Costs:
<table><tr><td>TDY</td><td>Supply</td><td>Contract</td><td>Total</td></tr><tr><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td colspan="4">Total team man-hours committed to project:</td></tr>
<tr><td colspan="4">Deliverable(s) accomplished:</td></tr>
<tr><td colspan="4">Lesson learned:</td></tr>
</table>

Attachment 5

LEARNING OBJECTIVE WORKSHEET – EXAMPLE

Task Behavior:
Task Number: Date:
Downgrade Justification (if applicable):
Use a Learning Objective Worksheet for each learning objective.
Terminal Learning Objective/Enabling Objective (Circle one):
Test Item / Evaluation:
Method / Media:

Attachment 6

PROFICIENCY CODE KEY – EXAMPLE

Proficiency Code Key		
	Scale Value	Definition: The learner:
Task Performance Levels	1	Can do simple parts of the task. Needs to be told or shown how to do most of the task. (extremely limited)
	2	Can do most parts of the task. Needs only help on hardest parts. (partially proficient)
	3	Can do all parts of the task. Needs only a spot check of completed work. (competent)
	4	Can do the complete task quickly and accurately. Can tell or show others how to do to the task. (highly proficient)
Task Knowledge Levels	a	Can name parts, tools, and simple facts about the task. (nomenclature)
	b	Can determine step-by-step procedures for doing the task. (procedures)
	c	Can identify why and when the task must be done and why each step is needed. (operating principles)
	d	Can predict, isolate, and resolve problems about the task. (advanced theory)
Subject Knowledge Levels	A	Can identify basic facts and terms about the subject. (facts)
	B	Can identify relationship of basic facts and state general principles about the subject. (principles)
	C	Can analyze facts and principles and draw conclusions about the subject. (analysis)
	D	Can evaluate conditions and make proper decisions about the subject. (evaluation)

Note: The behavioral coding system is a bit more straightforward: "K" for subject knowledge, "pk" for task knowledge, and "P" for task performance.

Attachment 7

LESSON PLAN PART 1 - EXAMPLE

PLAN OF INSTRUCTION/LESSON PART I	
NAME OF INSTRUCTOR	COURSE TITLE Apprentice Course
BLOCK TITLE Block I - Electronic Principles	
COURSE CONTENT	**TIME**
1. Orientation, Air Force Core Values and Environmental Education a. School orientation conducted in accordance with AETCI 36-XXXX/XX TRG Sup. Task(s): N/A MEAS: None	2 (2)

SUPERVISOR APPROVAL OF LESSON PLAN	
SIGNATURE AND DATE	SIGNATURE AND DATE

SUPPORT MATERIALS AND GUIDANCE

Student Instructional Materials
V3ABRXXX1B 000C SW-I, Electronic Principles

Audiovisual Aids
Power Point Presentation, Block I (Optional)

Training Methods
Lecture/Discussion (2 hrs.)

Instructional Guidance
1(a) Welcome students to the course. The instructor/instructor supervisor will lecture/discuss all items of the orientation outline to ensure each student achieves a complete understanding of policies, objectives, and course materials, which will be in effect during the course. Ensure students are briefed on effective study techniques, the student critique program, and on the value of the Community College of the Air Force. Answer student's questions related to course content, length, and follow-on training. Technical data, Core Values as referenced in The Little Blue Book, and Operational Risk Management, to include equipment hazards, will be integrated throughout the course, as appropriate for the objective. Explain progress checks, block tests, and expectations.

Attachment 7 (Continued)

LESSON PLAN PART II – EXAMPLE

LESSON PLAN PART II, TEACHING GUIDE

UNIT TIME: 2 Hr(s), 0 Min(s)

INTRODUCTION

ATTENTION:

MOTIVATION:

REVIEW:

OVERVIEW:

TRANSITION:

BODY

PRESENTATION:
1. Publications

a. Without reference, identify basic facts about the description of the Technical Order System and TO/CEM Improvement Report with a minimum of 75% accuracy.

