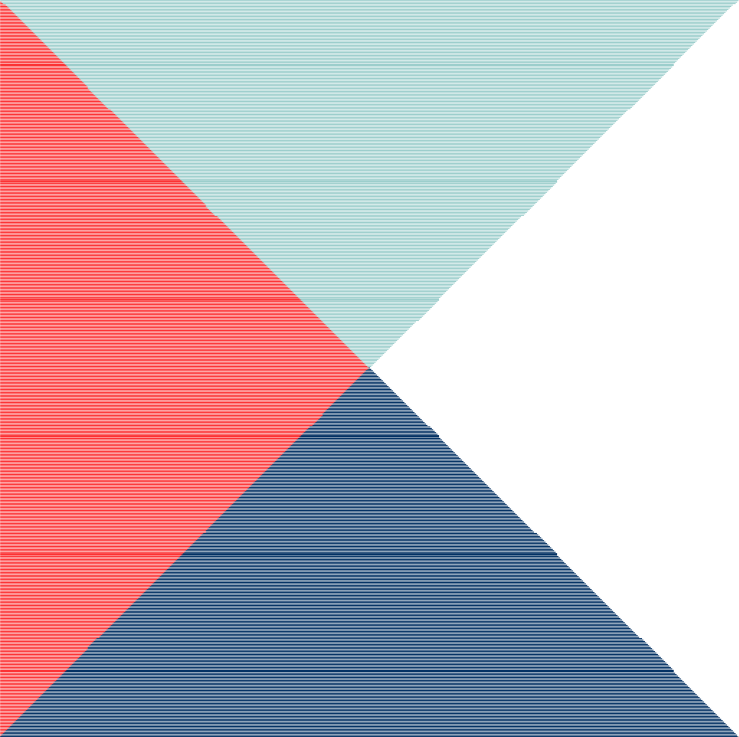
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**Defence Centre of Training Support Training Support Handbook**

**INSTRUCTIONAL DESIGN**

****

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**DOCUMENT QUALITY RECORD**

The following quality control statements are made in accordance with the requirements of the Defence Systems Approach to Training Quality System:

1. **Security Classification: UNCLASS**
2. **Authority:** This Training Support Handbook is published under the authority of the Commanding Officer Defence Centre of Training Support.
3. **Review Period:** This handbook will be reviewed annually.
4. **Issue Number:** V1.0
5. **Amendment status:** See page ii.
6. **Disposal Instructions:**
   1. **Amendments:** Individual pages that are replaced during the amendment process should be disposed of according to the document security classification in accordance with local instructions.
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**FOREWORD**

1. For the purpose of this document, the term “training”1 encompasses all Learning2, Education3 and Personal Development4 that has the objective of developing the knowledge, skills and/or attitudes of an individual toward preparing that individual for their role.
2. **Policy for the Management of Individual Training and Education in Defence.** This policy sets the framework for the management of individual training across Defence and details the key areas of Training Management (TM), Training Requirements Authority5 (TRA) and Training Delivery Authority6 (TDA) roles and Customer Executive Board (CEB) function. It is the high level policy that defines who is responsible for what in Defence Individual Training.
3. **Defence Systems Approach to Training Quality Standard (DSAT QS).** DSAT QS sets out the strategic principles to be applied to all Individual Training provided by, or on behalf of, Defence. The DSAT QS has been endorsed by the Training and Education Policy Group (TEPG) as the quality standard for the management of Individual Training across Defence. Any activity that has the objective of developing the knowledge, skills and/or attitudes of an individual for their current or future role must comply with DSAT QS.
4. **Defence Training Support Manuals (DTSMs).** The DSAT QS is underpinned and supported by DTSMs that direct its implementation. There are 6 DTSMs:

DTSM 1 - The Analysis, Design and Development of Training.

DTSM 2 - The Glossary of Defence Training Terminology.

DTSM 3 - Training Needs Analysis.

DTSM 4 - The Evaluation of Training.

DTSM 5 - Technology Based Training Solutions.

DTSM 6 - The Audit and Inspection of Individual Training.

1. **Defence Centre of Training Support (DCTS) Training Support Handbooks**. In order to further amplify the information contained in DTSMs and in direct support of the

training delivered to Training Support specialists, DCTS has developed a series of

1. An activity that aims to impart the specific knowledge, skills and/or inculcate appropriate attitudes required by an individual in order to perform adequately a task or job.
2. Learning is the acquisition of knowledge, skills and/or attitude.
3. Education encompasses the development of intellectual capacity, the acquisition of general supporting knowledge and inculcation of attitudes, which underpin performance, and engender understanding, commitment and ethos.
4. Personal Development is the enhancement of personal and/or professional attributes arising from a combination of training, education and experience.
5. The TRA represents the end-user of the trained output. It is the ultimate authority for the derivation and maintenance of the Operational Performance Statement (OPS) or the Learning Objectives/elements of the appropriate Competence Framework (CF), and is responsible for the evaluation of the effect of the training and education in achieving that OPS/CF (delivered both in the training school/organisation and the workplace).
6. The TDA is the organisation responsible for the provision of individual training or education, to agreed standards and in accordance with extant and funded Defence and single Service policies, on behalf of the customer(s). It is the conduit through which a Training Organisation/School is commanded/headed, resourced and administered.

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DCTS Training Support Handbooks. These publications are provided as reference guides for Training Support practitioners to give additional detailed guidance on specific areas relating to the training delivered by DCTS. DCTS Training Support Handbooks are available on the following topics:

Analysis

Instructional Design

Course Programming

Assessment

InVal and ExVal

Training Needs Analysis

Data Gathering and Analysis Techniques

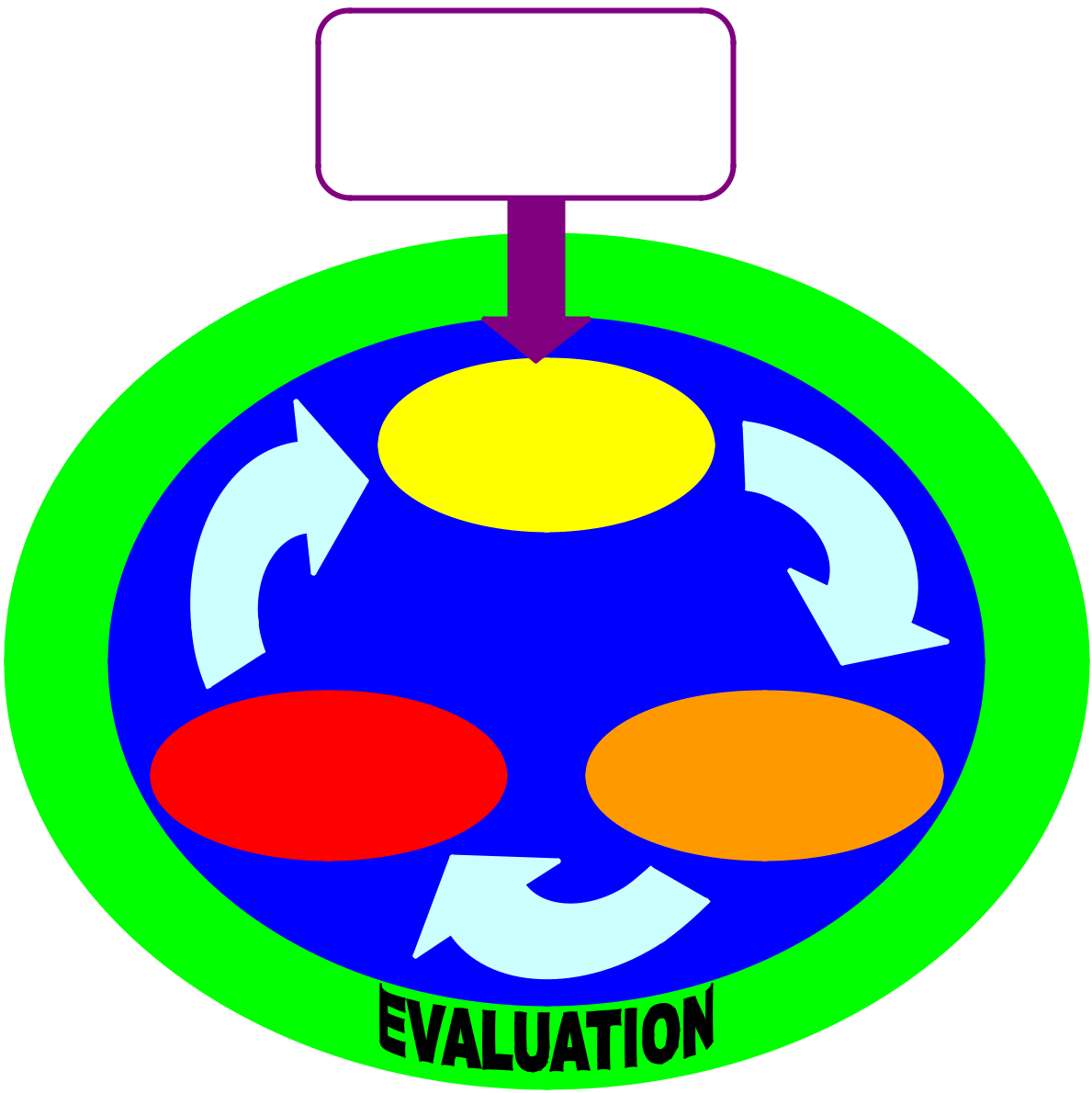
Audit

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**OVERVIEW OF THE DSAT PROCESS**

1. The DSAT process is illustrated in Figure 1 demonstrating how the main process groups are needed for the comprehensive Analysis, Design and Development exercise. These groups are:
   1. Needs Analysis.
   2. Training Design and Development.
   3. Training Delivery.
   4. Evaluation (DTSM 4 deals with the Evaluation of Training).



Change in, or review of,

operations/business triggers

a perceived need for Training

**NEEDS**

**ANALYSIS**

**TRAINING**

**TRAINING** **DESIGN &**

**DELIVERY** **DEVELOPMENT**

Figure 1 – DSAT Process

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1. **Scoping Exercise.** This exercise should be triggered when a change in business or operational practices creates a perception that either new training is required or existing training needs to change. The exercise identifies if new or changed training is the solution to the problem. Provided that training is deemed necessary then the Scoping Exercise will identify the method of and resources needed for the subsequent steps of Needs Analysis and Training Design and Development.
2. **Needs Analysis.** Following a Scoping Exercise that recommends a training solution, a Needs Analysis is required to ascertain the type and scope of the operational/business need. The Needs Analysis may, in its simplest form, be a discussion between the key stakeholders, which will ultimately result in the production of an Operational Performance Statement (OPS) or Competence Framework (CF), which is the documented agreement of the needs to be addressed. Where there is a change in the business/ operational capability that is likely to have a significant impact on the training resources required, a Training Needs Analysis (TNA) should be conducted. The conduct of TNAs is detailed in DTSM 3.
3. **Training Design and Development.** The results of the needs analysis phase inform the Training Design and Development process. This process builds on the performance objectives produced by the needs analysis phase and derives achievable Training Objectives (TOs) and training solutions. The Objectives and Solutions must be agreed between the TRA7 and the training provider. This process must yield a Formal Training Statement in sufficient detail to allow the training provider to deliver a trainee trained to the standard as close as possible to the operational/workplace performance objectives. This forms the detail of the contract between the TRA and the Training Provider.
4. **Training Delivery.** The results of the Training Design process result in training delivery, which is the process by which learning transfer to trainees/students occurs.
5. Figure 2 provides an illustrative process diagram of the analysis, design and development of training and shows how the production of the key DSAT documentation is linked to the 3 stages of Training Design.
6. The TRA represents the end-user of the trained output. It is the ultimate authority for the derivation and maintenance of the Operational Performance Statement (OPS) or the Learning Objectives/elements of the appropriate Competence Framework (CF), and is responsible for the evaluation of the effect of the training and education in achieving that OPS/CF (delivered both in the training school/organisation and the workplace).

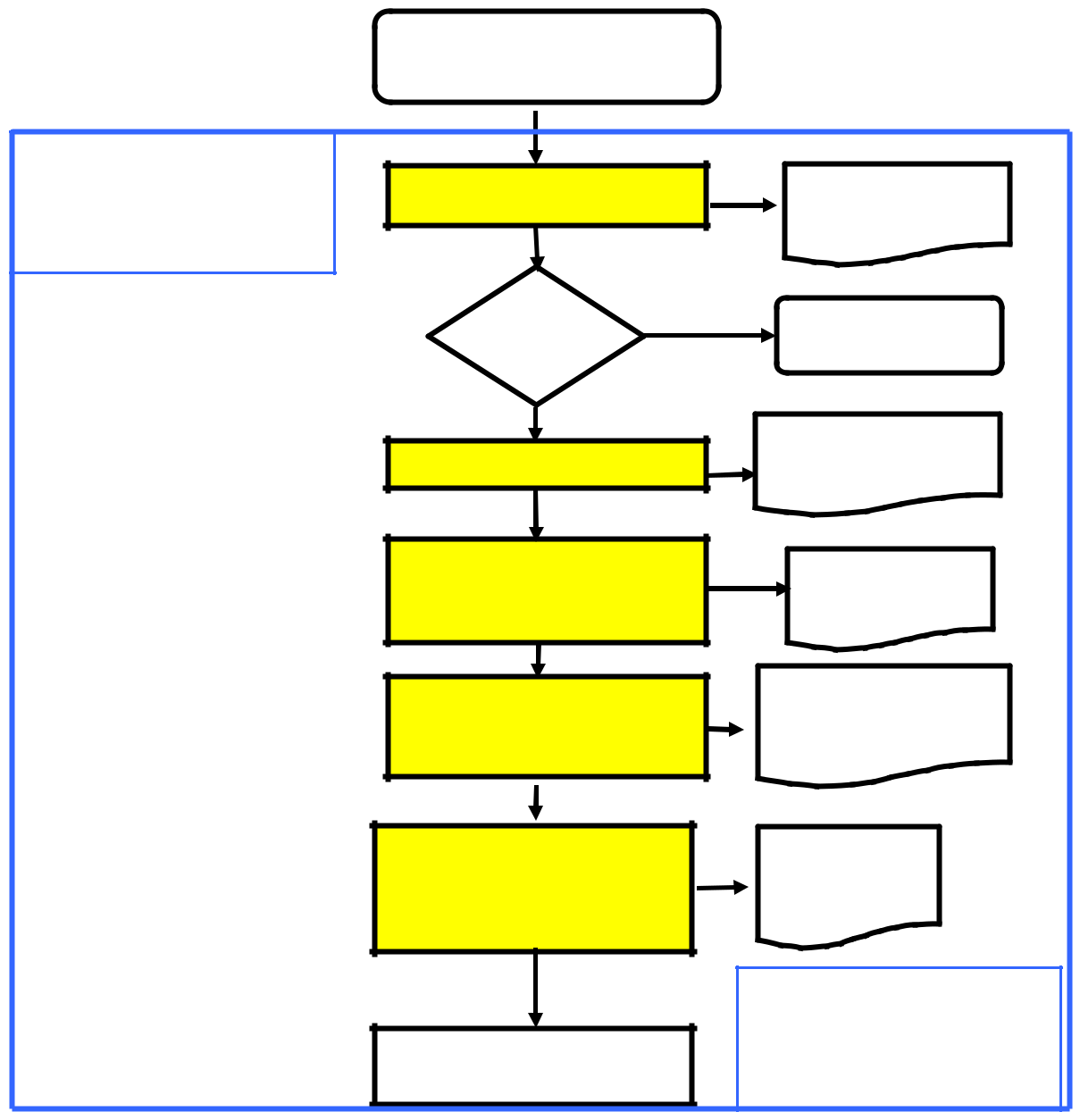
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**EVALUATION**

Applied to all stages of the DSAT process as appropriate

A change in, or review of, operational/business practices triggers a perceived requirement for training.



**SCOPING EXERCISE**

Is a training **NO**

intervention

required?

**YES**

**NEEDS ANALYSIS**

**TRAINING DESIGN & DEVELOPMENT – STAGE 1** (Determination of Training Objectives)

**TRAINING DESIGN &**

**DEVELOPMENT – STAGE 2**

**TRAINING DESIGN & DEVELOPMENT – STAGE 3** (Production of Training and Assessment Media)

**TRAINING DELIVERY**

**Scoping Report**

Stop DSAT process.

**Operational Performance Statement/ Competence Framework**

**Formal training**

**Statement**

**Assessment Strategy (incorporating Assessment Specification)**

**Instructional**

**Specification**

**EVALUATION**

Applied to all stages of the DSAT process as appropriate

Figure 2 DSAT Illustrative Process Diagram.

1. Evaluation is ‘the process of measuring the total worth of training to an organisation. It allows an organisation to monitor the impact of training and assess what has been achieved, whether it was effective and how this has contributed to the achievement of an organisation’s goals and targets.’8
2. The effectiveness and efficiency of this process will be reliant upon the following activities:
   1. **Validation**. Validation ensures that the processes and products of training meet Defence requirements. It is divided into Internal Validation (InVal) and
3. DSAT QS 002:2003

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External Validation (ExVal). They will be covered in Sections 3 and 4 of this manual.

* + 1. **Audit**. Audit determines the extent to which the whole training system meets the criteria set out in the DSAT QS. The auditing and inspection of individual training is covered in DTSM 6.

1. **Aims**. Evaluation should aim to ensure that training activities are focused towards the achievement of the business/operational needs of Defence. Evaluation processes and procedures should ensure that training is:
   1. Efficient and Effective.
   2. Focused - The training should be focused on operational/business goals. The trained output should be able to perform their job competently.
   3. Necessary - A requirement for training must be identified.
   4. Flexible - The training must be responsive to a change in circumstances.
   5. Appropriate - The training product should match the employment need.

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**SECTION 1 - CONDUCTING A KNOWLEDGE, SKILLS & ATTTUDE (KSA) ANALYSIS**

**PURPOSE OF KSA ANALYSIS**

1.1 KSA analysis is the systematic analysis of a job scalar task or Training Objective ‘Performance’, in order to identify the necessary behaviour required to perform it. In moving from job analysis to KSA analysis the emphasis changes from reviewing what the jobholder does, to identifying the particular knowledge, skills and attitudes that have to be learned in order to perform the task. It is these particular knowledge, skills and attitudes that must be incorporated into the training course, hence the importance of KSA Analysis. The results of KSA Analysis allow the production of Enabling Objectives, the compilation of the Instructional Scalar and the selection of the most appropriate training methods and media; thus ensuring the development of training that is both effective and efficient.

**LEARNING OUTCOMES**

1. 2. The process of acquiring the appropriate behaviour for competent job performance is known as Learning. Learning can be defined as **a change in human attitudes or capability which can be retained and which is not due to the process of growth.** Learning can be categorised into 3 outcomes:

**Knowledge**

**Skills**

**Attitudes**

1.3 There are other ways of describing learning outcomes. **Bloom** talked about learning **domains** and called them **cognitive** (knowledge and mental skills), **psychomotor** (physical skills) and **affective** (attitudes).

**KNOWLEDGE**

1.4 Knowledge generally involves recalling information. Recall of information could involve knowledge of rules and regulations, names, sequences, classifications, terminology, methodology, events, principles or theories. Whenever a task is performed, knowledge is required. When carrying out a task, a possible pre-requisite is knowledge of:

1. When to perform; what are appropriate tools and materials?
2. Where are the components, materials and/or equipment?
3. How to use/operate the materials, tools and/or equipment?
4. What are the safety procedures; what possible dangers are there?
5. What are testing or checking requirements; what are the procedures involved?
6. What constitutes task completion?

1

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1.5 KSA analysis identifies the supporting knowledge and mental skills required for task performance. However, training courses should not be overloaded with knowledge: only that which is essential to satisfactory task performance must be included.

1.6 Inexperienced designers, who find the knowledge level difficult to identify, tend to include everything to be safe. However, over-training is difficult to spot, de-motivates trainees and detracts from the vital areas of the course. One rule when identifying knowledge during KSA analysis is, IF IN DOUBT, LEAVE IT OUT (but maintain the audit trail of your decision making process). If the trainee can subsequently perform the task or display the skill then the information was not required. Adjustments, where required, can be made during the pilot course.

1.7 Mental skill can be defined as **organised co-ordinated patterns of mental activity developed by training or repeated experience**. Mental skills constitute theknowing **how** (procedural knowledge) as opposed to the knowing **what** (facts). For example; knowing how to calculate percentages, knowing how to interpret technical data, knowing how to classify sonar contacts. It would not be possible for the trainee to learn all of these things as facts because too many individual instances exist. The mental skills the trainee learns, therefore, enables him or her to respond to entire classes of situations.

**SKILLS**

1.8 Skills in this context are taken to mean physical skills, which are defined as **learned capabilities of performing actions in an organised and fluid manner.** Theyare overt and observable during their performance. These skills are learned in connection with common activities such as using a computer, driving a car or playing a musical instrument. Many tasks performed in the Services can be categorised as having a large physical component, for example stripping and reassembling a weapon, flying an aircraft and tying a bowline.

1.9 The performance of physical skills usually incorporates mental skills, attitudes and related knowledge, so the learning of physical skills involves the brain and senses as well as the body. Complex physical skills can often be broken down into smaller sub-skills, which can be learned separately and then put together for total performance. An example of this is swimming, which has 3 sub-skills (arm action, leg action, breathing technique) which can be learned and practised separately and then performed as one.

**ATTITUDES**

1.10 An Attitude can be defined as **an acquired mental state that influences the choice of personal actions**. People have attitudes resulting in a tendency to act orreact in a certain manner when confronted with another person, group, object, situation or idea. Attitudes may be positive or negative, rational or irrational. Attitudes are related to personal values, beliefs, motives and emotions and manifest themselves in overt acts or expressions. Attitudes can also be related to groups and the defined attitudinal position of a group is known as the “norm”. KSA analysis identifies attitudes associated with job performance to determine the required direction of that attitude.

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1.11 Within each specialisation there are tasks that have an attitudinal component related to their performance. Once the attitudes required to do a job are identified, training can be designed to achieve them. To assess an attitude, behaviour must be observed over a period of time.

1.12 Knowledge and skill training can be wasted if attitudinal training is ignored. For example, a lecture on computer security may be successful in imparting information on how viruses are transmitted but unless it develops an attitude of security consciousness within the trainees there is every chance that virus attacks will continue to occur.

**HIERARCHIES OF SKILLS**

1.13 The various learning outcomes, whether expressed as Knowledge, Skills and Attitudes or Cognitive, Psychomotor and Affective domains, can be performed at different levels. Training must take place at correct level.

1.14 The most commonly used and widely accepted way of dividing Knowledge and Attitudes or Cognitive and Affective domains into hierarchies was devised by Bloom. Harrow produced a similar hierarchy for the Skills or Psychomotor domain. These hierarchies of skills for the learning domains are given and explained at Annex A.

**KSA ANALYSIS PROCEDURE**

1.15 **Sources of Information**. KSA analysis can use the procedures listed in the ‘Standards’ section of the Training Objective, referenced documentation, job scalar information and interviews with jobholders and job supervisors.

1.16 **KSA Analysis Procedure** . A simple worksheet is used to conduct the KSA analysis. A specimen worksheet is at Annex B. For ease of use, the ‘knowledge’ or ‘cognitive’ domain is broken out into 2 columns, one for knowledge and one for mental skills. The following procedure should be adopted when carrying out a KSA analysis:

1. **Step 1**. Copy the job, duty, task, sub-task and task element onto the KSA

analysis worksheet. Alternatively, substitute the Training Objective ‘Performance’ and list the procedures entailed in this performance in the correct sequence in the first column.

1. **Step 2**. Identify and list the knowledge required.
2. **Step 3**. Identify the mental skills required and list them in the appropriate column.
3. **Step 4**. Identify the physical skills required and list them in the appropriate column.
4. **Step 5**. Identify the associated attitudes and list them in the appropriate column.
5. **Step 6**. Cross reference information that has been recorded previously on other KSA analysis sheets.

3

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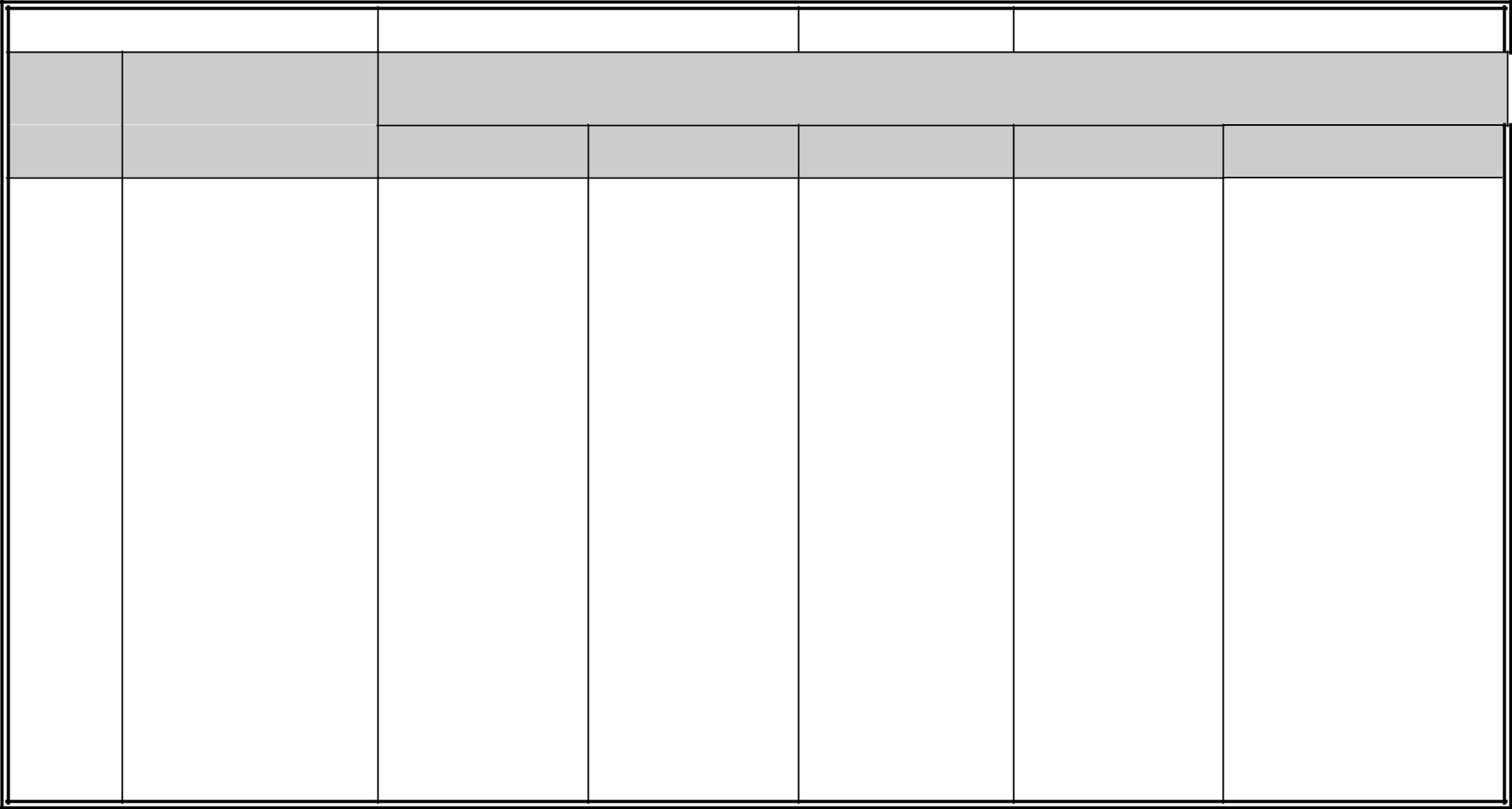
1. **Step 7**. When appropriate, enter any training requirements, ideas or justifications into the Training Notes column.
2. **Step 8**. Repeat Steps 2-7 inclusive for the next procedure until all procedures have been analysed.

1.17 An example of a completed KSA Analysis worksheet for the task of changing engine oil is at Figure 1 below.

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Figure 1: KSA Analysis Sheet – Change Engine Oil | | |  |  |  |  |
| **Job:** XXXXXXX | | **Duty:** Maintain Engine | | **Task No:** 3.3 | **Task:** Change engine oil | |
| **Unit No** | **Sub-Task/Task** | **Required for Execution** | |  |  |  |
|  | **Element** |  |  |  |  |  |
|  |  | **Knowledge** | **Mental Skills** | **Physical Skills** | **Attitudes** | **Training Notes** |
| 3.3.1 | Drain oil | Correct service |  | Use of ramps or | Safety | Must wear protective |
|  | 1. Prepare | intervals |  | inspection pit |  | clothing |
|  | Knowledge of | Gauge size of |  |  |  |
|  | receptacle | procedures | receptacle |  |  |  |



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 2. | Remove filter |  | Use of strap | |  | Taught in basic |
|  |  | wrench | |  | mechanics |
|  | 3. | Remove drain |  | Select spanner |  |  |  |
|  |  | Use of spanner | |  | Taught in basic |
|  | plug | |  |  |  | Use of | mechanics |
|  | 4. | Drain oil |  |  |  | protective |  |
|  | Symptoms of | Diagnose |  | clothing |  |
|  | 5. | Inspect oil | engine | engine |  |  |  |
|  | problems | problems |  |  |  |
|  | 6. | Dispose of oil |  | Disposal w/o | | Environmentally |  |
| 3.3.2 |  | spillage | | friendly disposal |  |
|  | **Replace oil** | |  |  |  |  |  |
|  | 1. | Select oil | Correct oil for |  |  |  |  |
|  | engine type |  |  |  |  |
|  | 2. | Select filter | Correct filter for |  |  |  |  |
|  | engine type |  |  |  |  |
|  |  |  | U | f |  |  |
|  |  |  |  |  |  |

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**HIERARCHIES FOR LEARNING DOMAINS THE COGNITIVE DOMAIN9**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **LEVELS OF THE DOMAIN** | | | **ASSOCIATED VERBS** |
|  | Evaluation | | | Evaluate |
|  |  |  |  |
|  | Making judgements | | |
|  | Judge |
|  | about value. | | | Decide |
|  | Is a combination of all | | | Choose |
|  | Assess |
|  | other categories. | | | Contrast |
|  | Determine the logical | | | Criticise |
|  | Select |
|  | flaws and benefits in the | | | Defend |
|  | arguments presented. | | | Support |
|  |  |  |  | Seek Out |
|  |  |  |  | Compare |
|  |  |  |  | Determine |
|  | Synthesis | | | Combine |
|  |  |  |  |
|  | Combines together | | |
|  | Restate |
|  | various elements to | | | Summarise |
|  | form a coherent whole. | | | Precis |
|  | Propose three ways in | | | Generalise |
|  | Conclude |
|  | which a hypothesis | | | Derive |
|  | might be tested | | | Organise |
|  | Logical deduction | | | Design |
|  | Deduce |
|  | concerned with thinking and | | | Classify |
|  | creativity. | | | Formulate |
|  | The sub-categories of | | | Propose |
|  | Compose |
|  | synthesis are: | | |  |
|  | Production of a unique | | |  |
|  | combination. | | |  |
|  | Production of a plan or | | |  |
|  | proposed set of | | |  |
|  | operations. | | |  |
|  | Derivation of a set of | | |  |
|  | abstract relations. | | |  |
|  | Analysis |  | | Analyse |
|  | Breaking down, or separation of a | | |
|  | Identify |
|  | whole into its component parts. | | | Separate |
|  | A process of reasoning or thinking. | | | Break Down |
|  | Discriminate |
|  | Includes a simple listing of the | | | Distinguish |
|  | Detect Categorise |

**ANNEX A TO**

**SECTION 1**

**SOME EXAMPLES**

****

Write a trials report on a weapon system.

Assess an estimate for a defensive position.

Evaluate the effectiveness of a plan in terms of its announced aims.



Design a weapon system.

Produce an estimate for a defensive operation.



Identify the relationship between different weapons in a fire plan.

Determine the weak points in a defensive position.



1. Based upon Bloom, (1956) Taxonomy of educational objectives handbook of cognitive domain, New York: McKay

|  |  |
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relationships between elements.

Highest form of analysis includes

identifying the organising principle

or principles behind the actual

material or phenomena concerned.

Application

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | Apply |
|  | Involves using | | |  |
|  |  | Show |
|  | something in a specific | | | | Demonstrate |
|  | manner. | | |  | Use |
|  | Includes relevancy and | | | | Perform |
|  | Relate |
|  | capacity for close attention to | | | | Develop |
|  | detail. | | |  | Transfer |
|  | Two lower categories of | | | | Construct |
|  | Explain |
|  | knowledge and | | |  | Infer |
|  | comprehension are | | | |  |
|  | prerequisites to | | |  |  |
|  | application. | | |  |  |
|  | Involves an element of | | | |  |
|  | creativity as it involves | | | |  |
|  | seeing how particular | | | |  |
|  | phenomena can be | | | |  |
|  | used in a new situation to | | | |  |
|  | which there is no | | | specified |  |
|  | solution. | | |  |  |
|  | Comprehension | | |  | Comprehend |
|  |  |  |  |  |
|  | Comprehension involves | | | |
|  | Understand |
|  | understanding or perceiving. | | | | Have Insight Into |
|  | Includes taking in, | | | grasping. | Predict |
|  | Interpolate |
|  | Comprehension may | | | | Extrapolate |
|  | Interpret |
|  | include changing | | |  | Translate |
|  | information into a format, | | | | Illustrate |
|  | which is more meaningful to | | | | Draw |
|  | the learner: e.g. explain, | | | |  |
|  | summarise material | | | |  |
|  | predicting consequence or | | | |  |
|  | effects. | | |  |  |

Three sub-categories of

comprehension are:

Translation

(changing

information into

another form).

Interpretation

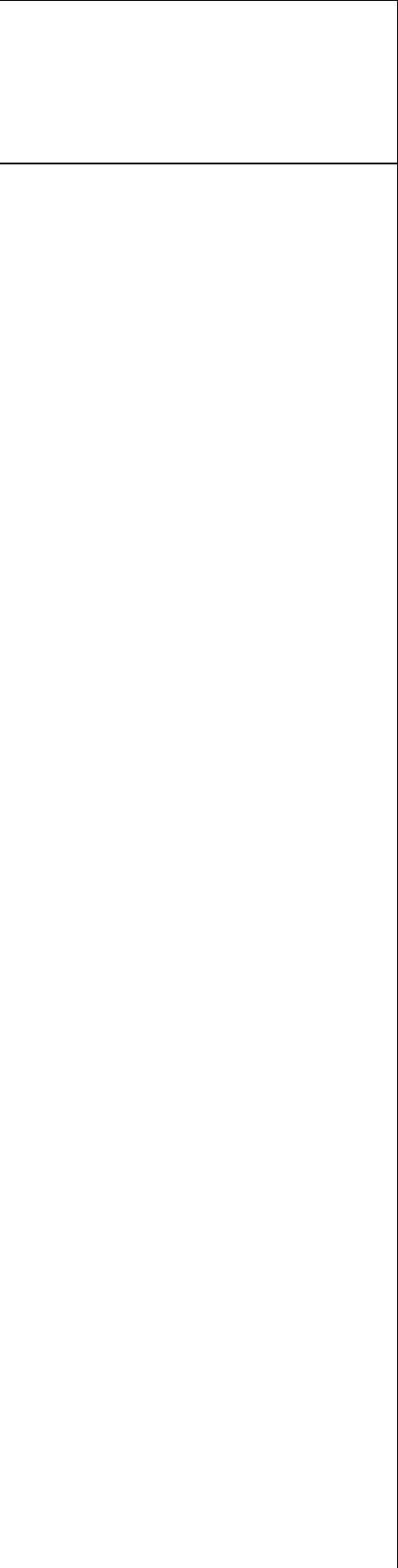
(clarifying

meaning)

Extrapolation (going

|  |  |
| --- | --- |
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Tactically site a weapon system.



Deliberately play an opponent ‘off-side’ in football.



Describe the operation of a weapon system.

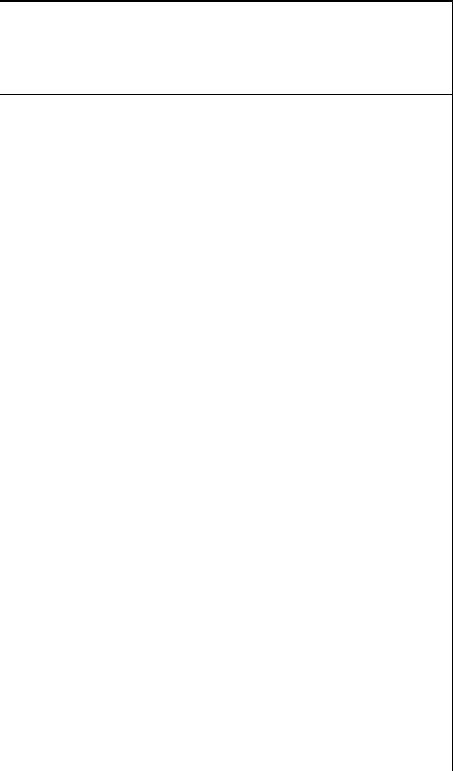
Give examples of the use of depth in defence.



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|  |  |  |  |
| --- | --- | --- | --- |
|  | beyond the information | |  |
|  | given). | |  |
|  |  | |  |
|  | Knowledge | | Describe |
|  |  |  |
|  | Involves elementary skill of | |
|  | Recall |
|  | recalling, or remembering | | Define |
|  | specific information/ | | State |
|  | experiences. | | Recognise |
|  | Information recalled | | Name |
|  | List |
|  | may include specific | | Underline |
|  | pieces of information | | Reproduce |
|  | terminology and facts. | | Measure |
|  | A higher level form of | | Label |
|  | Write |
|  | knowledge involves | | Acquire |
|  | knowing ways/means of | |  |
|  | dealing with information. | |  |
|  | Highest level of all | |  |
|  | includes knowledge of | |  |
|  | principles and | |  |
|  | generalisations as well as | |  |
|  | theories and structures. | |  |

Name the parts of a weapon.



List the principles of marksmanship.

Give a definition eg the offside rule in football.

State the relationship between temperature and pressure

Label the enclosed map of the major populated regions of the world

Measure the distance between points A and B.



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**THE PSYCHOMOTOR DOMAIN10**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | LEVELS OF THE DOMAIN | | | | ASSOCIATED |
|  |  |  |  |  | VERBS |
|  | Non-discursive Communication (non | | | | Gesture |
|  | verbal communication) | | |  |
|  | Behaviours/attitudes | | reflected by | | Carry Oneself |
|  | body movement/gestures. | | | | Express Facially |
|  | Ranges from facial expressions to | | | | Perform Skilfully |
|  | Paint Skilfully |
|  | highly sophisticated dance | | | | Smile knowingly |
|  | choreography as in classical ballet. | | | | Shrug |
|  | Involves expressive communication | | | |  |
|  | forms like gestures and posture, as | | | |  |
|  | well as interpretative movements | | | |  |
|  | that can be either aesthetic or | | | |  |
|  | creative in form. | | | |  |
|  | Response comes more from | | | |  |
|  | intuition than from reason. Hence, | | | |  |
|  | the term ‘non-discursive’ is | | | |  |
|  | employed | | | |  |
|  | Skilled Movements |  | | |  |
|  | Any efficiently performed complex | | | | Type |
|  | movement. | | | | Play a musical |
|  | Require learning and should be | | | | instrument |
|  | Ski |
|  | based upon some adaptation of | | | | Skate |
|  | the inherent patterns of movement. | | | | Somersault |
|  | Involve simple adaptive skills, | | | | Juggle |
|  | Fence |
|  | compound adaptive skills | | | | Paint |
|  | incorporating the management of a | | | |  |
|  | tool or implement and complex | | | |  |
|  | adaptive skills requiring a greater | | | |  |
|  | mastery of ‘body mechanics’. | | | |  |
|  | Performed with apparent ease and | | | |  |
|  | grace almost as if no effort or | | | |  |
|  | thought was involved. | | | |  |
|  | In every case, however, they have | | | |  |
|  | been consciously, acquired and | | | |  |
|  | practised over a period of time until | | | |  |
|  | the present level of skill was | | | |  |
|  | acquired. | | | |  |

**EXAMPLES**

****

Moves expressively so as to communicate emotions/mood:

Defiance

Contempt

Submission

‘Poker’ faced

Boxers’ intimidating stares



Changes or modifies basic movement patterns using an implement or tool

Changes or modifies basic movement patterns with total body involvement, often without a basis of support so that delicate adjustments are constantly necessary



1. Based upon Harrow, AJ (1972) A Taxonomy of the psychomotor domain, New York: McKay

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**Physical Abilities**

Essential for efficient motor activity.

Concerned with the vigour of the person and allow the individual to meet the demands placed upon him or her in and by the environment.

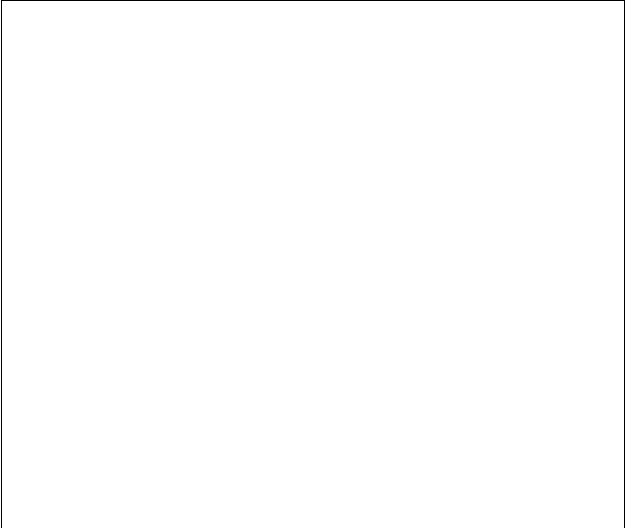
An essential foundation for the development of skilled movements.

Prominent amongst physical abilities are speed, endurance exertion, and flexibility

Endure

Improve Increase Stop and Start Move precisely Touch Toes

Exerts tension against resistance



Moves quickly

Stops immediately

Endures long periods of fatigue



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|  | Perceptual Abilities: | | | Catch |
|  |  |  |  | Bounce |
|  | Inseparable from motor | | |
|  | Eat |
|  | movements. | | | Write |
|  | Help learners to interpret stimuli so | | | Balance |
|  | Bend |
|  | that they can adjust to their | | | Draw From |
|  | environment. | | | Memory |
|  | Superior motor activities depend | | | Distinguish By |
|  | Touching |
|  | upon the development of | | | Explore |
|  | perception. | | |  |
|  | Involve kinaesthetic discrimination, | | |  |
|  | visual discrimination, auditory | | |  |
|  | discrimination and co-ordinated | | |  |
|  | abilities of eye and hand, eye and | | |  |
|  | foot. | | |  |
|  | Skill of discrimination underlies all | | |  |
|  | these abilities, whether they are | | |  |
|  | gross in character or fine in quality. | | |  |
|  | This skill has to be deliberately | | |  |
|  | learned and practised over a wide | | |  |
|  | range of conditions. | | |  |
|  | Basic Fundamental Movements: | | | Crawl |
|  |  |  |  | Creep |
|  | Defined as those inherent body | | |
|  | Slide |
|  | movement patterns, which build | | | Walk |
|  | upon the foundation laid by reflex | | | Run |
|  | movements. | | | Jump |
|  | Usually occur during the first year | | | Grasp |
|  | Reach |
|  | of life and unfold rather than are | | | Support |
|  | taught or consciously acquired. | | | Handle |
|  | Movements involve movement | | |  |
|  | patterns that change a child from a | | |  |
|  | stationary to an ambulatory | | |  |
|  | learner. | | |  |
|  | Involve non-locomotor movements | | |  |
|  | of the limbs and portions of the | | |  |
|  | trunk, as well as manipulative | | |  |
|  | movements of the extremities. | | |  |
|  | Movements involved in this | | |  |
|  | category are fundamental to all | | |  |
|  | normal, everyday human activity, | | |  |
|  | and any deficiency is usually quite | | |  |
|  | serious in terms of day to day | | |  |
|  | psychomotor activities | | |  |
|  |  |  |  |  |

Discriminates kinaesthetically



Discriminates visually

Discriminates auditory-wise

Discriminates tactually

Co-ordinates two or more perceptual abilities and movement patterns e.g.

Intercepting a pass in rugby/football Timing a tackle

A batsman hitting a spin/fast bowl Returning a serve in tennis. Braking/slowing down when coming up to traffic lights



Changes location

Creates dynamic movement patterns in space, but remains in one place

Moves extremities in co-ordinated fashion

(Note: There is little need to write TOs for this classification unless a learner is having difficulties and needs to be placed in a remedial programme)



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Reflex Movements:

Defined as involuntary motor responses to stimuli (e.g. does not require conscious thought).

Form the basis for all behaviour involving movement of any kind.

Reflex movements are functional at birth and develop throughout life.

Involve one or more spinal segments and sometimes the participation of the brain centres.

Represent the lowest level in the psychomotor domain, but without them life, at least as we know it, is impossible.