TRAINING METHOD(s): Lecture/Discussion

AUDIOVISUAL AID(s):

Power Point Presentation, Block V (Optional)
AFTO Form 22
T.O. 00-5-1 (Electronic Copy)

(1) Definition of a technical order

(a) A technical order is a manual issued by the Air Force that explains in writing how to do work on a piece of equipment or to describe a general subject

(b) All T.O.'s are written orders that must be obeyed

(2) Technical order administration

(a) The Secretary of the Air Force authorizes the preparation and publication of all new technical orders

(b) On July 1, 1992, the Air Force Logistics Command and Air Force Systems Command were integrated to form the new Air Force Materiel Command. Today, the Air Force Materiel Command assumes responsibility for development, printing, storage and distribution of new T.O.s

Attachment 8

VALIDATION PROCESS/CHECKLISTS – EXAMPLE

VALIDATION PROCESS/CHECKLIST

BEFORE and DURING VALIDATION

ISD:

- ☑ Distribute tentative course documents and Validation Data Checklist (Attachment 1) to validating instructors
- ☑ Validation Data Checklist will be used for all course validations.

INSTRUCTOR:

- ☑ Complete all mandatory headings for each of the validation attachments.
- ☑ Ensure training materials are complete and available for students.
- ☑ Ensure necessary support resources are available.
- ☑ At the beginning of class, have students complete the Student Data Worksheet (Attachment 1)
- ☑ After EACH BLOCK/OBJECTIVE of instruction:
    - ☑ Ensure each student completes the Student Validation Questionnaire (Attachment 3).
    - ☑ Discuss student's areas of concern.
    - ☑ Resolve student's concerns if possible; elevate as appropriate.
    - ☑ Complete the Instructor Validation Questionnaire (Attachment 4), and address unresolved concerns.
    - ☑ Annotate programmed/actual lecture, demonstration and performance times on the Time Increments Worksheet (Attachment 5), rounded to the next quarter hour.
    - ☑ Document progress checks/evaluations pass/fail data.
    - ☑ Perform an analysis of written measurement items and identify high-miss items.
- ☑ At the completion of each class, forward all worksheets and related documentation to ISD monitor.

STUDENT:

- ☑ Complete Student Data Worksheet (Attachment 1).
- ☑ Complete a Student Validation Questionnaire (Attachment 3) after each block/objective.
- ☑ Provide course feedback (as required).

AFTER VALIDATION

ISD:

- ☑ Review all Student Validation Questionnaires (Attachment 3).

☑ Review all Instructor Validation Questionnaires (Attachment 4) identifying any trends, common problems or concerns. (Attach any additional comments to the worksheets on a separate sheet of paper)

☑ Review Time Increments Worksheet (Attachment 5) for each class, making any needed comments on the back of the worksheets.

☑ Meet with SMEs to finalize identified changes necessary during validation. Establish milestones/suspenses.

☑ Perform a validation review upon completion of final validation class addressing the quality of the following items as a minimum:

- ☑ CC/TS or Course Chart
- ☑ Objectives
- ☑ Teaching steps
- ☑ Instructional times, methods, and materials
- ☑ Audiovisual aids
- ☑ Training resources (equipment, facilities and personnel)
- ☑ Multiple instructor requirement
- ☑ Instructional guidance
- ☑ Lesson plan content.
- ☑ Measurement devices and specific items.
- ☑ Student population data.
- ☑ Using the data from the validation review, prepare a validation package to include, as a minimum, the following items:
- ☑ All Student Data Worksheet (Attachment 1)
- ☑ All Instructor Validation Questionnaires (Attachment 4)
- ☑ All Time Increments Worksheet (Attachment 5
- ☑ Student Surveys that specifically address course content.

☑ Document proposed course changes and include list of changes with validation package.

☑ Provide supervision a notification upon validation completion and provide a list of changes.

☑ File the validation summary report in the course document package.

☑ Publish new course documents within 30 days of validation. If an extension is required, coordinate extension approval with supervision via email.

Attachment 8 (Continued)
ISD VALIDATION PLAN AND CHECKLIST

Instructions: Fill in all validation dates and checklist. Once validation is complete, the ISD Manager and supervision will sign/date verifying completion.