Flex

Stretch

Straighten

Extend

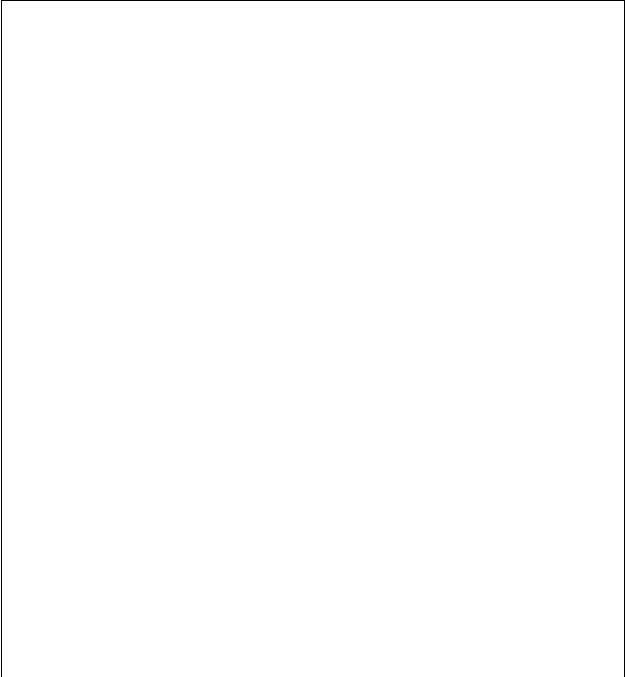
Inhibit

Lengthen

Shorten

Tense

Response with correct reflexes



(Note: there is no need to write objectives for this classification level movements are not learned but are reflex to stimuli e.g. blink at bright light)



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**THE AFFECTIVE DOMAIN11**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **LEVELS OF THE DOMAIN** | | | | **ASSOCIATED** |  | **EXAMPLES** |
|  |  |  |  |  | **VERBS** |  |  |
|  | Characterisation: | | |  | Revise | Develops an internally consistent value system – | |
|  | Organisation of values into a total | | | | Change | ‘Born Again Christian’. | |
|  | Judge |  |  |
|  | and consistent philosophy applied | | | | Develop | Revises philosophy of life. | |
|  | by the individual. | | | | Resolve |  |  |
|  | Fundamental rules of conduct. | | | | Believe | Accepts the necessity for changing opinions and | |
|  |  | attitudes in the light of new information vehement | |
|  | Beliefs and attitudes fused | | | |  | anti-smoker. | |
|  |  |  |  |
|  | together into an overall view of life. | | | |  | Maintains self-discipline. | |
|  | Behaviour is consistent and | | | |  | Displays integrity | |
|  | predictable and is characteristic of | | | |  |  |  |
|  | the individual | | | |  | If developed can be viewed as a ‘characteristic | |
|  |  |  |  |  |  | lifestyle’. | |
|  | Organisation: | |  | | Organise |  | Relates own code of conduct to that of an |
|  | Situations are encountered which | | | | Judge |  | organisation. |
|  | Relate |  |  |
|  | involve one or more value or | | | | Correlate |  | Forms own rationale as a prefect |
|  | attitude. | | | | Determine |  |  |
|  | Organisation is required otherwise | | | | Select |  | Weighs the pros and cons for a course of action |
|  | Balance |  | against the needs of friends |
|  | behaviour would become | | | | Define |  |  |
|  | inconsistent or unpredictable. | | | | Formulate |  | Develops a plan for identifying the rules for a new |
|  | Different values are brought | | | |  |  | organisation. |
|  |  |  |  |
|  | together and conflicts are resolved | | | |  |  | Balances conflicting choices. |
|  | The ability to defend particular | | | |  |  | Develops a positive outlook. |
|  | values is implied. | | | |  |  |  |
|  | Valuing: | | | |  |  |  |
|  |  |  | | |  |  |  |
|  | Sees an object, phenomenon or | | | | Accept |  | Recognises the value of a philosophy |
|  | behaviour as having worth and | | | | Recognise |  |  |
|  | demonstrating behaviour | | | | Participate |  | Becomes actively involved in a particular cause |
|  | consistent with this attitude may | | | | Decide |  |  |
|  | range from simple acceptance of a | | | | Influence |  | Accepts the importance of understanding other |
|  | value eg desire to improve group | | | | Support |  | people’s point of view |
|  | skills to assuming responsibility for | | | | Debate |  |  |
|  | effective functioning of the group. | | | | Argue |  | Defends rules. |
|  | The item that is valued has taken | | | |  |  | Accepts the place of the church in the local |
|  | on the characteristics of a belief | | | |  |  | community |
|  | and may act as a motivating force. | | | |  |  |  |
|  | Sub-categories are identified: | | | |  |  |  |
|  | Value is seen to have worth. | | | |  |  |  |
|  | There is preference for the value. | | | |  |  |  |

1. Based upon Krathwohl, D R Bloom, B S and Masia, (1964) Taxonomy of Educational Objectives. Handbook
   1. Affective Domain, New York: McKay

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|  | Responding: | | | State | Does what is told – follows procedures |
|  |  |  |  | Answer |  |
|  | Showing active attention at a low | | |  |
|  | Complete | Obeys rules |
|  | level, e.g. displaying an interest. | | | Select |  |
|  | Behaviour is simply more than | | | List | States the underlying assumptions |
|  | Record |  |
|  | attending is involved – element of | | | Comply | Assumes responsibility when asked |
|  | active participation. | | | Follow |  |
|  | Commitment is low, but a degree | | | Acclaim |  |
|  |  |  |
|  | of curiosity has occurred. | | |  |  |
|  | Sub-categories: | | |  |  |
|  | Individual reacts. | | |  |  |
|  | Willingness to respond. | | |  |  |
|  | Satisfaction in response. | | |  |  |
|  | Receiving (Attending): | |  | Listen | Listens to what is said but does not necessarily |
|  | Developing an awareness of and a | | | Attend | agree with condition. |
|  | Receive |  |
|  | willingness to receive certain | | | Be Aware | Is aware of the situation but attention could be |
|  | stimuli. | | |  | selective |
|  | Communication is listened | | |  |  |
|  | to/heeded. | | |  |  |
|  | Sub-categories: | | |  |  |
|  | Awareness. | | |  |  |
|  | Willingness to receive and not | | |  |  |
|  | avoid. | | |  |  |
|  | Controlled/selective attention. | | |  |  |

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|  |  |  |  |  |  |  |  | **ANNEX B TO** | | | |  |  |  |
|  |  |  |  |  |  |  |  | **SECTION 1** | |  |  |  |  |  |
|  |  |  |  |  |  |  |  | **FORMAT FOR THE KSA WORKSHEET** | | | | | | |
|  |  |  |  |  |  |  |  | |  | | |  |  |  |
|  | **Job:** XXXXXXX | | |  | **Duty:** |  | **Task No:** | | **Task:** | | |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | **Unit No** |  | **Sub-Task/Task** |  | **Required for Execution** | |  |  |  |  |  |  |  |  |
|  |  |  | **Element** |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | |  | | |  |  |  |
|  |  |  |  |  | **Knowledge** | **Mental Skills** | **Physical Skills** | | **Attitudes** | | | **Training Notes** | |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



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**SECTION 2 - DEVELOPING ENABLING OBJECTIVES**

**DEFINITION**

2.1 An Enabling Objective (EO) can be defined as: **A statement in behavioural terms (Performance, Conditions and Standards) that describes the knowledge, skills and attitudes necessary for the trainee to achieve a TO***.* An EO sets the destination of a learning event and specifies what trainees can do at the end of an instructional period that they could not do at the start. Achievement of the EO contributes towards TO.

**WRITING THE PERFORMANCE**

2.2 EOs are developed from the results of KSA Analysis using the following procedure:

1. **Step 1**. Allocate all information on KSA sheet as:
   1. Possible EO topic
   2. KSA covered previously or already held
2. **Step 2**. From the areas identified in Step 1, list topics for development as EOs, identifying the predominant learning outcome for each topic.
3. **Step 3**. Write EO statements

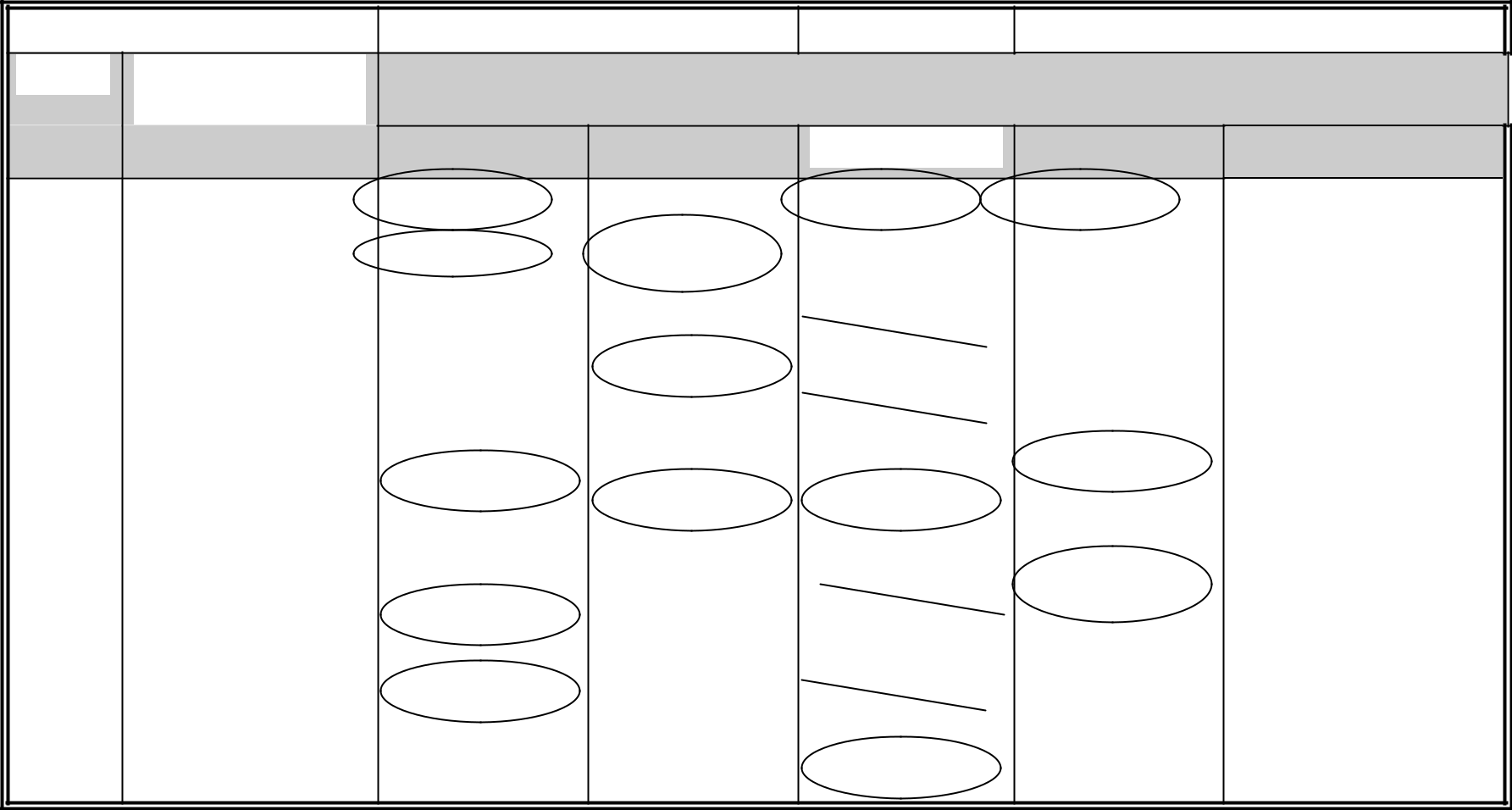
2.3 An example of the application of this procedure is given below, using the completed KSA Analysis worksheet from Section 1.

2.4 **Step 1** All information on the worksheet is examined. Skills that can be grouped together as possible EO topics are circled and numbered, e.g. everything to do with safety is linked. Finally, the knowledge associated with each possible EO topic is identified and linked to that topic. The completed process is shown in Figure 1.

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| *Figure 1: Completion of Step 1* | | |  |  |  |  |  |  |  |
| **Job:** XXXXXXX | | | **Duty:** Maintain Engine | | | **Task No:** 3.3 | **Task:** Change engine oil | | |
| **Unit No** | **Sub-Task/Task** | |  |  |  | **Required for Execution** | |  |  |
|  | **Element** | |  |  |  |  |  |  |  |
|  |  |  | **Knowledge** | | **Mental Skills** | **Physical Skills** | **Attitudes** |  | **Training Notes** |
|  | Drain oil | |  |  |  | 5 | Safety | 1 | Must wear protective |
| 3.3.1 | Correct service2 | |  | Use of ramps or |  |
|  |  | 5 |  |
|  | 1. | Prepare receptacle | intervals |  | inspection pit |  |  | clothing |
|  | Knowledge of | | Gauge size of |  |  |  |  |
|  | 2. | Remove filter | procedures | 5 | receptacle | Use of strap |  |  | Taught in basic |
|  |  |  |  |  | 5 |  |  |
|  | 3. | Remove drain plug |  |  | Select spanner | wrench |  |  | mechanics |
|  | 4. | Drain oil |  |  | Use of spanner |  |  | Taught in basic |
|  |  | 4 | 4 |  |  |
|  |  |  |  |  |  |
|  | 5. | Inspect oil |  |  |  | Use of |  | mechanics |
|  | Symptoms of |  |  | 5 |  |
|  |  |  |  |  | protective |  |  |
|  | 6. | Dispose of oil | engine |  | Diagnose | Disposal w/o | clothing | 1 |  |
|  |  | **Replace oil** | problems |  | engine | spillage |  |  |  |
|  |  |  |  | problems |  |  |  |  |
|  |  |  |  | 3 |  | Environmentally | |  |
| 3.3.2 | 1. | Select oil |  |  | Use of strap |  |
|  |  | Correct oil for | |  | friendly disposal | |  |
|  | 2. | Select filter | engine type | 3 |  | wrench |  | 5 |  |
|  |  |  |  |  |  |  |
|  | 3. | Fit filter | Correct filter for | |  | Use of spanner |  |  |  |
|  |  |  |  |  |  |  |
|  | 4. | Replace drain plug | engine type |  |  | Pouring w/o | 5 |  |  |
|  |  |  |  |  |  |  |  |
|  | 5. | Replace oil |  |  |  | spillage |  |  |  |
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2.5 **Step 2** The areas identified in Step 1 as possible EO topics are listed, along with the predominant learning outcomes for each area. For the example in Fig 1, these might be as follows:

1. Safety (knowledge)
2. Correct service intervals for xxx engine (knowledge).
3. Correct oil and filter types for xxx engine (knowledge).
4. Diagnose possible engine problems (mental skill & knowledge).
5. Procedure for changing engine oil (knowledge & physical skill).

2.6 **Step 3** An EO is written for each topic area identified in Step 2. The identification of the predominant learning outcome for each topic assists in determining the appropriate action verb to be used in the EO, eg “knowledge” implies verbs such as “list” or state, while “mental skill” implies verbs like “assess”, “calculate” or “estimate”. Examples of EOs written from the topics listed in the previous paragraph are given below. Further examples of action verbs are given at Annex A.

1. State the safety precautions to be observed when changing engine oil.
2. State correct service intervals for xxx engine.
3. Select correct oil and filter types for xxx engine.
4. Analyse old oil and diagnose possible engine problems.
5. Carry out the procedure for changing engine oil.

**WRITING THE CONDITION**

2.7 The conditions statement of an Enabling Objective specifies the actual conditions, or circumstances, in which the performance will take place. In training, the ideal solution is to provide the same conditions normally experienced in the job. However, this is not always possible, so the conditions statement must clearly indicate what the training environment does provide and what is achievable. The conditions of the EO may be derived directly from the conditions of the TO.

2.8 The conditions defined in an Enabling Objective act as modifiers to the final performance (the test situation). There are seven different areas to be considered when writing conditions:

1. the range of performance;
2. tools, equipment, and clothing required;
3. special job aids and manuals allowed;
4. environmental conditions;
5. simulated situations;
6. geographic locations; and
7. personnel required.

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2.9 **The range of the performance** . Should the trainee be able to solve all problems of a general nature, or deal with only a specific problem? Is the performance limited to particular equipment? Is a medical orderly required to treat all bone fractures, or is the scope of practice limited to limbs?

2.10 **Tools, equipment, and clothing required**. What tools, equipment, and special clothing are required for performance? These should match the job environment.

2.11 **Special job aids and manuals allowed**. What cue cards, procedural checklists, and manuals are available to the trainee during the required training performance.

2.12 **Environmental conditions**. The performance of many tasks may vary under different environmental conditions such as extremes of temperature, humidity or noise, or when performed in a cramped space. It may be more difficult to perform a task in the dark, or in wind and rain, than under comfortable conditions in a well lit, dry location. For example, flight navigation at night or in heavy cloud.

2.13 **Simulated situations**. Some training is conducted and assessed using a simulated situation, role-playing, case study, or exercise.

2.14 **Geographic location**. The performance maybe in a specific work location or using a particular simulated environment

2.15 **Personnel**. Any personnel required in the test situation, other than assessor and trainee, should also be identified in the conditions of the objective statement. For example, ‘a trained operations room team closed-up at all positions’ as part of a Warfare Officer performance scenario.

2.16 Different types of condition with examples of each are at Annex B.

**WRITING THE STANDARD**

2.17 The standards of the EO may be derived from the standards of the TO. As with standards in the OPS and TPS, the standards for EO are usually a combination of:

1. **Product Standards**. Minimum absolute standards e.g. time, accuracy and safety limits etc.
2. **Process Standards**. Elements of the EO which must be completed to achieve the overall performance.

2.18 Product standards emanate from two possible sources:

1. **Laid down standards**. Laid down standards are those recorded in Books of Reference, Standing Orders, technical publications, or other ‘official’ or recognised documents. Identification of the correct standard necessitates only reference to the specific area of the appropriate document.
2. **Consensus standards**. On many occasions the standard required for job performance will not be officially laid down, even though a task may have

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been performed for many years. On other occasions objective statements will be written around simulated situations, case studies and cognitive aspects of jobs; on such occasions standards will need to be defined and agreed at conception. In this situation the standard, which is known colloquially as ‘the staff answer’, is set from a consensus of the ‘informed’ school staff. Once defined and agreed the ‘staff answer’ should be recorded in detail, numbered and inserted with the test specification in the course documentation.

2.19 Standards of performance can be considered under the headings of quality, quantity, and time; and for any one objective, the standard may be set using one or more of these criteria. Examples of acceptable standards for performance objectives are given at Annex C.

2.20 **Enabling Objective Format.** A suggested format for recording the three elements of the objective, including a link to the Training Objective and Course, is given at Annex D.

2.21 The conduct of a thorough KSA Analysis is essential to the design of effective training, as it is only by carrying out KSA Analysis that the learning outcomes are identified. The products of KSA analysis (completed worksheet and EOs) are then taken forward and combined with data from a methods and media analysis to provide the basis for the detailed design of instructional events and the production of Instructional Scalars and Instructional Specifications (I Specs).

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**ANNEX A TO**

**SECTION 2**

ACTION VERBS

Accounts for. Explains; tells the cause; accounts for an action.

Accomplishes. Brings to fulfilment; accomplished periodic checks of equipment.

Acknowledges. Recognises as true or pertinent; admits obligation; reports receipt of; acknowledges receipt of supplies.

Acts. Performs in lieu of or in substitute capacity for; operates for another, as in assuming responsibility and authority or a superior; acts for supervisor in their absence.

Adjusts . Settles difference or discrepancies; fits to meet regulations or requirements; adapts in accordance with situation.

Administers. Manages or directs execution, conduct or application of; performs offices of an administrator; administers a programme.

Advises. Consults with; gives advice to; counsels; gives information or notice to; recommends course of action (particularly applicable to staff and technical fields); advises a course of action.

Aligns. Adjusts, forms, or brings to, a line.

Allocates . Plans an apportionment or allocation of funds, materials or equipment; allocates funds in line with budgetary recommendations.

Amends. Corrects, brings up to date.

Analyses. Studies parts, elements, or factors of a situation or problem in detail to determine course of action, solution, or outcome; examines critically for understanding the organisation or nature of; analyses malfunction of a system.

Annotates. Furnishes with critical or explanatory notes; annotation of a report.

Applies. Places in contact with; puts to use, employs; applies to a situation.

Appraises. Estimates, judges, such as organisational efficiency, effectiveness or losses.

Approves. Confirm officially, such as plans and recommendations of subordinates; endorses, such as reports or replies of subordinates to higher authority.

Assesses. Determines the importance, size.

Assigns . Appoints, prescribes a course of action; specifies, selects or designates; assigns responsibilities to personnel.

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Assists. Aids, helps, supports; assists in performing a task.

Assumes (duties). Takes over the authority and responsibility of another, usually as a temporary substitutes in the absence of the other person.

Assures. Ensures: confirms: makes certain.

Attends. Is present at and may participate in; conferences, ceremonies.

Audits. Assures adherence to standard practices; checking the accuracy of accounting records.

Authenticates. Renders authentic; given authority to; by the proof, attestation or formalities required by law; proves authentic, confirms, verifies as to genuineness.

Authorises. Permits, empowers, establishes by authority of position.

Balances. Weighs in a balance; compares in relative force, importance, or value; settles and adjusts (as an account); computes the difference (as an equation); comparing debits and credit accounts ensuring equal totals.

Calculates . Determines by mathematical processes, implies highly intricate processes as against computes, which implies simple arithmetical process and exact results; forecasts consequences or results, as in taking risks.

Calibrates. Ascertains the calibre of, determines, rectifies or marks the graduations of; adjusts in accordance with a previously defined standard; calibrates equipment.

Carries out. Takes action on basis of order, regulations, directives, established policies, approved plans.

Catalogues. Makes a list, inserts in a list; catalogues information for filing.

Censors. Examines correspondence, news dispatches, speeches, to suppress or delete whatever; if communicated, might damage public relations.

Certifies. Assures; makes certain, verifies; endorses authoritatively; testifies to, in writing.

Charts. Draws or exhibits on, a chart; map or graph; charts statistics.

Checks. Reviews, controls, tests, verifies, investigates, by means of checks.

Clarifies. Makes more readily understandable;

Classifies. Places in categories, as personnel, position, supplies.

Closes. Stops or fills up, as an opening, shuts; brings to an end; unites, consolidates.

Collaborates. Works or acts jointly with others.

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Collates. Examines and compares critically to verify arrangement, parts, often to arrange in order; collates a summary report prepared in separate portions by several individuals.

Collects. Gathers together, assembles, accumulates, compiles, calls for and/or receives payment; collects data on structure and functioning of organisations.

Communicates. Gets in touch with others through letters, messages, or orally; used in sense of maintaining communication with.

Compares. Examines for likeness or differences; compares performance against established standards, actions taken as against regulations.

Compensates. Counterbalances, makes up for; gives an equivalent to, adjusts makes equal return to, usually with the preposition “for”; compensates for loss or for an action performed.

Compiles. Collects into proper or designated form; compiles data into a report. Composes out of materials from other documents, reports and statistical summaries, from other reports.

Composes. Forms a combination, makes up, constitutes; puts together in ordered format; makes coherent and integral; adjusts or settles, as to compose differing opinions, or reconciles, as reconciles contending factions.

Compounds. Makes an aggregate of, puts together, mixes or combines elements of; compounds interest on the sum of the principal and accrued interest.

Computes. Determines by calculation; reckons or counts; takes account of, makes up a count; computes by payroll.

Concurs. Agrees; acts jointly on corresponding opinion.

Conducts. Supervises and personally performs work necessary to accomplish the results desired; to perform; does not imply management.

Confers . Consults; compares views, hold conferences; confers with; obtaining opinion, recommendations, advice.

Confirms. Makes firm or firmer, recording verbal order into written form; verifies and makes valid by formal assent.

Considers. Gives thought to accepting or adopting a possibility, or a course of action.

Consolidates. Unites into one mess or body; brings together in close union.

Constructs. Puts together, systematically; builds, devises, as a bridge, theory, triangle.

Contributes. Gives or supplies, along with others, as information or advice, a selection, a plan.

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Controls. Checks or regulates; keeps within limits; exercise directing, guiding or restraining power over; controls deployment of materials and equipment.

Co-operation. Acts or operates jointly with another or others; implies voluntary action rather than under orders or implicit direction.

Co-ordinates. Brings into common action with others, generally with equal ranks, not subordinates, as in co-ordinating staff functions to obtain a result that requires action on the part of several staff sections. To bring into common action, condition, or harmony; to produce a smooth operation; to co-ordinate work to meet production schedule deadlines: co-ordinate activities but with the authority to control them. When the term co-ordinate is used, it must be followed by the activities or elements being co-ordinated.

Copies. Duplicates an original as nearly as possible.

Corrects . Makes or sets right; alters or adjusts to bring to a required condition; rectifies; indicates errors, faults, discrepancies to be amended.

Counsels. Advises, gives advice to; recommends as action; also, take advice from others.

Creates . Makes, plans, designs, or generally brings about something new and original in thought and imagination.

Decides. Arrives at a solution that ends uncertainty or dispute; makes a choice of judgement.

Defines. Determines or sets down the boundaries of, sets down or shows the precise outlines of; determines and states the limits and nature of; describes exactly; gives the distinguishing characteristics of; states or explains the meaning of.

Delegates. Appoints as a delegate; entrusts authority to a person acting as an agent or representative.

Delineates. Traces the outline of, sketches out; describes; delineates data or information.

Demonstrates. Gives evidence of, displays; shows with the intent of proving; explains or illustrates; demonstrates results an analysis.

Describes. Tells or writes about; gives a detailed account of; describes symptoms of a problem.

Designs. Plans, sketches a pattern or outline for; contrives; designs cards and report forms.

Detects. Discovers the presence or existence of something previously hidden or unclear; detect air pollution.

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Determines. Sets bounds or limits to, fixes conclusively or authoritatively, comes to a decision concerning, as the result of investigation, reasoning; obtains definite and first hand knowledge of; determines title to property.

Develops. Unfolds more completely, evolves the possibilities of, makes active something latent, advances further, promotes the growth of; unfolds gradually, forms or expands by a process of growth; makes more available or useable; develops patterns and templates. To obtain a new method or produce by combining, and/or expanding various existing ideas.

Devises. Contrives; forms new methods or possibilities of; implies using ingenuity under difficult circumstances when regular technical assistance or standard materials are not available.

Diagnoses. Recognises, analyses and identifies usually a disease by examination and observation; diagnoses the causes of a problem.

Differentiates. Perceives or expresses the difference; distinguishes between.

Digests. Condenses for brevity; abstracts; arranges methodically.

Directs. Regulates the activities or course of; controls; guides; gives an order or instruction to; directs individuals during operations. Assign, guide, and review the work of others. Does not imply complete supervision.

Disciplines. Punishes or penalises for the sake of control; brings a group under control; imposes order upon; enforces obedience.

Discusses. Talks with others, particularly in considering a question of problem requiring examination and debate preparatory to decision because of uncertainty and lack of precedence.

Dispatches. Sends of quickly or promptly; dispatches information.

Dispenses. Deals out in portions; distributes; dispenses pharmaceutical preparation.

Disposes. Gets rid of; disposes of obsolete files and publications.

Disseminates. Diffuses, distributes, spreads by dispersion, circulates.

Distinguishes. Recognises or discriminates one thing from another; perceives clearly.

Distributes. Divides, deals out, portions; administers, dispenses; distributes information to divisions.

Drafts. Makes a preliminary sketch or composition of; drafts correspondence.

Edits. Sets in order for publication; examines for corrections and content.

Effects . Brings to pass; accomplishes by performance; makes possible by execution; effects authorised organisation changes.

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Encourages. Inspires with courage and spirit; fosters esprit de corps.

Enforces. Gives force to, strengthens, invigorates; executes with vigour; enforces regulations, safety precaution.

Ensures. Gives assurance guarantees; makes sure.

Enters. Goes or comes into a place or condition; makes a beginning; begins as a participant; inscribes, enrols, records; enters changes in publications.

Establishes. Makes firm, sets on a firm basis, as in establishing specific procedure to be followed; sets up as an order of precedent.

Estimates. Forms a judgement about, gauges, determines or calculates approximately; estimates the need for supplies and equipment.

Evaluates. Determines value or worth or, appraises, evaluates inspection forms, work orders, and discrepancy reports.

Examines. Tests by an appropriate method; interrogates closely; subject to inquiry or inspection.

Executes. Follows out or carries out; does, performs, fulfils; creates or produces in accordance with an order, plan, blueprint; executes the flow of work.

Exercises. Puts into action, uses, employs; practices, activates for the purpose of training or developing; exerts, wields, or has influence, control, authority; exercises control over departmental operations.

Exhibits. Presents or exposes to view; show, displays; gives evidence of, reveals.

Expedites. Speeds the process or progress of; facilitates; carries through with dispatch.

Explains. Makes something clear or intelligible; interprets to assure understanding.

Exposes. Lay upon to, or sets out for, inspection or examination; subjects a sensitive plate or film to radiation.

Expresses. Puts into words, represents by language, states; makes known, shows; pictures, represents, symbolises; signifies; expresses multiplication.

Extracts. Draws out, pulls out; deduces, derives, manages to obtain; copies out, makes a selection or quotation; extracts portions of a plan.

Fabricates. Makes, builds, puts together, frames manufactures, as by assembling parts connotes processing over a period of time, rather than relatively instantaneous construction; fabricates assemblies.

Files. Lays away documents, papers, in a methodical manner; sets in order.

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Finishes. Arrives at the end of, brings to an end; completes, accomplishes, perfects; finishes a surface.

Follows through. Takes action in sense of control measure to assure completion or compliance; usually implies corrective action.

Follows up. Makes a renewed, repeated or supplementary action, based on action previously initiated, to prompt a desired response.

Forecasts. Estimates beforehand.

Forges. Forms by heating or hammering; beats into a shape; forges metal.

Formulates. Expresses or puts in systematised statement, formulates plans, policies, procedures.

Forwards. Transmits; sends onward, as a report through channels.

Functional direction. The determination and maintenance of standards and methods of operation within a function for individuals or groups in an organisation outside of the “chain of command”. Implies authority to obtain conformance.

Furnishes. Supplies, provides, equips; furnishes program reports to central agency.

Grades. Rates, as efficiency reports, on basis of performance.

Guides. Regulates; manages; directs in a certain way; orders instructs, superintends training.

Handles. Manages, controls, directs; deals with, performs a function with regard to; treats, manipulates; touches.

Holds. Maintains authority over, as holds subordinates responsible for attainment of desired results. Carries on or joins in, as ‘holds’ meeting.

Identifies. Establishes the identify of; distinguishes, discriminates.

Illustrates. Makes clear, explains, demonstrates, as by figures and examples.

Implements. Accomplishes, fulfils, completes, carries out, puts into effect; implements plans and policies.

Incorporates. Unites with, or introduces into, something already existing; blends, assimilates; combines into a structure or organisation; embodies, includes.

Indicates. Points out; suggests; intimates or shows indirectly.

Indoctrinates. Instructs rudiments or principles of.

Informs. Gives knowledge to, tells; acquaints with a fact.

Initiates. Brings into practice or use, introduces by first doing or using; initiates routine correspondence.

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Inserts. Puts or thrusts in; sets in; introduces; inserts a punch card.

Inspects. Looks at carefully, examines critically; examines or reviews officially; Examine to test against established standards, usually a physical comparison or measurement.

Installs. Sets up or fixes for use or service; establishes in a place.

Instructs. Imparts knowledge systematically; forms; furnishes with directions; directs or commands; trains or indoctrinates.

Integrates. Unites; combines; unifies; consolidates; organises; systematises; puts together to form a whole.

Interprets. Examines or tells the meaning of; understands or appreciates in the light of individual belief, judgement, or interest; construes. Makes inferences from ambiguous information to provide meaning or make relevant.

Interviews. Meets with personally; sees; consults formally with; usually implies questioning or obtaining information, as interviews applicants to determine qualifications.

Inventories. Makes an account of goods or stock, usually at regular intervals and sometimes including the worth of the items listed; inventories of materials.

Investigates. Follows up or makes research by patient examination of facts, inquiry and observation. To systematically collect data usually with a single purpose or problem in mind.

Isolates. Sets apart from others, places alone; isolates defective components of system.

Issues. Gives out officially, as order and directives, supplies, and equipment.

Lays out. Prepares materials for a subsequent work operation; lays out elementary designs.

Leads. Directs in action or opinion; guides or conducts; precedes and directs in movement, as leads men.

Localises. Limits or confines to a place, area, or locality; determines the origin or place of, as an organic or mechanical malfunction; localises a malfunction.

Locates. Designates the site or place of, defines the limits of; stations someone in a place; searches for and discovers the position of.

Machines. Planes, shapes, turns, mills, etc., by machine; machines a surface.

Maintains. Holds or keeps in a state or condition, especially in a state of efficiency, newness, validity or cleanliness; keeps property to not let it fail or decline; supports, sustains, upholds, defends. To keep in a prescribed state or condition as, to maintain records by keeping them up-to-date.

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Mans. Supplies with men; staffs.

Manages. Controls; directs; conducts; guides, administers. Plan, organise, staff, direct and control efforts of subordinate organisational units through intermediate levels of management or supervision. Sometimes this term is used to donate final responsibility for an organisational function whether or not supervision of supervisors or employees is involved.

Manufactures. Makes by hand, machinery, or other agency; works into suitable forms for use; fabricates, manufactures a product.

Marks. Puts a mark on, fixes or traces out the bounds or limits of, affixes a significant identification to; indicates by marks or symbols; marks boundaries.

Masks out. Covers or conceals, as by surfacing over with tape; masks areas.

Measures . Ascertains the extent, degree, quantity, dimensions or capacity of, by a standard.

Monitors. Keeps watch over; reports on; keeps in order.

Motivates. Provides with ideas, incentives, goals, reasons that stimulate and prompt action.

Negotiate. Confers with another so as to arrive at the settlement of a matter.

Notifies. Informs; makes known, gives notice of.

Observes. Adheres to, follows, keeps or abides by law, duty, rule, custom; celebrates; notices or perceives; pays special attention; examines scientifically; observes safety precautions.

Obtains. Procures, gets possession of; obtains data for inclusion in a survey.

Opaques. Makes opaque, so as not to admit light; paints over to blot out portions of opaques lens.

Operates. Puts into or continues in operation or activity; manages, conducts, carries out or through; drives, as to operate a vehicle; operates a radio.

Orders. Commands; gives and order to; commissions someone to purchase, sell or supply goods, orders supplies.

Organises. Arranges; systematises persons or things into proper places, especially in relation to each other; gives structure to; puts in proper order.

Orients (orientates). Puts into correct position or relation, acquaints with an environment, conditions or situation; sets or arranges in position; fixes direction.

Originates. Begins, produces as new; procedures, plans, techniques.

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Outlines. Summarises more significant features of, or gives preliminary or general sketch of, as systems, regulations.

Overhauls. Examines thoroughly and checks for needed repairs; makes repairs and adjustments needed to restore working order; overhauls equipment.

Oversees. Supervises; superintends; inspects; examines. Checks the work of others for performance, without supervisory responsibility or authority over their efforts.

Packages. Wraps or boxes as for selling, carrying, disposing, or storage; packages items.

Participates . Takes a part or shares with others in some activity, enterprise; participates in group discussions.

Performs. Carries out or executes some action; accomplishes, achieves, effects.

Places. Sets or arranges to establish in a certain position, as rank, order, condition; disposes of in a desired or selected way; places survey stakes.

Plans. Represents as by a diagram; devises or projects as a method or course of action; prearranges the details of, as to plan a campaign; intends, proposes to do; plans an assignment.

Plots. Makes a plan or map of something, marks the position of something on a map or plan; delineates, draws, outlines an action in advance, lays out, devises.

Posts. Transfers or carries from a book of original entry to a ledger.

Predicts. Tells or declares beforehand; foretells.

Prepares. Adapts or qualifies beforehand for a purpose, and or condition; makes ready, puts into a state for use or application, prepares a request for survey.

Prescribes. Lays down or sets as a guide, direction or rule of action, procedures, regulations.

Preserves. Keeps from harm, damage, danger, evil; protects; keeps from spoiling or rotting; maintains; preserves equipment.

Prevents. Forestalls, averts; generally implies taking immediate and effective measures, or establishing appropriate controls to keep from happening.

Processes. Prepares by or submits to a special treatment or process.

Procures. Obtains, secures, gets, purchases through appropriate channels, procures equipment.

Programmes. Works out a sequence of operations to be performed.

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Projects. Protrudes, especially as part of a structure; causes light or shadow to fall into a space, or an image upon a surface; locates or places upon as in the phrase “projects construction sites on a topographical map”.

Promotes. Furthers; contributes to growth or activity of something; also, advances in rank.

Promulgates. Publishes, makes known; spreads knowledge of and information on through established channels.

Pronounces. Utters or speaks aloud, especially with reference to articulation or correct sound or accent, gives proper phonetic utterance to; pronounces numbers and phonetic alphabet.

Provides. Supplies for use, furnishes; equips in preparation.

Purges. Cleanses or ride of impurities, foreign matter, or undesirable elements; clears away, off or out; drains out water or air nautical; purges air from air-conditioning systems.

Qualifies. Is qualified; is fit; as for an office or employment; is capable; fits, as for an office, place, character or privilege.

Readies. Makes ready, puts in a state of order or preparation.

Re-babbitts. Re-applies Babbit metal, a soft, silver-coloured alloy of tin, copper and antimony used to reduce friction in bearings; loosely, re-applies any anti-friction alloy.

Receives. Takes or comes into possession of.

Reclaim. Gets back, purifies for re-use; reclaims used material.

Recognises. Perceives a person or thing previously known, recovers or recalls knowledge of.

Recommends. Advises; counsels; offers or suggests course of action; recommends a survey.

Reconciles. Makes congruous; adjusts, settles; checking items.

Records. Writes, enters, registers for purpose of evidence or reproduction, records data in a record book.

Reduces. Diminishes, especially in a bulk, amount, or extent; bring into certain order, arrangement, or classification; brings from one form to another; reduces survey notes.

Refers. Sends or directs to some person or place, as for treatment, aid, decision, information.

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Registers. Enters in a record or list, enrols, records officially; indicates on a scale; safeguards by having a record made, as registered mail; registers assignments.

Releases. Sets free, unfastens and lets go, as something snagged) permits to be shown, issued, published; release data on employment.

Regulates. Directs in accordance with regulations; brings under control of assigned authority.

Rejects. Refuses to accept, generally because considered unsatisfactory as to condition or status against standards.

Relays. Passes on, as messages, through communication systems.

Relieves. frees from, wholly or in part, as relieves supervisor from administrative duties; also, releases a person from a duty, post, station.

Remedies. Provides or serves as a remedy for; cures, relieves, corrects; repairs something broken or out of order, or corrects a malfunction.

Removes. Changes the location of by taking off, out of, or away from, lifting, pushing aside; removes an object.

Renders. Causes to be or to become; represents or depicts; furnishes, as an account of money or actions; gives; delivers, or transmits, as to render a message, or renders artificial respiration.

Repairs. Restores to working condition, as equipment; repairs equipment.

Replaces. Restores to a formed place or position; takes the place of; supplies an equivalent for.

Reports. Gives an account of; relates; tells; repeats; prepares an account of, orally or in writing; presents conclusions reached, makes, issues, or submits formal report; presents oneself, as reports for duty.

Represents. Fills place of, be substitute for; represents supervisor.

Requests. Asks for something or some action desired.

Requisitions. Makes a formal request, application or written order, as for equipment, tools, paper, food, supplies, requisitions materials.

Researches. Conducts investigation or experimentation aimed at the discovery and interpretation of facts, revision of accepted theories or laws, in the light of few facts or practical application of such new or revised theories or laws.

Rescues. Fees from any confinement, violence, danger or evil; rescues someone.

Resolves. Analyses, determines, decides, settles, solves, explains, convinces, assures, implies position and authority for making a decision.

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Resuscitates. Revives, brings back to life or consciousness; resuscitates a victim.

Retrieves. Recovers, regains, brings back.

Reviews. Examines again; makes formal or official examination of the state of, as inspection of men, equipment.

Revises. Look at or over again and corrects or improves as estimates, plans; makes new, improved, up-to-date version of, as procedures.

Routes. Sends, forwards, or transports in an established manner; arranges the course of; fixes the order of procedure in a series of operations; routes classified matter.

Scales. Arranges in a graduated series, scales a test; makes or patterns in regularly graded proportions; hence, regulates; rises in a graduates series; as of steps or notes.

Scans. Looks over to pick out certain pertinent items for details.

Schedules . Designates fixed times for accomplishment of, as training programs, mail deliveries, courier service.

Screens. Passes through standardised test for sorting out candidates; subjects to interviews or tests; also, reviews to determine security classification.

Searches. Looks for, hunts through, examines, goes over, explores, inquiries, scrutinises.

Secures. Makes safe; guards, protects; makes certain, guarantees; ensures as with a pledge; secures a loan; makes firm, fast, tight; gets hold or possession of, obtains, acquires.

Selects. Takes by preference from among others; picks out or from; selects portable power tools for maintenance of equipment.

Serves. Is assigned to a position; fulfils the obligations or discharges the requirements of a duty or position.

Serves. Is assigned to a position; fulfils the obligations or discharges the requirements of a duty or position.

Services. Performs maintenance, supply, repair, installation, distribution, etc., for or upon.

Sets up. Brings into operation or use; institutes, establishes, arranges; puts together; erects.

Shifts . Changes the place, position or direction of, moves or removes, as from one place or person to another; transfers; shifts to alternate controls.

Shows. Explains; teaches; instructs; demonstrates.

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Solves. Finds or provides a satisfactory answer or explanation for, makes clear, explains.

Sorts. Puts in a certain place or rank according to kind, class or nature.

Specifies. Names or states explicitly or in detail; includes as an item in a specification.

Sponsors. Presents and assumes responsibility.

Stacks. Piles up; arranges in a pile whose sides are relatively uniform, so as to prevent collapse of the structure; stacks cargo.

Standardises. Places within, prescribed limits or procedures.

Sterilises. Frees from living germs; sterilises dental instruments.

Stores. Furnishes or provides, particularly for a future time or need; accumulates; deposits, as in warehouse or depot.

Stows. Places or arranges in a compact mass; puts in its proper, or in a suitable and/or convenient place; fills by packing closely.

Studies. Reads and examines so as to learn or understand, such a regulations.

Submits. Refers; offers or puts forward as an opinion; defers to the opinion or authority of another, as submits reports or recommendations for approval.

Suggests. Advances as opinion or recommendation.

Superintendent. Have management of; arranges and inspects work.

Supervises. Gives directs orders and instructions followed up by personal observation of activities of subordinates. Carry out assignments through subordinates, usually time card employees; or direct supervision of small numbers of exempt supervisors.

Surveys. Examines with reference to condition, situation, value, etc.; inspects; also, technically determines and delineates the form, extent, position of a tract of land. A brief but comprehensive search to locate information applicable to a problem.

Sutures. Joins together with, gut, thread, wire, for the purpose of stitching up a wound or incision; sutures minor wounds.

Sweats. Causes to perspire, as by drugs, exercise, heat; causes to give forth moisture as pipes, vegetables; heats a metal in order to extract an easily fusible constituent; heats solder until it melts; unites metal parts by heating at the point of contact; sweats a watertight or airtight flange, joint, stud or lead.

Synchronises. Causes to be or appear synchronous; arranges, or tabulates so as to indicate coincidence or co-existence; renders synchronous in operation.

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Takes action. Assumes a task or duty, performs a function, does something to accomplish a desired end as a result of a condition, requirement, directive, frequently qualifies by “follow up” or “remedial”; takes follow-up action - pertaining to corrective action.

Tempers. Brings steel, glass or the like to a degree of hardness and toughness; tempers springs.

Tests. Examine critically or tries out material; measures skills, knowledge, capacities, or aptitudes of an individual or group.

Traces. Follows the path, development, process or history of, especially by proceeding from the latest to the earliest evidence; finds or determines by this procedure; draws the lines, delineates; makes a diagram; notes and marks a course on a map.

Trains. Forms or imparts proficiency by teaching, drilling, instructing, discipline.

Transacts. Carries on, performs, conducts or completes a piece of business; negotiates.

Transcribes . Makes a written or typewritten copy of shorthand notes, speech; arranges or adapts a piece of music for an instrument, voice of ensemble other than that for which it was originally composed records for rebroadcast.

Transfers. Conveys from one place, person or thing to another, transports, removes or causes to pass to another; prints or otherwise copies from one surface to another; takes over the possession or control of, conveys; transfers circuits for normal and emergency conditions.

Transmits. Sends, forwards, transfers from one place to another; implies passing on to others through established channels.

Transports. Carries from one place to another, especially over relatively long distances.

Transposes. Changes the usual, normal, or relative position of; writes or plays a musical composition in a different key.

Treats. Subjects to some action or process to improve appearance, taste, usefulness; processes, brings or puts a person or thing into a specified or implied condition by treating; treats chemically a closed cooling system of an internal combustion engine.

Troubleshoots. Corrects, removes, or mitigates a problem or deleterious condition; troubleshoots a control system.

Uses. Employ; partakes of; exploits.

Validates. Proves, confirms; authenticates.

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Verifies. Proves, confirms, substantiates, authenticates; checks or tests the accuracy or exactness of, verifies by comparing items.

Welds. Unites or consolidates metallic parts by heating to a plastic or fluid state the surfaces or the parts to be joined and then allowing the metal to flow together with or without the addition of other molten metal, or by hammering or compressing with or without previous softening by heat; welds section.

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**ANNEX B TO**

**SECTION 2**

EXAMPLES OF CONDITIONS CATEGORIES FOR TRAINING OBJECTIVES

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| **Types of Condition** | **Examples of wording** |
| The range of performance | • Measure voltages between 0 and 100 |
|  | volts AC. |
|  | • Under supervision |
| Tools, equipment, and clothing | Given: |
| required | • All necessary tools and equipment as laid |
|  | down in xx, paragraph xxxx. |
|  | • SA80, 3 magazines, 60 rounds ball |
|  | ammunition. |
|  | • Using only the tools that are part of its |
|  | equipment schedule. |
|  | • Wearing an NBC suit and respirator. |
| Special job aids and manuals | Given: |
| allowed | • Access to the aircraft flight emergencies |
|  | handbook. |
|  | • Equipment start-up procedure checklist. |
| Environmental conditions | • Within a confined space. |
|  | • In a smoke filled compartment. |
|  | • In winds up to 25 knots. |
|  | • At temperatures down to -5 C. |
|  | • By day and by night. |
| Simulated situations | Given: |
|  | • Case study – Exercise RELIEF. |
|  | • Simulated system fault A21. |
| Geographic locations | • In the outpatients treatment room. |
|  | • On the flight deck of… |
|  | • In a simulated Mess dining room |
|  | • Within the confines of a military |
|  | establishment. |
|  | • In a moving vehicle. |
| Personnel required | • Trainee to act as leader of a team |
|  | comprising of five other trainees. |
|  | • A trained operations room team closed-up |
|  | at all positions. |
|  | • Working as part of an operations room |
|  | team. |

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**ANNEX C TO**

**SECTION 2**

EXAMPLES OF STANDARDS CATEGORIES FOR TRAINING OBJECTIVES12

|  |  |  |
| --- | --- | --- |
| **Type of standard** | **Example** | |
|  |  |  |
| Time | • | Within one minute |
|  | • | Within 1/2 hour |
|  | • | Every quarter |
|  | • | Before 1200 |
|  | • | Before ship sails |
| Quantity | • | 50 rounds |
|  | • | (identifies) all contacts |
|  | • at a speed of 16 words per minute | |
|  |  | with a maximum of 4 errors |
|  | • 30 times in a row | |
| Tolerance | • | ±0.003 mm |
|  | • | ±0.5 volts |
|  | • | ±1°C |
|  | • | ±2 miles |
|  | • | within range marks |
|  | • not to exceed 1000 kg | |
|  | • | IAW xx Chap. x paragraphs 7-9 |
| Percentage | • | (hits target) 8 times out of 10 |
|  | • achieves a kill rate of 75% | |
| Procedures and/or Sequence | • | IAW Small Arms Wing -Checklist 4 |
|  | • IAW xxxx Chap. 22 Para. 9 | |
|  | • IAW Standing Order Article 206 | |
|  | • IAW Chapter 3 Para. 7 of Maker’s | |
|  |  | Handbook |
|  | • IAW xxx Chapter 6 Paras 17-19b | |
|  |  | (Check List ) |
| Safety | • | Without injury to personnel or |
|  | • | damage to equipment |
|  | without aggravating injury |
|  | • IAW Range Safety Regulations, | |
|  |  | Chapter 2. |
| General | • | (reports) whenever a change occurs |
|  | • IAW Staff Answer – Checklist ‘ABC2’ | |
|  | • To the standard of the test piece. | |
|  | • To the standard of the enclosed | |
|  |  | model. |
|  | • Of smooth, shiny appearance, free | |
|  |  | from bumps, tails, and sharp ends. |

1. Note that these are all examples of **product** standards. Process standards may also be used.

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**ANNEX D TO**

**SECTION 2**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **EXAMPLE OF AN ENABLING OBJECTIVE FORMAT** | | | |  |  |
|  |  |  |  |  |  |  |  |
| **Course No & Title:** |  |  | **Job Title:** |  | |  |  |
|  |  |  |  |  | |  |  |
| **Training Objective:** |  |  | **Enabling** |  | |  |  |
|  |  |  | **Objective:** |  | |  |  |
|  |  |  |  |  |  |  |  |

**Performance**

**Conditions**

**Standards**

|  |  |
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**SECTION 3 - DEVELOPING AN INSTRUCTIONAL SCALAR**

3.1 **Definition.** The instructional scalar is a diagrammatic representation of instructional material in terms of Training Objectives, Enabling Objectives (EOs) and Key Learning Points (KLPs), organised to reflect the optimum instructional sequence.

3.2 **Instructional Scalar Diagram**. An instructional scalar diagram is a tool used to identify dependent skills and knowledge. It can be used instead of or complementary to the KSA analysis as a method of deriving EOs and KLPs. It takes the form of a branching pattern identifying procedures and relationships. An example of this is shown at Figure 1. The process begins with the TO and breaks the subject matter down into the lower order EOs and KLPs. This then forms the basis for the sequencing of instruction.

**TO**

**KLP**

**EO**

**KLP**

**KLP**

**EO**

**KLP**

**KLP**

Figure 1 : Developing the Scalar

3.3 **Method of Construction.** The process of developing an instructional scalar diagram is one of constant reiteration and amendment. The easiest way to approach this is to create a working area by attaching large sheets of paper (A1 or larger) to a wall and adding the details using temporary labels (eg self-stick notes or similar) that can be moved around and replaced as change becomes necessary. The first step in producing the instructional scalar is to identify and state the terminal performance. This is obtained from the TO and should be the same performance statement as in both the Job Specification and the Job Scalar. The Terminal Performance should be written on its own label and placed at the top of the working area.

3.4 **Listing Procedures.** The next stage is to list all of the Enabling Objectives that contribute to the Terminal Performance is sequential order from left to right below the TO. The starting point for this procedure is after the process standards of the TO. An example is at Figure 2.

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EO1  EO2  EO3  EO4  EO5



LOAD AIM FIRE OBSERVE UNLOAD

Figure 2: Layout of the procedure within a given TO.