VALIDATION CLASSES	LOCATION	START DATE	END DATE
FIRST (PROJECTED)			
SECOND (PROJECTED)			
THIRD (PROJECTED)			

Step	*OPR*	Complete
1. Validation package distributed to instructor(s)	ISD	
2. Instructor briefed on validation process	ISD	
3. Validation forms distributed to students and explained	INSTR	
4. Written measurement analysis forwarded to ISD	INSTR	
5. Instructor Questionnaires turned in to ISD	INSTR	
6. Student Questionnaires turned in to ISD	INSTR	
7. Time Increments Worksheets forwarded to ISD	INSTR	
8. Class validation review conducted: Date of Review:	ISD	
	INSTR	
9. Open items with corrective actions identified, and target dates established.	ISD	
	INSTR	
10. If applicable, coordinate changes with Lead Curriculum Manager	ISD	
11. Scan/file Validation Documents/Report with course documents (within 30 work days of last validation class completion)	ISD	

Attachment 8 (Continued)

STUDENT DATA WORKSHEET

Course Number/Title: _____

Class Dates: _____

Note: All entries on this form are MANDATORY.
This worksheet may be used to document data for multiple classes

NAME LAST, FIRST	GRADE	CLASS NUMBER	TIME IN SERVICE	TIME IN CURRENT JOB	AFSC	EDUCATION LEVEL

Attachment 8 (Continued)

STUDENT VALIDATION QUESTIONNAIRE

Course Number/Title: _____

Block/Objective Number: _____

Class Dates: _____

INSTRUCTIONS: **Students** complete a separate questionnaire after each block/objective being validated.

Note: Unless otherwise noted, ALL entries are MANDATORY. For 'No' responses, provide remarks in the 'Student Comments/Suggestions' section below.

Note: Check the appropriate response and feel free to comment on any and all areas. At the conclusion of each block/objective of instruction, present this form to the instructor.			
Presentation	**Yes**	**No**	**N/A**
1. Were the objectives stated and written clearly?			
2. Was the instructor's presentation clear?			
3. Were examples used applicable to the lesson?			
4. Did the audiovisuals support the objectives?			
5. Did the time "seem right" for the objectives?			
Literature *(EX: technical orders, study guides, etc.)*			
1. Did training literature support the objectives?			
2. Was the training literature understandable?			
3. Were drawings/figures clear and helpful?			
4. Was the amount of reading "about right"?			
Evaluation			
1. Were progress check (PC)/evaluation instructions clear?			
2. Did the PC/evaluation measure the objective(s)?			
3. Did your instructor review all PC/evaluation objective(s)?			

Student Comments/Suggestions:

Attachment 8 (Continued)

INSTRUCTOR VALIDATION QUESTIONNAIRE

Course Number/Title: _____

Block/Objective Number: _____

Class Dates: _____

INSTRUCTIONS: Instructors complete a separate questionnaire after each block/objective being validated. Use reverse for additional comments or attach additional sheets.

Note: Unless otherwise noted, ALL entries are MANDATORY. For 'No' responses, provide remarks in the 'Instructor Comments/Suggestions' section below.

Questions *(Be specific about any "No" or "N/A" selected)*	Yes	No	N/A
1. Did the lecture/discussion go smoothly?			
2. Was the lecture/discussion time about right?			
3. Were there problems with training literature?			
4. Did the audiovisual aids enhance the training?			
5. Did practice exercises prepare students?			
6. Did performance PCs/evaluations measure the objectives?			
7. Was practice/performance time about right?			
8. Did the written PCs/tests measure the objectives?			
9. Were there any high miss PC/test questions? *(Over 50%)*			
10. Were there any resource restraints that impacted training?			
Note: Check the appropriate response and feel free to comment on any and all areas. At the conclusion of each unit/objective of instruction, collect the student questionnaires and forward with this form to ISD Manager.			

Instructor Comments/Suggestions:

_____
_____
_____
_____
_____

Attachment 8 (Continued)

TIME INCREMENTS WORKSHEET

Course Number/Title: ___________________

Block/Objective Number: ________________

Class Dates: ___________________________

INSTRUCTIONS: Use reverse for additional comments or attach additional sheets.

Note: All heading entries are MANDATORY

	ACTUAL TIMES			
Objective (*EX: 2a*)	Lecture/ Discuss	Demonstration	Performance	Objective Total