3.5 **Key Learning Points (KLPs).** It is necessary to identify the KLPs on which each EO depends. These can be identified via examination of the KSA Analysis, Job Scalar, Reference Material and discussion with the Subject Matter Experts (SMEs). Each of these KLPs should be written on its own label and arranged in a sequential order under the appropriate EO. It may be helpful to work through the process by asking “What must the trainee know or be able to do in order to perform this?” For example in order to “Load weapon” a trainee must, in sequence, “Select ammunition”, “Fill magazine” and “Fit magazine”, but each skill is dependent upon knowing how to do it. Therefore, before trainees can “Select ammunition”, they must first be able to describe what ammunition is. This process is illustrated in Figure 3. In drawing up an instructional scalar, it is important to ensure that all the required knowledge is listed. Each dependent EO should be examined in turn, and the question asked, “On what skill or knowledge does this depend?”

**LOAD**

**WEAPON**

**SELECT**

**AMMUNITION**

**IDENTIFY**

**CORRECT**

**AMMUNITION**

**FILL**

**MAGAZINE**

**FIT**

**MAGAZINE**

**DESCRIBE**

**AMMUNITION**

Figure 3: Layout of dependent Key Learning Points within a given EO.

3.6 **Testing the Scalar Diagram.** Despite the best efforts, there will still be some anomalies in the hierarchy. It is necessary to stand back and:

1. Check that each dependent KLP has been correctly identified. Are there any missing? Has the need for dependent knowledge been identified?
2. Check the logic of the diagram. Within a TO, the EOs will be taught sequentially from left to right. This may be based upon dependency within the TOs or best instructional practice. Within the stem of KLPs descending from

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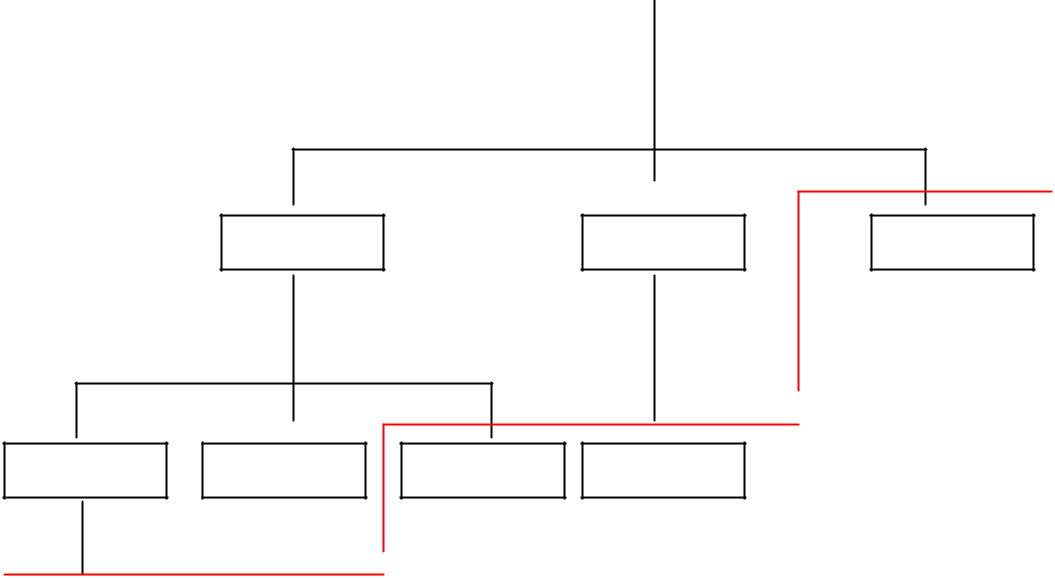
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an EO, each item is dependent upon the item(s) below it. Therefore, the sequence of instruction is from bottom to top within each EO, and left to right overall.

1. Adjust the position of anything that has been wrongly placed in the diagram.

3.7 **Red-lining the Scalar Diagram.** It is possible that some of the dependent skills listed will be of very basic nature, e.g. Recognise red, amber and green. Sometimes it can be assumed the trainee will already be capable of a certain skill before they arrive on the course. Such skills will not require training and can be separated or “red-lined” from the scalar as in Figure 4.

EO1.1



**Red-line**

Figure 4: The effect of Red-Lining the scalar.

3.8 There may be other areas of the scalar that can be cut out of the course. An example of such would be training for overseas where the necessary skills are taught more effectively on the job or in theatre. Generally, this should apply only to whole EOs or TOs, and no other skills should be dependent upon items that are red-lined for this reason. It should also be noted that decisions about red-lining based on the location of instruction, although described here for convenience, would probably be made later in the training design process, and the scalar diagram amended retrospectively.

3.9 **Entry Standard.** Skills can only be excluded from a course if it can safely be assumed that trainees will already possess the abilities and knowledge below the

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red-line before they begin the training programme. Even so, it may become apparent at a later date that some trainees starting the course do not possess these skills. This will demand an adjustment for future courses and some objectives may need to be reinstated. Consequently, **all items below the red-line should be annotated with the reason for red-lining and not deleted from the master scalar diagram.**

3.10 **Duplication of Items.** After red-lining, the scalar diagram is left containing a logical order of subject matter. If the same KLP appears listed several times it should be fully covered the first time and is otherwise ‘red lined’ or ‘red boxed’, unless overtraining is required.

3.11 **Numbering Scalar Items.** This suggested numbering system for an Instructional Scalar works from left to right. Therefore, for TO1, numbering follows the pattern in Figure 5. The KLPs are also numbered from the left, but starting at the bottom within each EO. Following this method the position and sequence of each KLP can be established without having to constantly refer back to the scalar. Any other numbering system can be used as long as the relationship between each item is clear. Once the sequence has been settled, the timetable for the course can be designed to reflect this logical flow. The foundation KLPs are covered first, beginning at the lowest point on the left of the scalar and progressing up to the achievement of each EO in turn. On some long courses, or in training organisations where topics may be common to a number of courses, the use of subject area identifying letters as a prefix can help later planning, eg, all signals items beginning with “S”.

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1.1.1.1

1.1.1.1.1

**TO1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **EO1.1** | |  |  | **EO1.2** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1.1.1 |  | 1.1.2 |  | 1.1.3 |
|  |  |  |  |  |

1.1.2.1

|  |  |  |
| --- | --- | --- |
| 1.1.1.2 |  | 1.1.1.3 |
|  |  |  |

Figure 5: Numbering the Objectives

**EO1.3**

|  |  |
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**SECTION 4 – PRODUCING AN ASSESSMENT STRATEGY**

**INTRODUCTION**

4.1 **Background**. Throughout any training system tests and assessments are used for a variety of purposes, not least of which is to ensure that the TOs have been achieved. To ensure that these tests and assessments are reliable, valid and administered correctly it is necessary to specify and control them. An Assessment Strategy provides the means for Instructional Designers to achieve this.

4.2 **Scope**. This section considers the purpose of the Assessment Strategy and the procedure for developing an Assessment Spec. Details on producing tests and analysing test results are covered in the module Assessment in Training.

**PURPOSES OF TESTS**

4.3 The main purposes of tests are as follows:

1. **Selection**. Tests may be used for selecting trainees for a particular training course or employment. Selection tests may require those selected to meet a defined standard or they may be used to select the top x% of candidates.
2. **Achievement Measurement**. Achievement, or mastery, tests measure whether trainees are achieving, or have mastered, the objectives of a course.
3. **Diagnostic**. Diagnostic tests are used for identifying individual weaknesses in knowledge or skill. They can be delivered before a course begins or during a course. Diagnostic tests are invariably associated with some form of remedial instruction designed to address the weakness identified by the test.
4. **Trainee Motivation**. As trainees find themselves under increasing

pressure they tend to become more strategic in their learning approaches, only putting their energies into work that counts. Assessments can be designed to maximise trainee motivation, prompting their efforts towards important achievement.

1. **Classifying or Grading Trainees**. There may be a requirement to classify or grade the achievement of individuals within a particular group or cohort. This could be for the award of prizes, prioritisation for subsequent training or employment or for determining the level of post course monitoring/supervision required.

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**USES OF TESTS**

4. 4 Test results are sources of information that can be put to many uses throughout a course. Tests can be classified by the use of their results within the course as follows:

1. **Entry Tests**. Many courses require a base level of knowledge or skill on which to build. Entry Tests establish whether a potential trainee has this level of knowledge or skill. The aim of entry testing is to select only those trainees who have the prerequisite knowledge and skills that are required to commence training.
2. **Pre-Course Tests**. These tests are given immediately prior to, or at the beginning of training and can be used for either one of two purposes. Firstly, they can be used as diagnostic tests to identify weaknesses in knowledge and/or skills, enabling early remedial action to be taken. Secondly, they can be used to identify areas where a trainee already meets the TOs, thus enabling appropriate accreditation or exemptions to be given. To establish this level, however, a pre-course test should be at the same standard as the criterion tests for the TOs.
3. **Formative Tests**. Also known as progress tests, these tests are administered at intervals during a course to gain data for feedback to trainees and trainers on trainee progress. This provides the basis for the action to be taken by both trainees and trainers to ensure trainee success on the course.
4. **Summative Tests**. These tests gain the required data to assign pass/fail grades.

**FRAMES OF REFERENCE**

4.5 Tests are designed as instruments of measuring trainee performance and ability. Like any measurement tool tests require a frame of reference in which to operate, otherwise the measurement cannot be quantified. Tests can be categorised as using either of the following frames of reference:

1. **Criterion Reference**. Criterion referenced tests measure whether a trainee has achieved a certain standard. The trainee either passes or fails by reference to the criteria set in the test. Examples of criterion referenced tests are the driving test (theory) and the driving test (practical).
2. **Norm Reference**. Norm referenced tests measure a trainee’s relative standing against his or her peers. They are used to rank or order trainees rather than measure the achievement of specific objectives. Once ordered, trainees may then be grouped into specific classes or grades.

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**WHAT TO TEST**

4. 6 It may not be practical to test all standards of all EOs. Choices therefore have to be made by the instructional designers. If areas are not tested, the customer has no guarantee that the individual has achieved mastery of the subject. Due to resource limitations, choices may have to be made, for example whether to test:

1. All the Skills or Knowledge?
2. All Practical Skills?
3. All TOs?
4. All EOs?
5. Critical Elements?

4.7 The ultimate arbiter of these choices is the customer.

**TEST SUITABILITY**

4.8 Instructional Designers must carefully consider the suitability of the tests they specify when formulating the assessment strategy. The main factors affecting test suitability can be considered under the following headings:

1. Validity.
2. Reliability
3. Usability

**VALIDITY**

4.9 Test validity is defined as **the extent to which a test measures what it was designed to measure**. For example, if you wish to measure someone’s ability todrive a vehicle across rough ground a valid test would be driving a vehicle across rough ground. Ideally tests used should be as near 'job-like' as possible, within the constraints of the training environment. However, job-like tests are not always possible given the constraints of the training environment but this should never be used as an excuse for invalid testing - using test items which measure recall of knowledge when the intended job performance calls for the application of knowledge or performance of skills.

**RELIABILITY**

4.10 The reliability of a test is defined as the **extent to which a test will provide the same measurement when it is repeated**. To be considered reliable a test mustmeasure consistently and accurately. Responsibility for ensuring that tests are reliable will be divided between instructional designers and test designers. There are a number of factors that affect test reliability:

1. **Test Length**. In a test each question or item is a sample of the knowledge or skill being measured. More reliance may be placed on a test of 50 items than one of five items; the longer test offers more evidence to judge an individual's ability. However, this reliance only applies when the test items are

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measuring the same thing. Generally, the length of a test affects its reliability; the longer the test, the more reliable it is.

1. **Objectivity in Marking**. Tests can be broadly categorised as Objective or Subjective. Objective tests have only one correct answer to a test item or one correct way of performing an action, eg multiple choice tests and weapons handling tests. Subjective tests rely on the judgement of the assessor to determine the degree of “correctness” of an answer or quality of performance, e.g. essay questions and leadership tasks. If a test is objective test reliability is high. If, however, a test is subjective then there is scope for variation in marking which reduces the test’s reliability. This variation can occur between assessors and between trainees assessed by the same assessor. Much can be done to improve the reliability of subjective tests by reducing the variation in assessment through the use of marking guides and checklists.
2. **Range of Ability**. If a test is norm referenced (designed to discriminate between trainees) then the greater the range of ability of trainees the greater the tendency for a test to be reliable in grading those trainees.
3. **Test Conditions**. Test conditions should be taken from the **conditions** in the TOs and mirror, as closely as possible, the conditions under which operational performance is delivered. Notwithstanding this, conditions such as extraneous noise, the presence of other trainees and the presence of the assessor(s) may affect performance. Efforts should be made to reduce the influence of these factors through effective test administration, thus providing
4. consistent environment for all occurrences of the test.

**USABILITY**

4.11 A test may be valid and reliable, but unusable because it is impracticable to implement. Again responsibility is split between instructional designers and test designers. The five elements listed below are not mutually exclusive but interrelated parts of test design and implementation. To ensure usability a test must be:

1. Administratively feasible.
2. Easily interpreted by all users.
3. Feasible in terms of time taken.
4. Marked using a suitable and practicable scheme.
5. Cost effective.

**TEST TYPES OR FORMATS**

4.12 There are two main ways in which tests can be presented:

1. **Practical Tests**. These tests are used to test the achievement of a skill or skills both mental and physical. They can assess either the product of the

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skill, or the process involved in employing the skills and should have an associated checklist to ensure both reliability and objectivity in assessment. Examples of practical tests are; weapon handling tests, practical leadership tasks and simulator based tests.

1. **Theory Tests**. Since practical tests demand much time and many resources, supplementary theory tests are sometimes required. Theory tests measure the knowledge that supports job skills, usually by taking a sample of what must and should be known. These tests are usually in written form although oral tests can also be used. To achieve validity, theory tests require much care in construction and scoring.

**WHEN TO TEST**

4.13 TOs may be tested by any one of the following patterns:

1. **TOs are tested immediately after they have been taught.** The advantage of this pattern is that trainee weaknesses can be identified early and immediately addressed. Subsequent modules can be progressed confidently in the knowledge that each trainee has achieved any learning pre-requisites. The disadvantage is that, if the course is long and early modules not reinforced by later modules, the trainee may lose the skill or knowledge after successful testing. Consequently while TPS has been achieved over the length of the course, it may not be being achieved at the completion of the course. This gives rise to the phenomena euphemistically known as “learn and dump” and “cram and dump”. Situation A in Figure 1 illustrates this strategy.
2. **All TOs are tested at the end of the course.** The advantage of this testing pattern is that that those trainees who pass will go to the job fully capable of meeting all TOs. Situation B in Figure 1 illustrates this strategy. The disadvantages of this pattern, however, are:
   1. The achievement of some TOs may be a pre-requisite for later modules. You cannot tell whether they have been achieved until it is too late and the trainee has failed the course.
   2. It makes it difficult to provide any formative feedback to trainees
   3. It may place an unnecessary workload on trainees, revising for successive tests.
   4. It may place an unnecessary burden on limited equipment and facilities.
3. **TOs are tested immediately after instruction and again at the end of the course.** This represents a combination of the previous 2 patterns. All TOs are tested immediately on completion of the instruction and then a sample of the TOs are tested at the end of the course. This testing pattern has all the advantages of the previous 2 patterns without their attendant

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disadvantages. There is however a unique disadvantage, namely that the course may need to be lengthened to enable trainees to revise and accommodate the extra time required for the final tests. Situation C in Figure 1 illustrates this strategy.

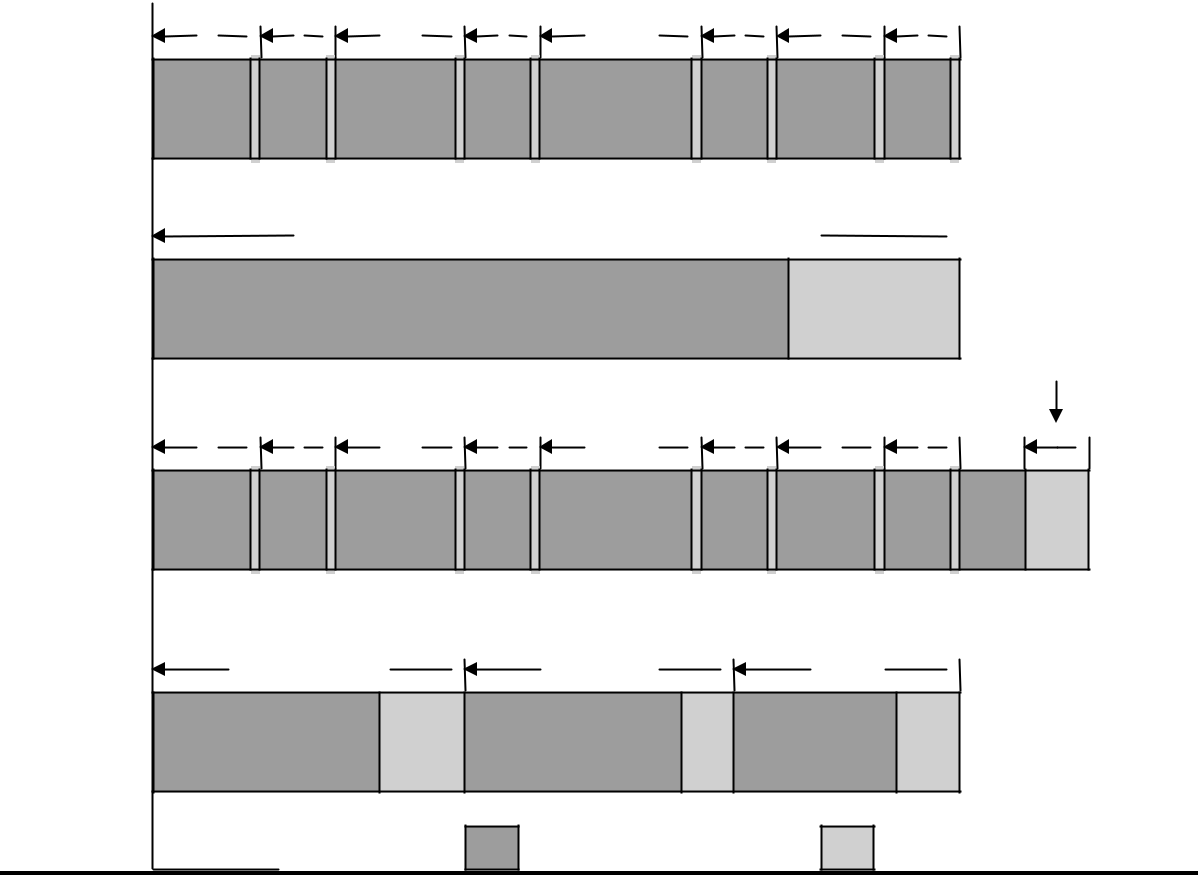
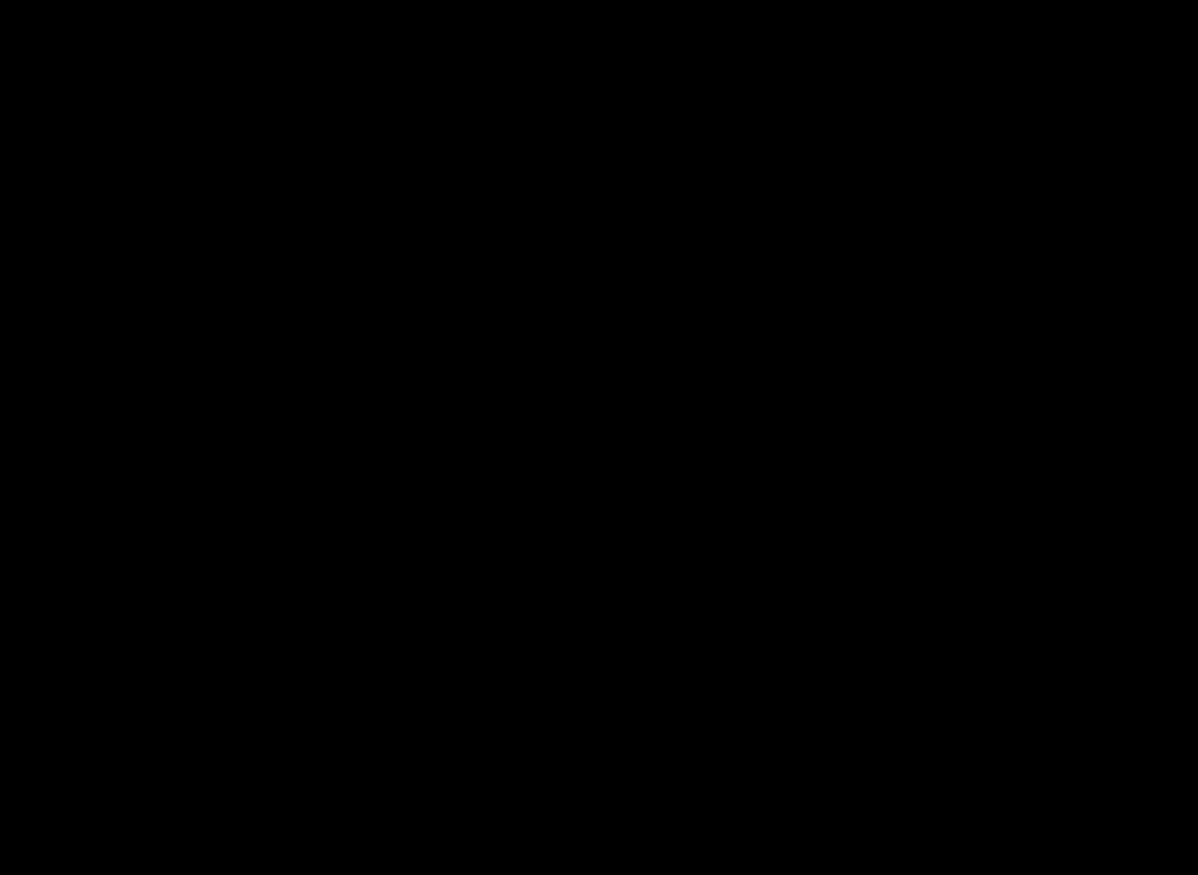
1. **TOs are grouped and tested in groups**. This is a compromise solution. Situation D in Figure 1 illustrates this strategy.

4.14 When selecting the most appropriate testing pattern, Training Designers must consider the advantages and disadvantages of each pattern and also the relationship of TOs to each other. No matter which testing pattern is chosen, there is a fundamental principle of systematic training that must not be violated:

Each trainee who passes a course must at some time meet the required standard of performance for each of the TOs.

**Figure 1: When to Test – Various Strategies Illustrated**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Start |  |  |  |  |  |  |  | Complete |
| Course |  |  |  |  |  |  |  | Course |
| TO1 | TO2 | TO3 | TO4 | TO5 | TO6 | TO7 | TO8 | |
| Situation |  |  |  |  |  |  |  |  |
| A |  |  |  |  |  |  |  |  |
|  |  |  | TOs 1 - 8 | |  |  |  |  |
| Situation |  |  |  |  |  |  |  | Sample of |
| B |  |  |  |  |  |  |  | TOs 1- 8 |
|  |  |  |  |  |  |  |  | Tested |
| TO1 | TO2 | TO3 | TO4 | TO5 | TO6 | TO7 | TO8 | |
| Situation |  |  |  |  |  |  |  |  |
| C |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  | Complete |
|  | TOs 1, 2, 3 | |  | TOs 4,5 |  | TOs 6,7,8 | | Course |
| Situation |  |  |  |  |  |  |  |  |
| D |  |  |  |  |  |  |  |  |
|  |  | Time |  | Learning Time | |  |  | Testing Time |



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**THE ASSESSMENT STRATEGY**

4.15 **Definition and Rationale.** Every course should have a document that clearly lays down the strategy for the use of tests in support of a training program. A carefully conceived assessment strategy will achieve the following:

1. It provides an overview of the sorts of tests to be used, the points during the training when they will occur, and how the results of tests are to be interpreted and acted upon.
2. It is both a record of decisions taken about the best approach to assessment, and a guide for the later development of individual tests.
3. It helps ensure that tests match the requirements of the Training Objectives, and that adequate resource for testing are identified and obtained.
4. It will, quite rightly, influence the manner in which instruction is delivered (e.g. a gunnery instructor knows that the summative test will emphasise practical handling skills, and wisely ensures ample student practice during instructional periods).

4.16 **Elements of the Assessment Strategy.** As a minimum, the assessment strategy must include clear direction for each of the following:

1. A concept for the summative testing of each of the Training Objectives. This should be based upon a practical terminal test, which may be supported by selected enabling tests in either practical or theory format. At this point, a short description of the test is sufficient; e.g., “A practical test in which each student will command a tank during a troop advance” or “a theory test on the Highway Code”.
2. A concept for the formative testing of student progress. This might include
3. statement of purpose, an assignment of responsibility, and a caution about the use of formative test results.
4. A policy for the assignment and interpretation of grades.
5. A policy for the action to be taken upon student failure of a (valid) test. As appropriate action will depend upon many variables, it is recommended that this policy be flexible rather than restrictive. For example, a statement guaranteeing (or denying) a re-sit will seldom prove practicable; it would be better to establish a procedure (e.g., a Student Review Board) by which each case will be considered against criteria such as:
   1. Resources required to repeat the test, without compromise of test conditions and assessment standard.
   2. Requirements for additional tuition and/or practice.
   3. Likelihood of student success during the re-sit.

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1. A policy for determining course pass or failure. This can be a statement such as, “to pass this course, students must achieve all Training Objectives”, or “pass all summative tests”. The inclusion of such a simple statement provides focus to the testing; it can also prevent misunderstanding or even serious grievance later on.
2. A policy for the maintenance of test records. This should state a clear requirement for both of the following:
   1. A record for each student that includes a summary of all test results (both formative and summative), as well as a record of formative action taken, such as counselling notes or copies of written warnings. This record should be used to guide the preparation of the student course report.
   2. A consolidated tabular record of summative test results. This record, accumulated over several repetitions of a course, provides valuable information for internal validation of training in general, and evaluation of tests in particular.

4.17 **Publication.** Under Tri -Service rationalisation the **overall assessment strategy** for a course will form an important section of the **Course /Module Specification Document.** The content of a Course /Module Specification Documentas dictated by DSAT is given at Annex A.

**THE ASSESSMENT SPECIFICATION**

4.18 Whilst the assessment strategy gives an overview of the course assessment, the detail is given in the assessment specification. This document forms an annex to the course/module specification. The content of an assessment specification as dictated by DSAT is given at Annex B.

4.19 Detailed information on compiling an assessment specification is given below and a possible format is at Annex C to this chapter.

1. **Assessment Number/Title**. All tests should be uniquely identifiable. The test title should indicate the test purpose and relate to the course/module name, e.g.: “UG 237 final”, “TD Mod 4 ” and “ ME 202M progress 2”.
2. **Programming of Assessment**. The assessment specification is to indicate the week and period when the test is to be conducted. When programming a test consideration should be given to the type of test, scheduling of the course modules and to the most appropriate testing pattern.
3. **Type of Assessment**. The assessment specification must detail the type of test being employed, e.g. Practical, Theory (Written), Theory (Oral), Formative or Summative.

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1. **Duration of Assessment**. The assessment specification must detail the maximum time allowed for the trainee to complete the test. Adequate time must be allowed for each individual to complete the performance being tested. Test timing should be based on the time taken by a competent jobholder to deliver the operational performance plus an increment to allow for the trainees lack of experience/practice. Test timing should be confirmed from a pilot of the test.
2. **TOs and EOs Assessed**. All TOs, and where applicable, EOs covered by the specified test are to be detailed on the assessment specification.
3. **Marking Details**. The assessment specification must contain sufficient detail to show how the test is marked, the aim being to achieve maximum reliability in marking. This is best done through the provision of marking guides and checklists, which should be referenced here.
4. **Pass/Fail Criteria**. The Pass/Fail criteria stated on the assessment specification must reflect the standard specified on the TPS. Consideration should be given to whether the same pass fail criteria applies to all parts of the test, e.g. a test requiring an overall 80% pass may require 100% on safety related items.
5. **Consequences of Failure**. Consequences of failure, including repeated failure, must be specified. This must consider the requirement for trained manpower and training failure policy. Consequences may include back - classing, withdrawal from training, re-categorisation, remedial or further instruction and practice under supervision.

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**ANNEX A TO**

**SECTION 4**

**CONTENT OF A COURSE/MODULE SPECIFICATION**

1. The Course/Module Specification is a training management tool, which provides the administrative details of a training course or module. The following is the proposed content for a Course Specification for a joint training course.

**MINIMUM CONTENT OF THE COURSE/MODULE SPECIFICATION**

1. The Course/Module Specification must include the following data:
   1. Protective Marking.
   2. Course Title/Course Number.
   3. Module Title/Module Number (If Applicable).
   4. Training Sponsor/Training Authority
   5. Course/Module Aim.
   6. Issue Status.
   7. Training Objectives: Performance, Conditions & Standards – Tagged to indicate whether the TO is included to meet:
      1. The Core Training Requirement.
      2. Legislative Requirement.
      3. Civilian Accreditation Requirement.
   8. Course/Module Duration (Number of Periods).
   9. Details of Effective/Non-Effective Training Time.
   10. Assessment Strategy. [*The Assessment Strategy should state the overarching assessment policy for the course/module and the rationale for the policy (where the rationale is deemed necessary/appropriate – e.g. Accreditation/Awarding Body or legislative requirements). It should also include the consequences of failure of the course/module (including warning and disciplinary procedures as well as any consequences pertinent to advancement/promotion and/or future employment). These may be stated in full or reference made to the appropriate standing orders or SOPs. The Assessment strategy should also reference the relevant Assessment Specification(s)for the administrative details of the assessments pertinent to the course/module.*]
   11. Maximum & Minimum Class Size.
   12. Lesson Location(s)/Venue(s) required.

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1. Health & Safety, Environmental Protection and all Risk Assessments.
2. Course Reference Details.
3. Resources Required (Including Instructor Hours and Assessment/Test Resources).
4. Course/Module Programme.
5. Course/Module Prerequisites (Feeder Courses/Modules, Entry Standards, Target Population).

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**ANNEX B TO**

**SECTION 4**

**CONTENT OF AN ASSESSMENT SPECIFICATION**

1. The Assessment Specification is a training management tool, which provides the assessment details for a training course or module, and is to be an Annex to the Course/Module Specification.

**MINIMUM CONTENT OF THE ASSESSMENT SPECIFICATION**

1. The proposed minimum content for an Assessment Specification is as follows.
   1. Protective Marking.
   2. Course Title/Course Number.
   3. Module Title/Module Number.
   4. Issue Status.
2. The following details are required in tabular form under the headings:
   1. Assessment Number.
   2. Assessment Title.
   3. Programming of Assessment (When is test required).
   4. Type of Assessment 1 (e.g. Theory or Practical).
   5. Type of Assessment 2 (i.e. Formative or Summative).
   6. Duration of Assessment (Time Allowed).
   7. TOs/EOs being assessed.
   8. Reference any pertinent National Standards.
   9. Marking Details (Norm or Criterion referenced grading, marked by whom, by when).
   10. Pass/Fail Criteria.
   11. Consequences of Failure (i.e. Action to be taken in the event of failure of a specific assessment. This should include re-sit and remediation action).

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**ANNEX C TO**

**SECTION 4**

**SUGGESTED FORMAT OF AN ASSESSMENT SPECIFICATION**

**Course No &**

**Title:**

****

**Job Title:**

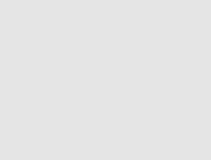
**Duty:**

**Test No &**

**Title**

To identify a test

**Week &**

****

**Period**

Course

programme



**Time**

**Allowe**

**d**

Test

duration

**Type of**

**Test**

Test

description

**TOs/EOs**

**Covered**

List of objectives

tested

**Marking**

**Details**

How test will be

marked

**Pass/Fail Criteria**

(Acceptance standard)

**Consequences**

**of Failure**

(Failures procedure)

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**SECTION 5 - METHODS AND MEDIA**

**INTRODUCTION**

5.1 Background. Having conducted a KSA analysis, it is important to conduct an analysis of training methods and media to determine the most cost-effective way of imparting the required knowledge, skills and attitudes. Methods are the strategies or techniques used to impart the required KSA, while media are the tools and means used to apply the methods selected. Selection of methods and media is to have regard for job performance requirements identified by the KSA analysis, taking into account characteristics of intended trainees, characteristics of instructors, cost effectiveness, training effectiveness, availability of learning resources and identified constraints. The Training Categories which form part of the Operational Performance Statement (OPS) will give some guidance on the priority to be given in training to certain subject areas and will inform the process of selecting methods and media13.

5.2 **Scope**. This section covers the factors influencing methods and media selection, and the analysis process itself.

**FACTORS INFLUENCING METHODS SELECTION**

5.3 **Learning Factors**.

1. **Type of Learning**. The method used to deliver instruction depends on whether learning is categorised as knowledge, a mental or physical skill, or an attitude. Each Enabling Objective must be examined to determine whether it is primarily expressed as a knowledge, skill or attitude. This will suggest the appropriate choice of method; for example, a skills based EO must have some element of practice involved in the method, whilst role-play is an example of a training method suitable for an attitude-based EO. The aim must be to choose a method that is compatible with the material to be learned. Learning a physical skill may require equipment and machinery and a low trainee to staff ratio as it is normally trainee-centred. Knowledge learning can normally be carried out in a classroom with higher numbers and this is instructor-centred.
2. **Retention Ability**. A basic categorisation of instructional methods state that these can either be instructor or trainee-centred. The appropriate selection of instructional methods improves the effectiveness and efficiency of learning. Wherever possible a learner-focused approach should be adopted, although this is not always as simple as it seems as it can be time consuming and costly on resources. A learner focused approach aids information retention by considering the needs of the students and increasing their involvement in the learning process. An instructor focused approach, whilst increasing student to instructor ratios, is not as effective for aiding student retention. The more active the student is in the learning process, the higher
3. More information on Training categories can be found in the course handbook for the Defence Training Support module ‘Analysis of Training’.

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the rate of retention. The table below shows the percentage of material retained by the trainee 6 weeks after a course had finished:

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| --- | --- |
| **Method of Learning** | **Percentage Retained** |
| Reading | 10% |
| Listening | 20% |
| Seeing | 30% |
| Seeing & Hearing | 40% |
| Saying | 70% |
| Doing | 90% |

1. **Learning Styles**. Everyone learns differently.. Attempting to fulfil the needs of individual trainees is not easy. Presenting the material in a variety of ways will help to cater for the majority. However, there is no one right way to select, or even use, instructional methods and media. Trainees in one group are likely to have different abilities and levels of intelligence to trainees in another group. If possible, these differences should be accounted for. Honey & Mumford (1986) used four preferred styles of learning to describe trainees; their characteristics are at Annex A. An outline of these learning styles is listed below14.
   1. **Activists**. Activists involve themselves fully and without bias in new experiences. They tend to thrive on the challenge of new experiences but are bored with implementation and longer-term consolidation learning
   2. **Reflectors**. Reflectors like to stand back to ponder experiences and observe them from many different perspectives. They collect data, both first hand and from others, and prefer to think about it thoroughly before coming to any conclusion. They are thoughtful people who like to consider all possible angles and implications before making a move. They prefer to take a back seat at meetings and discussions.
   3. **Theorists**. Theorists adapt and integrate observations into complex but logically sound theories. They think problems through in a step-by-step logical way. They assimilate disparate facts into coherent theories. They like to analyse and synthesise. They are keen on basic assumptions, principles, theories, models and systems thinking.
   4. **Pragmatists**. Pragmatists are keen on trying out ideas, theories and techniques to see if they work in practice. They positively search out new ideas and take the first opportunity to experiment with applications. They tend to be impatient with ruminating and open-ended discussions. They are essentially practical down to earth people who like making practical decisions and solving problems.
2. Honey, P & Mumford, A, (1986) *Using Your Learning Styles* (2nd Edition), Peter Honey, UK.

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5.4 **Trainee Characteristics**. Characteristics for consideration are:

1. **Motivation**. There may be a contrast between groups of trainees in terms of their experience, maturity, sense of responsibility and motivation. One group may require an instructor dominated setting with control and guidance for learning to be most effective while another group could need less control and benefit more from a self-learning system.
2. **Literacy Level**. Information should only be presented to trainees in a form they can cope with. Information should not be at a level that they cannot comprehend nor should it be at a level that will patronise the students. Key questions should include ‘What is the literacy level of the trainees?’ and ‘What is the most appropriate language for passing information to them?’.
3. **Numbers**. How many trainees will there be in each class? A large class will make instructor demonstrations difficult to plan. A small class will make student discussions difficult.

5.5 **Practical Constraints**. Facilities and resource availability are likely to limit the choice of method. Often training design staff will find that the most appropriate medium is not always practical or within budget. The medium may be unavailable, there may not be time to meet all training objectives, it may be difficult logistically, financially or the group may be of mixed ability and unable to make the best use of the medium selected. Where resources to support the optimum training method are not available, and this lack of availability is likely to affect the successful achievement of objectives, the sponsor must be advised of this fact and made aware of the likely consequences.

5.6 **Instructor Attitude and Ability**. A question that will need to be asked is can or will instructors use the media selected? Instructors are unlikely to use a medium that they do not understand, which will increase their workload or which are complex to manage. If new teaching methods are to be introduced, then due regard must be given to ensuring that instructors are both willing and able to cope. To avoid problems in this area, wherever possible designers should:

1. Involve instructors in the course design project as early as possible.
2. Identify any additional instructor training requirements.

5.7 **Time Availability.** There is never enough time on a course but designers must be careful not to make false economies. A lecture may seem to be an attractive option for passing large amounts of information in a relatively short time. However, it would be wrong to believe that the information received by the trainees had been processed at any but the most superficial level, or that skill levels had been advanced. On the other hand, imaginative combinations of compatible objectives within a single training period can enhance learning potential within the time available.

5.8 **Need for Transfer of Learning.** Unless the training is to be actually carried out at the place of work (On-the-Job-Training or OJT), the training environment will

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differ to some extent to the work environment. It is therefore important that the training method chosen should minimise this difference to make the transfer of knowledge, skills and attitude from the training environment to the work environment as easy as possible.

5.9 **Priority of Learning.** It is unlikely that the various subjects covered on a course will all be of equal importance to the trainees in their future job. Some skills may be used on a daily basis and others may be only be used sporadically, but when they are used it is essential that the performance of these skills is correct. If the course TOs are a result of a rigorous job analysis, an analysis of the required learning levels based upon the Difficulty, Importance and Frequency of use (DIF analysis) should have been carried out. The results of the DIF analysis should be made available to the course designer. In subjects where the possibility of skill fade could have dire consequences, consideration must be given to allocating extra teaching time and using instructional methods and media that will enhance retention.

5.10 **Training Methods**. Instructional methods should be selected in a systematic way. KSA analysis sheets should be used as a basis for the selection of methods, related to the required knowledge, skills and attitudes identified by task analysis. Classifying what is to be learnt, the Enabling Objective (EO) specifies a general learning strategy for instruction. A table indicating the advantages and disadvantages of a range of training methods is shown at Annex B.

**FACTORS INFLUENCING MEDIA SELECTION**

5. 11 **Training Media.** In some ways, the distinction between methods and media is a rather artificial one. If a particular method is chosen, the media appropriate to that method are immediately limited, and sometimes virtually defined. The process of selecting instructional media requires a good understanding of the EOs and knowledge of the available resources. The main consideration in selecting appropriate media must always be its effectiveness in supporting learning. Although the quality of presentation must not be neglected, what really counts is content; is the medium capable of presenting instructional stimuli for learning? Learning is influenced by the quality of the presentation only to the extent that the quality influences the clarity of the message. Often one medium is not enough for presenting the stimuli required and so a multi- media or “blended” approach is prescribed. A table indicating the advantages and disadvantages of a range of training media is at Annex C.

5.12 **Variety of Media**. Using a variety of media when delivering instruction is no doubt enjoyable and there should be a good balance of different media to stimulate as many senses as possible. However, whether a medium is enjoyable is not an overriding factor in media selection. It is necessary to consider the characteristics of media in terms of whether they are essential or optional:

1. **Essential Media Characteristics**. These control the clarity of a message. For example, learning a foreign vocabulary requires print (to recognise words) and audio media (to pronounce them).
   1. Media appropriate to deliver the desired learning outcomes.

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* 1. Media that provide an appropriate level of fidelity.
  2. Media that can cope with student throughput.

1. **Optional Media Characteristics**. These improve the quality of the presentation. There are some considerations that can influence selection:
   1. Attractiveness to the learner - using colour, animation, illustration.
   2. The learners’ study habits - give them a choice.
   3. The instructor's style, habits and skills.
   4. Choosing media that from experience and research improves learning efficiency.
   5. Choosing media that allows the efficient management of training.
   6. Choosing media that has low risk of failure (for whatever reason).

5.13 **Guide for Selecting Media** . The effective selection of media is vital to achieving training objectives and this relies on the judgement of instructional designers. To reduce subjectivity, a systematic selection procedure is desirable. Due to the complexity and variety of training scenarios, an overall selection procedure that fits every training situation is unlikely to exist. However, as a guide, such a systematic selection procedure will assist training designers with the selection of training media so that resources are not wasted by choosing the media 'flavour of the month'. A media selection guide detailing a variety of techniques is at Annex D.

**PROCESS**

5.14 The detailed selection of appropriate training media to meet a defined training requirement usually involves an in-depth analysis, involving all the processes described in the proceeding chapters.

5.15 The media selection process can take many directions depending on the complexity of the tasks to be trained, the learning outcomes and the training objectives. Trainee throughput is also relevant, as are the capital and through-life support costs. Once completed, the methods and media analysis is combined with the results of KSA analysis to produce instructional specifications (ISpecs).

5.16 The availability of existing resources, be they manpower, money and time, will have a large sway on the methods and media being selected. However, to simplify the process, for illustrative purposes in this handbook, it is assumed resource needs are met.

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5.17 Each EO identified through KSA analysis is examined via the use of a flowchart or pair-wise analysis in consultation with advantages and disadvantages of methods and media (Annexes B&C). The use of flowcharts and pair -wise analysis is described at Annex D. The methods and media worksheet at Annex E can be used both as a step -by- step guide to the process and as a record of the decisions made. Ultimately the skill and experience of the training designer will have the greatest impact on the quality of the training methods and media selected. A checklist to assist with the analysis of methods and media is at Annex F.

Annexes:

1. Learning Styles - General Descriptions and Development Activities.
2. Advantages and Disadvantages of Training Methods.
3. Advantages and Disadvantages of Training Media.

D. A Training Designer’s Method/Media Selection Guide

1. Methods and Media Worksheet.
2. Methods and Media Checklist.

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**ANNEX A TO**

**SECTION 5**

**LEARNING STYLES - GENERAL DESCRIPTIONS AND DEVELOPMENT ACTIVITIES**

**ACTIVISTS**

1. **Style**. Activists involve themselves fully and without bias in new experiences. They enjoy the here and now and are happy to be dominated by immediate experiences. They are open-minded, not sceptical, and this tends to make them enthusiastic about anything new. Their philosophy is "I'll try anything once". They tend to act first and consider the consequences afterwards. Their days are filled with activity. They tackle problems by brainstorming. As soon as the excitement from one activity has died down they are busy looking for the next. They tend to thrive on the challenge of new experiences but are bored with implementation and longer-term consolidation. They are gregarious people constantly involving themselves with others but, in doing so, they seek to centre all activities on themselves.
2. **Strengthen Activist Style**. Do something new, at least once a week. Visit a part of your organisation that you have neglected, go running at lunch time, read a newspaper with views opposed to your own, change your office or home furniture layout. At large gatherings, conferences or parties, force yourself to initiate and sustain conversations with everyone present. Deliberately fragment your day by chipping and changing activities each half hour. Make the switch as diverse as possible, from cerebral activity to doing something utterly routine and mechanical; if you have been sitting down stand up; or if you have been talking keep quiet.

**REFLECTORS**

1. **Style**. Reflectors like to stand back to ponder experiences and observe them from many different perspectives. They collect data, both first hand and from others, and prefer to think about it thoroughly before coming to any conclusion. The thorough collection and analysis of data about experiences and events is what counts so they tend to postpone reaching definitive conclusions for as long as possible. Their philosophy is to be cautions. They are thoughtful people who like to consider all possible angles and implications before making a move. They prefer to take a back seat at meetings and discussions. They enjoy observing other people in action. They listen to others and get the drift of the discussion before making their own points. They tend to adopt a low profile and have a slightly distant, tolerant, unruffled air about them. When they act it is as part of a wide picture which includes the past as well as the present and others' observations as well as their own.
2. **Strengthen Reflector Style**. Practise observing, especially at meetings where there are agenda items that do not directly involve you. Study people’s behaviour. Keep records about who does the most talking, who interrupts who, what triggers disagreements, how often the chairperson summarises and so on. Also study nonviable behaviour. When do people lean forward and lean back? Count how many times people emphasis a point with a gesture. When do people fold arms, look at their watches, chew their pencils and so on? Keep a diary and each evening

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write an account of what happened during the day. Reflect on the day's events and see if you can reach any conclusions from them. Practise reviewing after a meeting or event of some kind. Go back over the sequence of events identifying what went well and what could have gone better. Give yourself something to research, something that requires the painstaking gathering of data from different sources. Practise producing highly polished pieces of writing. Write a report or paper about something: put it aside for a week then force yourself to return to it and do a substantial rewrite.

**THEORISTS**

1. **Style**. Theorists adapt and integrate observations into complex but logically sound theories. They think problems through in a vertical, step by step logical way. They assimilate disparate facts into coherent theories. They tend to be perfectionists who won't rest easy until things are tidy and fit into a rational scheme. They like to analyse and synthesise. They are keen on basic assumptions, principles, theories, models and systems thinking. Their philosophy prizes rationality and logic. 'If it's logical it's good'. Questions they frequently ask are: 'Does it make sense?' 'How does this fit with that?' 'What are the basic assumptions?' They tend to be detached, analytical and dedicated to rational objectivity rather than anything subjective or ambiguous. Their approach to problems is consistently logical. This is their 'mental set' and they rigidly reject anything that doesn't fit with it. They prefer to maximise certainty and feel uncomfortable with subjective judgements, lateral thinking and anything flippant.
2. **Strengthen Theorist Style**. Read something 'heavy' and thought provoking for at least 30 minutes each day. Whatever you select to read, afterwards try to summarise why you have read in your own words. Practise spotting inconsistencies/weaknesses in other people's arguments. Go through reports highlighting inconsistencies. Analyse organisation charts to discover overlaps and conflicts. Take a complex situation and analyse it to pinpoint why it developed the way it did, what could have been done differently and at what stage. The situations could be historical or something from current affairs or something you have been involved in personally. You could, for example, do a detailed analysis of how you spend your time or which people and with what frequency you interact with them at work. Collect other people's theories, hypotheses and explanations about events, they might be about environmental issues, theology, the natural sciences, human behaviour - anything providing it is a topic with many different, and preferably contradictory theories. Try to understand the underlying assumptions each theory is based upon and see if you can group similar theories together. Practise asking probing questions - the sort of questions that get to the bottom of things. Refuse to be fobbed off with platitudes or vague answers. Particularly ask questions designed to find out precisely why something has occurred: 'Why do you think the machine has gone down again?' 'Why is absenteeism increasing?

**PRAGMATISTS**

1. **Style**. Pragmatists are keen on trying out ideas, theories and techniques to see if they work in practice. They positively search out new ideas and take the first opportunity to experiment with applications. They are the sort of people who return

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from management courses brimming with new ideas that they want to try out in practice. They like to get on with things and act quickly and confidently on ideas that attract them. They tend to be impatient with ruminating and open-ended discussions. They are essentially practical down to earth people who like making practical decisions and solving problems. They respond to problems and opportunities 'as a challenge'. Their philosophy is: 'There is always a better way' and 'if it works it's good.

1. **Strengthen Pragmatist Style**. Collect techniques, i.e. practical ways to do things. The techniques can be about anything potentially useful. They could be analytical techniques such as critical path analysis, cost benefit analysis, interpersonal techniques such as 'transactional analysis', assertiveness or presentation techniques, timesaving techniques, techniques to improve your memory or techniques to cope with stress and reduce your blood pressure! In meetings and discussions of any kind, concentrate on producing action plans. Make it a rule never to emerge from a meeting or discussion without a list of actions either for yourself or for others or for both. The action plans should be specific and include a deadline: ‘I will produce revision by 31 May.’ Make opportunities to experiment with some of your newfound techniques. Try them out in practice. If your experiment involves other people then tell them openly that you are conducting an experiment and explain the technique that is about to be tested. (This reduces embarrassment if, in the event, the technique is a flop!). Study techniques that other people use and then model yourself on them. Pick techniques from your boss, your colleagues, your subordinates, interviewers on television or politicians. When you discover something they do well - emulate them. Tackle a 'do-it-yourself' project - it doesn't matter if you aren't good with your hands. Pragmatists are practical and, if only for practice purposes, DIY activities help to develop a practical outlook. Renovate a piece of furniture, build a garden shed or an extension to your house. Learn to type. Learn a foreign language.

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**ANNEX B TO**

**SECTION 5**

**ADVANTAGES AND DISADVANTAGES OF TRAINING METHODS**

1. The table below indicates strengths and weaknesses of methods typically found in training. Further details can be found in TG3. Where appropriate or known, development times for one hour of training are quoted. These time values are for optional guidance and may be used to aid in planning and estimating purposes only.

|  |  |  |  |  |
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|  |  |  |  |  |
|  | **Method** | **Advantages** | **Disadvantages** |  |
|  | ***Discussion*** | Maintains interest. | Requires control by a skilled instructor |  |
|  | *A group activity usually* | Relaxed atmosphere for learning. | Small groups only. (Under 12). |  |
|  | *led by the trainer in* | High level of student participation and | Requires high level of skilled communication. |  |
|  | *which the participants* | development of opinions. | Time consuming if not properly structured. |  |
|  | *examine suggestions,* | Shares experience. | Need homogenous group for effective discussion. |  |
|  | *attitudes, ideas and* | Mature, co-operative way of learning. | Additional syndicate rooms required. |  |
|  | *solutions to problems.* | Increases trainee commitment. | Required learning outcomes not guaranteed. |  |
|  |  | Experience and knowledge of trainees can be |  |  |
|  |  | drawn out. |  |  |
|  |  | Good for attitudinal training. |  |  |
|  |  | Best employed in support of other methods and |  |  |
|  |  | to reinforce main points drawn out of other |  |  |
|  |  | sessions. |  |  |

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|  | **Method** | **Advantages** | **Disadvantages** |  |
|  | ***Lecture*** | Presents facts rapidly. | Mostly one-way communication. |  |
|  | *A talk or presentation* | High concentration of information. | Little student feedback. |  |
|  | *usually supported by* | Large audience. | Audience impassive. |  |
|  | *visual aids in which* | Easy to plan. | Inflexible. |  |
|  | *information about* | Trainer has complete control over content and | Poses problems for skill teaching. |  |
|  | *practices, procedures,* | sequence in which the material is presented. | Skill demand on presenter high. |  |
|  | *policies are described* | Suitable for knowledge based training. | Student retention is likely to be very low. |  |
|  | *and explained to the* |  |  |  |
|  | *audience.* |  |  |  |
|  | ***Seminar*** | Gathers together experts from many fields, | Audience tends to be passive. |  |
|  | *Meeting of interested* | therefore economical. | Requires lengthy question time to be valuable. |  |
|  | *parties or experts in a* | Stimulates active participation. | Requires highly competent instructors. |  |
|  | *particular field.* | Permits adaptive instruction. | Poses evaluation problems. |  |
|  |  | Can lead to innovative ideas. | Danger of learning nothing. |  |
|  |  |  | Not suited to new or inexperienced trainees. |  |
|  |  |  | Requires some “expert” knowledge. |  |

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|  | **Method** | **Advantages** | **Disadvantages** |  |
|  | ***Simulation*** | Trainees can practice in realistic and safe | Can be very expensive. |  |
|  | *A means of* | environment. | Requires careful planning. |  |
|  | *reproducing, in a* | Can be cheaper than the real thing. | Requires scenarios to be developed. |  |
|  | *specially created* | Good for procedural training, multi tasking and | Requires good brief, debriefing skills to be employed |  |
|  | *environment, a* | attitudinal training. | by instructors. |  |
|  | *representation of the* | Can reduce need for OJT |  |  |
|  | *real working conditions* | Risk-free environment |  |  |
|  | *to enable a trainee to* |  |  |  |
|  | *acquire and practice* |  |  |  |
|  | *with minimal risk some* |  |  |  |
|  | *of the Skills.* |  |  |  |
|  | *Knowledge and* |  |  |  |
|  | *Attitudes required in* |  |  |  |
|  | *their job.* |  |  |  |
|  |  |  |  |  |
|  | ***Tutorial*** | Small group, or even 1:1, high level of learning. | Costly in time, manpower . |  |
|  | *Structured training* | Suitable for complex learning skills. | Requires highly competent and knowledgeable |  |
|  | *which is conducted on* | Easy to determine 'gaps' in knowledge. | instructors |  |
|  | *a one to less than12,* | Stimulates active participation. | Requires trainee and instructor to be compatible. |  |
|  | *basis, Can be coaching* | Permits instructor to adapt the instruction as |  |  |
|  | *or even mentoring.* | required. |  |  |
|  |  | Constant feedback for trainee. |  |  |
|  |  | Long term relationship built between trainer and |  |  |
|  |  | trainee. |  |  |
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|  |  |  |  |  |
|  | ***Demonstration*** | Shows real situation. | Intricate/rapid procedures difficult to view: |  |
|  | *An illustration by live* | Can be repeated. | CCTV possible. |  |
|  | *performance of a task,* | Saves time and talk. | Equipment cost. |  |
|  | *skill or procedure* | Adds variety. | Requires skilled demonstrator. |  |
|  | *accompanied by an* | Explanations more concrete. | Needs careful planning. |  |
|  | *explanation by the* | Minimises damage and waste. | Requires careful preparation and rehearsal. |  |
|  | *trainer.* | Can be presented to large groups. | Requires equipment and visual aids. |  |
|  |  | Easy to attract and retain interest of trainees. | May be time consuming to gather materials, prepare |  |
|  |  | Delivery can be adapted to suit level of group. | and clear up. |  |
|  |  | Student attention is likely to be much greater |  |  |
|  |  | during a demonstration than in a lesson or |  |  |
|  |  | lecture. |  |  |

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|  | **Method** |  | **Advantages** |  | **Disadvantages** |  |
|  | ***Lesson (Theory)*** |  | Flexible: for all classroom topics. |  | Success depends upon good instructional |  |
|  | *Most used and* |  | Trainees can participate. |  | techniques. |  |
|  | *versatile tactic which* |  | Permits control over content and sequence. |  | Requires detailed preparation to ensure correct |  |
|  | *the trainer has. Used* |  | Encourages trainee involvement. |  | procedures are shown. |  |
|  | *for teaching facts and* |  | Trainee achievement easy to monitor. |  | Requires equipment and aids. |  |
|  | *mental skills. The* |  | Learning and retention are stimulated by active |  | For effective student participation the size of class |  |
|  | *structure of the lesson* |  | class participation. |  | must be limited. |  |
|  | *allows for a high level* |  | Can be incorporated with most other methods. |  | A class size of between ten and thirty is ideal. |  |
|  | *of interaction between* |  |  |  |  |  |
|  | *trainer and trainee* |  |  |  |  |  |
|  | *through question and* |  |  |  |  |  |
|  | *answer, practice and* |  |  |  |  |  |
|  | *the giving of feedback.* |  |  |  |  |  |
|  | *1 hour delivery – (30 -* |  |  |  |  |  |
|  | *45 hours development)* |  |  |  |  |  |

1. *hour instruction – 2-3 hours instructor preparation*

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|  |  |  |  |  |
|  | **Method** | **Advantages** | **Disadvantages** |  |
|  | ***Practical Lesson*** | Close approximation to operational situation, | Requires tools and equipment which can be |  |
|  | *A procedure or skill is* | reducing OJT. | expensive. |  |
|  | *described and* | Builds confidence with equipment. | Requires skilled instructors. |  |
|  | *demonstrated to the* | Enables skill evaluation. | Requires large blocks of time. |  |
|  | *students who perform* | Reduces damage and waste. |  |  |
|  | *the skill under* | Promotes safety. |  |  |
|  | *supervision.* |  |  |  |
|  |  |  |  |  |
|  | ***Self Study*** | Encourages self-disciplined approach to work. | Difficult to monitor. |  |
|  | *This normally takes the* | Can be arranged out of hours. | Waste of time for poor students. |  |
|  | *form of prescribed* | Trainees work at own pace. | No immediate feedback |  |
|  | *reading, project work,* |  | Requires self discipline on student’s part. |  |
|  | *case study, set* |  |  |  |
|  | *assignments or* |  |  |  |
|  | *correspondence* |  |  |  |
|  | *courses.* |  |  |  |

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|  | **Method** | **Advantages** | **Disadvantages** |  |
|  | ***Case Study*** | Requires trainee to make discoveries and | Can involve self study or group participation and |  |
|  | *Can be used as part of* | decisions based on given data/scenarios. | therefore requires some maturity. |  |
|  | *self-study or role-play.* | Useful exercise to enforce learning. | Can pose evaluation problems. |  |
|  | *Students are required* | Increases coverage of material. | Produces non-standard results. |  |
|  | *to study a given* | Reduces classroom time. |  |  |
|  | *scenario or data before* | Reduces instructor interpretation. |  |  |
|  | *participating in group* |  |  |  |
|  | *or individual tasks.* |  |  |  |
|  | ***Role Play*** | Can portray attitudes more easily especially if | Only successful for limited circumstances. |  |
|  | *Can be used as part of* | coupled with discussion at the end of role-play. | Small numbers required. |  |
|  | *a simulation* | Helps the players and audience gain insight into | Need maturity on the part of the trainee. |  |
|  |  | own feelings and responses to situations. | Requires careful planning. |  |
|  |  | Gives the trainee confidence for approaching the | Requires skilled trainer. |  |
|  |  | real situation. | Required learning outcomes are not guaranteed. |  |
|  |  |  |  |  |

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**ANNEX C TO**

**SECTION 5**

**ADVANTAGES AND DISADVANTAGES OF TRAINING MEDIA**

1. The table in this annex lists typical training media found in training locations. Where appropriate or necessary a brief

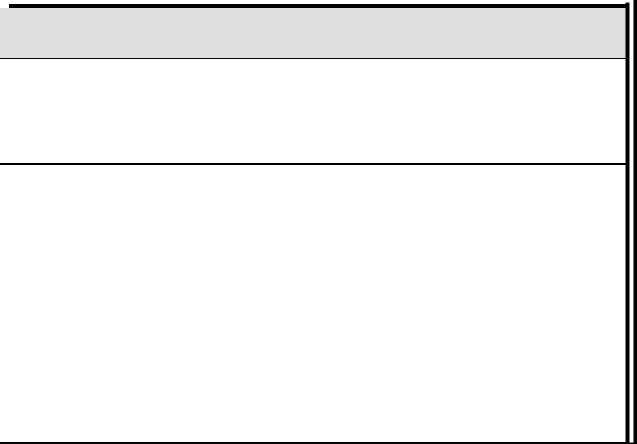
description of the media has been provided. These descriptions are not definitions, but are included to aid understanding. The list is not exhaustive, but its purpose is to highlight to the reader the variety of training media available along with their respective strengths and weaknesses.

1. Where appropriate or known, development times for one hour of training are quoted. These time values are for optional guidance and may be used to aid in planning and estimating purposes only. Development times will vary depending on many factors such as complexity of course content, complexity of the interactivity between student and media, the skills available to the development team and latest software authoring tools.



|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | **Media** | **Advantages** |  |
|  | *35mm Slide Projector* | Brings two-dimensional still views into |  |
|  |  | classroom. Easy to update and relatively |  |
|  |  | cheap. |  |
|  | *Audio* | Cheap to produce. |  |
|  |  | Easy to update. |  |
|  | *Development hours per hour (20-* | Realistic. |  |
|  | *200)* | Easy to operate. |  |
|  |  | Flexible. |  |
|  |  | Realism. |  |
|  |  | Does not disadvantage poor readers. |  |
|  |  | Uniform instruction. |  |

**Disadvantages**

****

No movement or sound. Darkened room required.

Must provide realistic representation of environment.

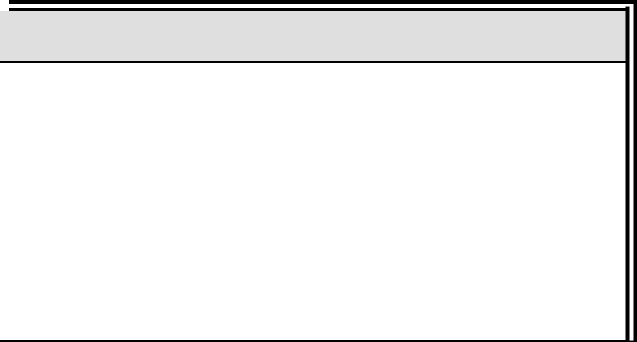
Pure audio has low retention rate compared to other media, best used in conjunction with other methods and media.

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|  |  |  |  |
|  | **Media** | **Advantages** |  |
|  | *Augmented Reality* | Can negate the requirement for a tutor. |  |
|  |  | Allows GFE to be supported electronically. |  |
|  | *A combination of a person’s real* | Can be used at point of need. |  |
|  | *world view and a computer* | Material may be reusable as a job support aid. |  |
|  | *generated virtual scene that* |  |  |
|  | *augments the world with* |  |  |
|  | *additional information, e.g. head* |  |  |
|  | *up displays.* |  |  |

**Disadvantages**

****

Cost of hardware, software and development.

Currently immature technology.

Long development time.

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|  |  |  |  |  |
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|  | **Media** |  | **Advantages** |  |
|  | *Computer Based Training (CBT)* |  | Individualised tuition. |  |
|  |  |  | Student centred and self paced. |  |
|  | *CBT is the use of a computer as* |  | Guaranteed learning transfer. |  |
|  | *an interactive device with an* |  | Maximum trainee involvement in responding to |  |
|  | *embedded training strategy in* |  | stimuli presented on the screen. |  |
|  | *which there are specific* |  | Consistent quality of instruction. |  |
|  | *programmed responses that seek* |  | Student retention of material can be high. |  |
|  | *to aid learning. The computer* |  | Lots of COTs solutions available. |  |
|  | *primarily acts as a tutor/instructor* |  | Good for students with low motivation. |  |
|  | *and the trainee interacts directly* |  | Suitable for mixed ability groups. |  |
|  | *with the computer.* |  | Suitable for teaching procedures and |  |
|  | *Development hours per hour:* |  | knowledge based learning outcomes. |  |
|  |  |  | Ideally suited to stable course content. |  |
|  | *Basic page turner (30-200)* |  | Immediate feedback to students. |  |
|  | PC based, may contain simple |  | Suited to procedural and knowledge based |  |
|  | simulation, video, audio, |  | training. |  |
|  | animation and graphics. Will track |  |  |  |
|  | student’s progress. Student |  |  |  |
|  | navigates through screens (75- |  |  |  |
|  | 250 |  |  |  |
|  | *High simulation, high degree of* |  |  |  |
|  | *interactivity, extensive branching,* |  |  |  |
|  | *maximum remediation* |  |  |  |
|  | *opportunity, real time event* |  |  |  |
|  | *simulation. Can interface with* |  |  |  |
|  | *other devices. Full motion, video,* |  |  |  |
|  | *audio, complex animation and* |  |  |  |
|  | *graphics. (200-750)* |  |  |  |

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**Disadvantages**

Requires careful analysis and design.

Can become dated very quickly.

If trainees reading ability is limited, then it may not be feasible to use simple CBT. Long development time.

Assumes student population is computer literate.

Possible aversion or fear of learning through this media. Not suitable for physical skills training.

Costs increase with complexity.

Lack of human interaction.

If linked to platform equipment may require to be updated in accordance with incremental acquisition programme.

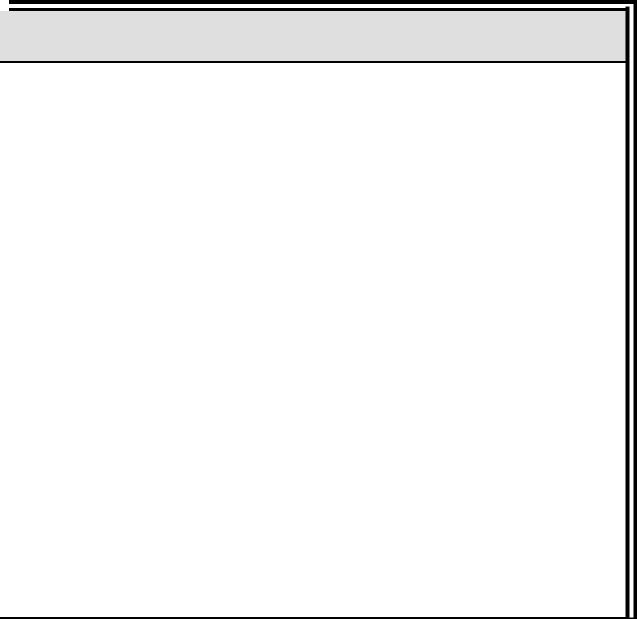
May lose face validity if “running “ slower than latest models.

Can be used for attitudinal training if scenario based and media rich.

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|  |  |  |  |
|  | **Media** | **Advantages** |  |
|  | *Computer-Assisted Instruction* | Flexible. 2D or 3D. |  |
|  | *(CAI)* | Good for demonstrating complex dynamic |  |
|  |  | systems. Powerpoint slide shows are quick |  |
|  | *CAI is the use of a computer as* | and easy to produce. |  |
|  | *an aid to the instructional process.* | Slide amendment easy. |  |
|  | *The computer is usually under the* | Constant good quality. |  |
|  | *control of the instructor. Included* | Allows complex drawings to be broken down or |  |
|  | *in CAI are electronic reference* | exploded thus simplifying the underlying |  |
|  | *databases of various forms of* | principles behind the system. |  |
|  | *simulations, and electronic* |  |  |
|  | *presentation media (e.g.* |  |  |
|  | *Powerpoint).* |  |  |
|  | *Development hours per hour (30-* |  |  |
|  | *200)* |  |  |
|  |  |  |  |

**Disadvantages**

****

Cost increases with complexity, especially dynamic productions.

Computer literacy and resources required to produce and execute.

Can be boring if used too much.

With CAI, there needs to be an instructor present if learning transfer is to be guaranteed.

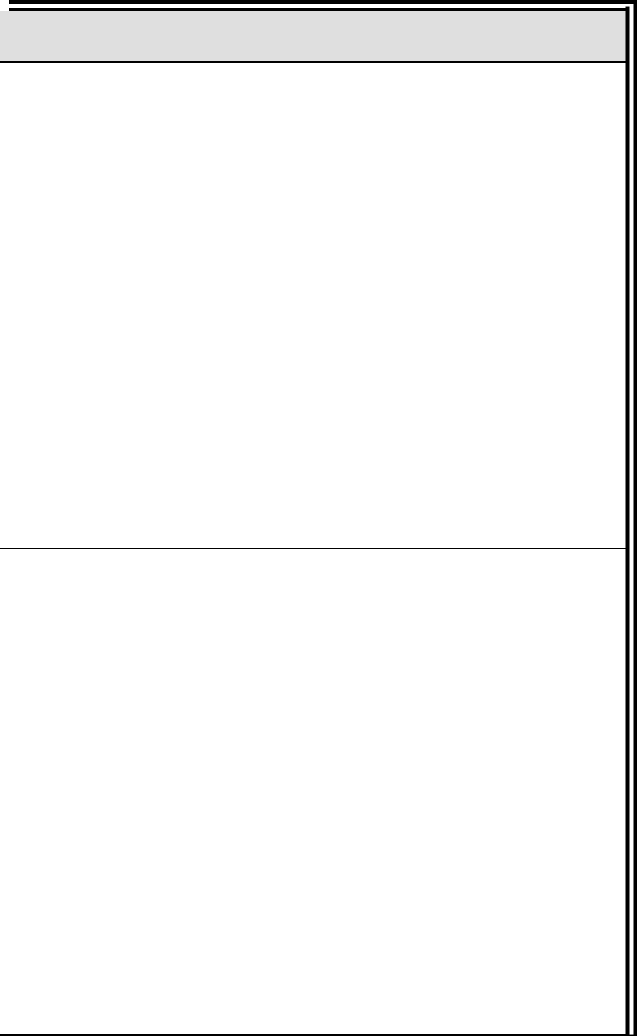
CAI does not replace the human tutor, it merely assists them.

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|  | **Media** | **Advantages** |  |
|  | *Electronic Performance Support* | Reference material available as a result of Def |  |
|  | *System (EPSS)* | Stan 00/60. |  |
|  |  | Provides reference and learning material at |  |
|  | *An electronic device which* | point of need. |  |
|  | *provides information, software* | Job aid, which also facilitates learning while |  |
|  | *tools and procedural knowledge,* | doing, with high probability of learning transfer. |  |
|  | *already available within the* |  |  |
|  | *organisation, to an employee at* |  |  |
|  | *their moment of need, in order to* |  |  |
|  | *enhance their performance of the* |  |  |
|  | *task in hand.* |  |  |
|  | *Development hours per hour (50-* |  |  |
|  | *700)* |  |  |
|  | *Emulator* | Allows students to experience and gain idea of |  |
|  |  | actual situation. |  |
|  | *A simulator which is constrained* | Environment and teaching situation controlled. |  |
|  | *to respond in a predetermined* | Can be less expensive than a simulator. |  |
|  | *manner. Such computer- based* | Emulator trained personnel perform well on |  |
|  | *devices may be used in CBT or* | transfer to operational equipment. |  |
|  | *CAI modes. They do not have to* | Can provide cues associated with forced |  |
|  | *be high fidelity representations of* | feedback mechanisms. |  |
|  | *the real equipment*. | Best results are obtained if students use real |  |
|  |  | equipment shortly after emulation training. |  |
|  | *Development hours per hour (75-* |  |  |
|  | *400)* |  |  |
|  |  |  |  |

**Disadvantages**

****

Cost.

Hardware specification must support EPSSs. CBT material requires careful analysis and design.

Not suitable for initial training.

Can be expensive.

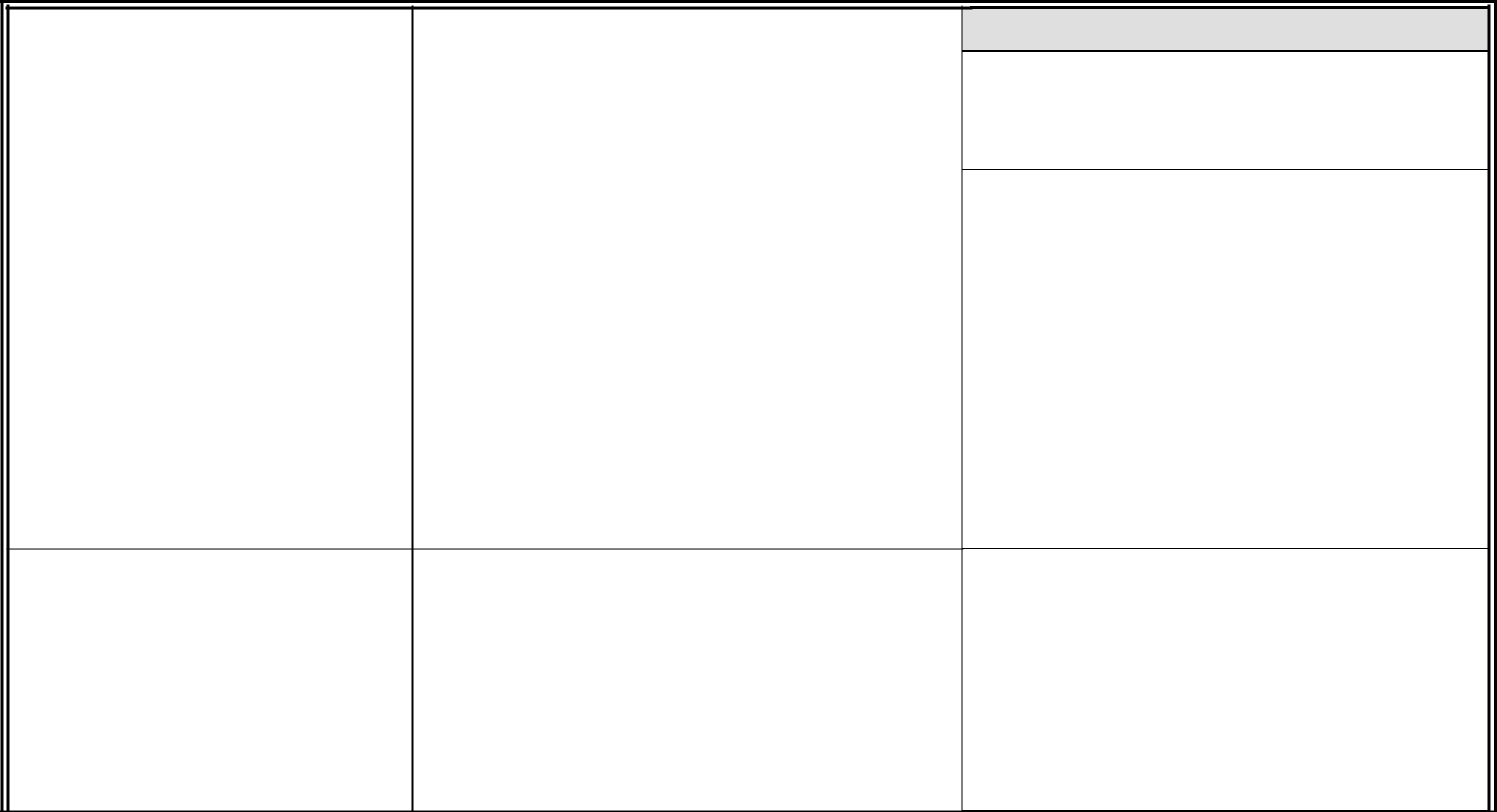
Requires intelligent tutor to brief, monitor, and debrief for learning transfer to occur. Incremental acquisition may require several updates of software.

Operators trained on emulators may not be initially as fast as operators trained directly on the equipment.

Usually requires some training on GFE after emulation.

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|  | **Media** |  | **Advantages** |  |
|  | *Generic Trainer* |  | Supports underlying principles which makes it |  |
|  |  |  | accessible for a larger target population of |  |
|  |  |  | trainees. |  |
|  |  |  |  |  |
|  | *GFE with embedded training.* |  | Training environment provided with the real |  |
|  |  |  | equipment. |  |
|  | *Training that is provided by* |  | Allows perishable skills to be practised. |  |
|  | *capabilities built into or added* |  | May be updated with operational equipment |  |
|  | *onto operational systems,* |  | updates. Reduces training time away from |  |
|  | *subsystems, or equipment, to* |  | unit. |  |
|  | *enhance and maintain the skill* |  | Both refresher and continuity training are |  |
|  | *proficiency necessary to operate* |  | resident in the unit or ship. |  |
|  | *and/or maintain that equipment.* |  |  |  |

|  |  |
| --- | --- |
| *Government Furnished* | Students can use the real thing and gain first |
| *Equipment (GFE)* | hand experience. Usually updated through |
|  | incremental acquisition. |
| *In a training context this is the* | High Fidelity. |
| *taken to be the actual equipment* | High credibility. |
| *found in a unit or on a platform* | Able to train all learning outcomes. |
|  | Good for emotional fidelity (inducing stress, |
|  | fear). |

**Disadvantages**

Is not specific to one piece of equipment. Higher fidelity training equipment may be required later in training system.

Expensive to fit to legacy equipment. Decision to provide embedded training should be made prior to design freeze of GFE.

May support training in small groups only. May place added burden on processing capabilities of host processors. May increase wear and tear.

Equipment may be operated in training mode rather than operator mode & vice versa. Possibilities offered by embedded training may be limited because of operational security.

Cost.

Size.

Support services.

Convenience.

Mobility.

Maintainability.

Health and Safety restrictions.

May support training in small groups only.

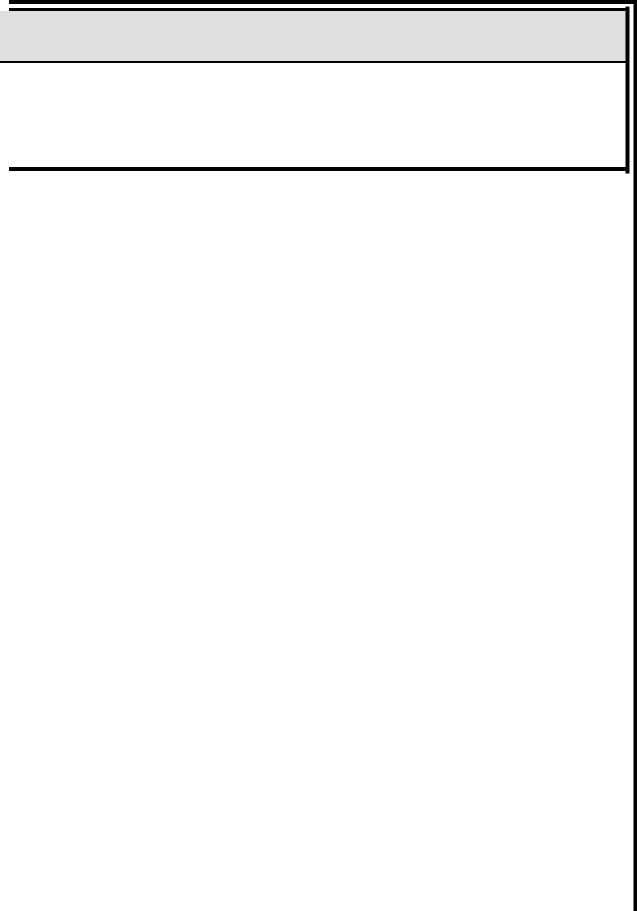
May not be available when required.

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|  |  |  |  |
|  | **Media** | **Advantages** |  |
|  | *Handouts/Books* | Can speed up course time, replacing note |  |
|  | *Development hours per hour (20-* | taking. |  |
|  | *200)* | Can be read in student’s own time. |  |
|  |  |  |  |
|  | *Interactive Electronic Technical* | Material available as a result of Def Stan |  |
|  | *Manual (IETMs)* | 00/60. Provides reference material at point of |  |
|  |  | need. |  |
|  | *An electronic instruction manual,* | Job aid rather than training solution. |  |
|  | *a book on a computer that* | Locate information quickly |  |
|  | *describes how to operate or* | Less storage space |  |
|  | *maintain a product.* |  |  |
|  | *Modified GFE* | Reduced maintenance costs. |  |
|  |  | Negates some Health and Safety restrictions. |  |
|  | *In a training context this is the* | Extended life expectancy. |  |
|  | *taken to be the actual equipment* |  |  |
|  | *found in a unit or on a platform* |  |  |
|  | *that has been altered in someway* |  |  |
|  | *to replicate only those key tasks* |  |  |
|  | *that require training.* |  |  |
|  | *Overhead Projector (OHP)* | Reliable. |  |
|  |  | Normal room lighting. |  |
|  |  | Cheap. |  |
|  |  |  |  |

**Disadvantages**

****

Lesser degree of recall compared to notes written by student.

Often wrongly overlooked for TBT solutions



Hardware specification must support IETMs. No guarantee of learning transfer. Preference is to read from paper based products.

No set standards, or format.

Cost.



Size.

Convenience.

Mobility.

May not be available when required.

May support training in small groups only.

Can be boring if used too much. Dated and not as versatile as CAI. Requires some training to be used effectively.



Has to be carefully positioned to ensure all students can see screen.

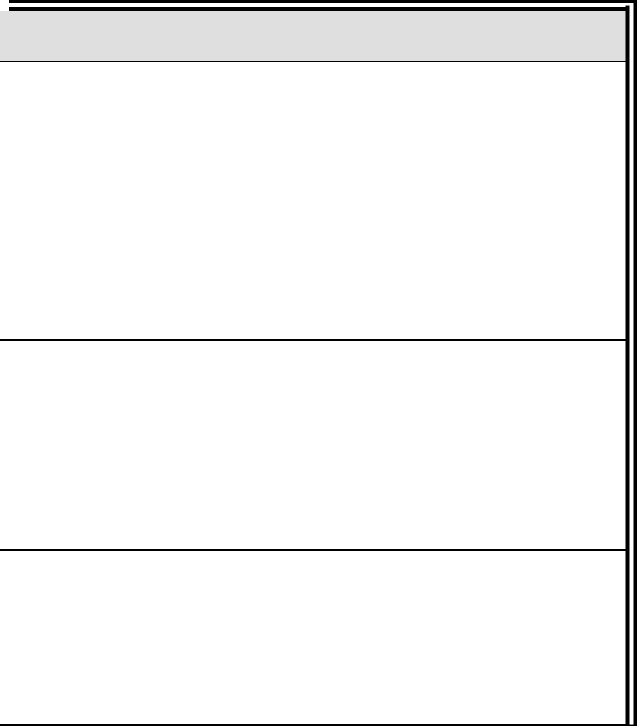


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|  | **Media** | **Advantages** |  |
|  | *Part Task Trainer (Often GFE or* | High level of fidelity. |  |
|  | *part GFE with partial stimulation)* | Permits multiple fault injections whilst not |  |
|  |  | contravening Health & Safety regulations. |  |
|  | *A device, which enables trainees* | Provides realism for specific tasks. |  |
|  | *to learn and practise a particular* |  |  |
|  | *skill or set of skills which, are part* |  |  |
|  | *of a task for which they are being* |  |  |
|  | *trained.* |  |  |
|  | *Physical model* | Can provide high level of fidelity. |  |
|  |  | Can model movement of internal components |  |
|  |  | impossible to view with GFE. |  |
|  |  | Simplicity |  |
|  |  | Adaptability |  |
|  |  | Emphasising colour and texture can be added. |  |
|  | *Reconfigurable Skills Trainer* | Negates the requirement for expensive multi |  |
|  |  | console training equipment. |  |
|  |  | Allows team, sub-team and individual training. |  |
|  |  | Hardware can support other training media. |  |
|  |  |  |  |

**Disadvantages**

****

Cost.

Size.

Mobility, Accessibility.

May support training in small groups only.

Expensive and difficult to modify.

At risk of subsequent updates to GFE. Requires extensive analysis to identify key tasks.

Can be expensive.

Only suitable for simultaneous instruction to

small groups.

Cumbersome.

Must be true to life.

Cost of hardware, software and development.

Some loss of fidelity may be required to allow reconfiguration.

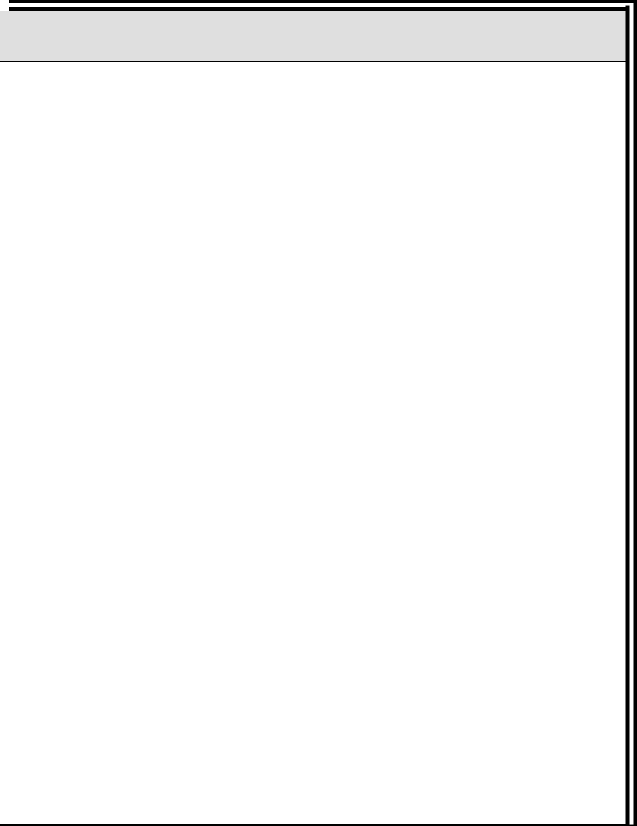
Long development time.

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|  |  |  |  |
|  | **Media** | **Advantages** |  |
|  | *Simulator* | Allows students to experience and gain idea of |  |
|  |  | actual situation. |  |
|  | *A device which presents trainees* | Environment and teaching situation controlled. |  |
|  | *with a representation of the* | May be the only possible training medium due |  |
|  | *important features of the real* | to danger of real environment. |  |
|  | *situation and reproduces, as far* | May be networked for federated and |  |
|  | *as possible, operational* | confederated training systems. |  |
|  | *conditions which enable them to* | Ability to replicate most fidelity requirements. |  |
|  | *practise directly, safely and* | Good for attitudinal training. |  |
|  | *economically, tasks which cannot* | Can provide the opportunity to improve unit |  |
|  | *be practised on the job itself, e.g.* | collective performance wherever people need |  |
|  | *a flight simulator.* | to practise expensive or dangerous activities |  |
|  |  | under realistic conditions. |  |
|  | *Development hours per hour* | Actively involve the learners in making |  |
|  | *(200-2000)* | decisions, playing roles and adopting attitudes. |  |
|  |  | Simulators allow instructors to progress from |  |
|  |  | simple to complex scenarios. |  |
|  |  | The operation of certain equipment or |  |
|  |  | scenarios may lead to environmental damage |  |
|  |  | and could therefore be constrained in time and |  |
|  |  | realism. In such cases the only way in which |  |
|  |  | practise may be allowed is by simulators. |  |

**Disadvantages** Can be expensive.



Requires instructor to brief, monitor, and debrief for learning transfer to occur. Assessments tend to be subject, relying on the experience of the instructor.

Must be well designed to ensure maximum benefits both intellectually and emotionally. Requires careful project management to ensure that only required learning outcomes are provided.

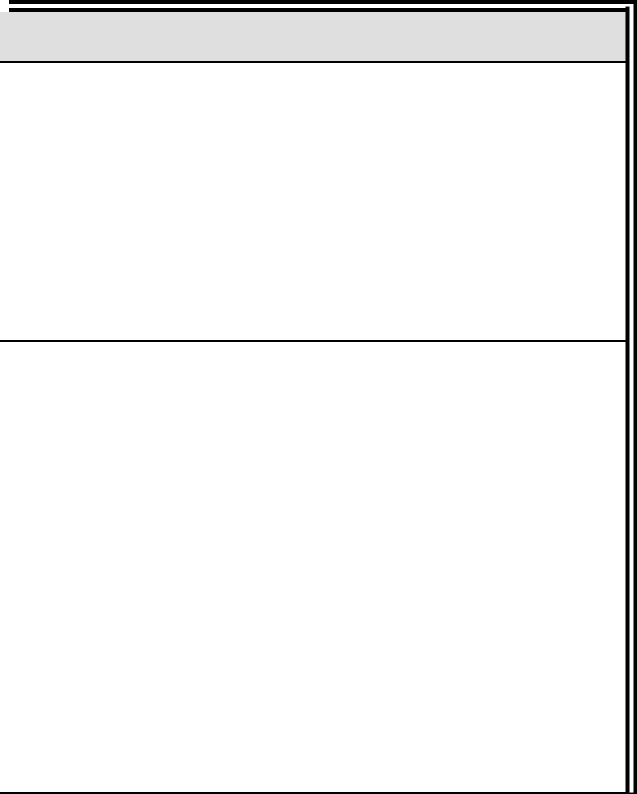
Requirements likely to be over specified. New software must be developed each time a change is made to operational equipment.

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|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | **Media** | **Advantages** |  |
|  | *Smartboard* | Professional look |  |
|  |  | Good for motor skills when used with photo |  |
|  | *PC driven interactive white board* | realistic software |  |
|  | *combining audio-visual support* | Puts instructor in front of the class. |  |
|  | *with an instructor. It allows the* | Can record actions and display for later use or |  |
|  | *user to drive software via a touch* | demonstrations. |  |
|  | *screen.* |  |  |
|  |  |  |  |
|  | *Stimulated GFE* | High fidelity |  |
|  |  | Key inputs generated without the need of live |  |
|  | *Controlled inputs directly to a* | inputs. |  |
|  | *piece of equipment that has been* | Cues can be programmed in increasing |  |
|  | *embedded in the training system,* | complexity. |  |
|  | *thus allowing it to be used as a* | Cheaper than simulation over long term. |  |
|  | *simulator. Stimulation is most* | Ability to freeze and reset features. |  |
|  | *effective when a large or complex* | Most effective when a large or complex |  |
|  | *function needed for training can* | function needed for training can be totally |  |
|  | *be totally provided by the* | provided by the embedded special purpose |  |
|  | *embedded special purpose* | computer and its internal software |  |
|  | *computer and its internal* |  |  |
|  | *software.* |  |  |

**Disadvantages**

****

Expensive

Instructor may mask some of the presentation when using the touch screen. Rear projection units are slicker, but more expensive.

Can dominate classroom.

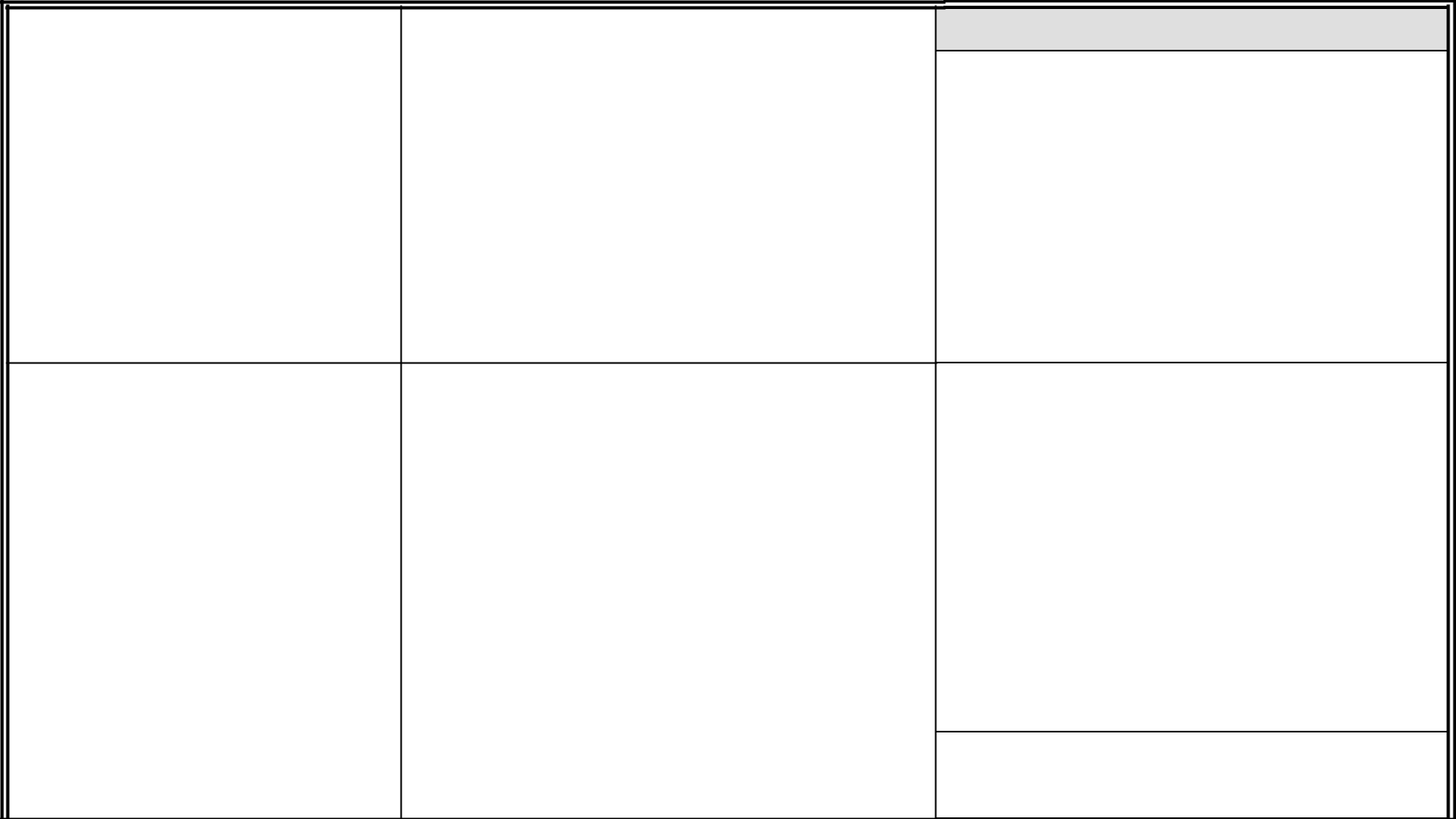
Front projection units are masked by the instructor

High up front costs.

May require changes as operational equipment develops.

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Media** |  | **Advantages** |  |
|  | *Video* |  | High visual fidelity. |  |
|  |  |  | Provides movement, colour, brings |  |
|  | *Development hours per hour (50-* events/demonstration into classroom that | | |  |
|  | *500)* |  | would be difficult and expensive to repeat. |  |
|  |  |  | Can be used for attitudinal training (Alcohol & |  |
|  |  |  | drug education, Equal Opportunities, safety). |  |
|  |  |  | Time saving substitute for field trips. |  |

|  |  |
| --- | --- |
| *Virtual Reality* | Allows visualisation and training on |
|  | equipment’s and platforms that do not yet |
| *Simulation of dynamic information* | exist. |
| *and the immediate work* | Material may already be in existence from |
| *environment, possibly including* | CAD drawings. |
| *sight, sound, smell and touch* | Can use cues to enhance trainee performance. |
| *simultaneously. VR technology* |  |
| *typically involves using powerful* |  |
| *computers. Commonly seen in* |  |
| *helmet mounted displays.* |  |
| *Development hours per hour* |  |
| *(200-2000)* |  |
| *Wall Charts* | Useful for showing complete electrical and |
|  | mechanical systems. |

**Disadvantages**

Can be costly to produce and up-date.

Can become quickly dated and loose of

credibility (c.f. Open University).

Passive, requires instructor present to be

effective, followed up by questioning to check

understanding.

Trainee passiveness.

Equipment requirement.

Requires supplemental methods.

Can become dated.

Copyright laws.

Cost of hardware, software and development.

‘VR sickness’, visual lag in eye and/or head track systems.

Technology now maturing requires very careful targeting. Long development time. Typical update rate of 20-30 frames per second required, trade off is lack of detail. No standards for hardware and software when applying VR technology to training.

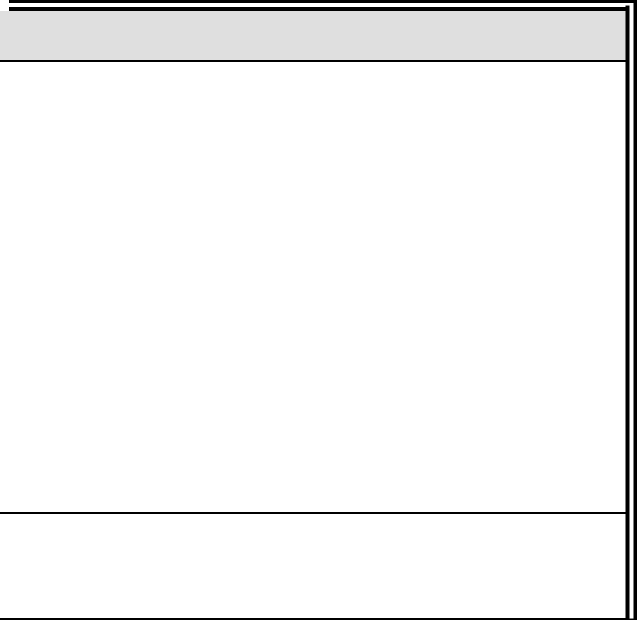
Preparation is time consuming and expensive if produced commercially. Not easy to amend.

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|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | **Media** | **Advantages** |  |
|  | *Web Based Training* | Lots of COTS packages. |  |
|  |  | Ability to access anywhere, anytime. |  |
|  | *CBT delivered over the Internet or* | Can be hosted on LAN, local intranet or the |  |
|  | *an Intranet, often via a Learning* | Internet. Flexible. |  |
|  | *Management System. The usual* | Good for stable course content. |  |
|  | *meaning of the term ‘e-Learning’* |  |  |
|  | *when used by industry.* |  |  |
|  | *Synonymous with On-Line* |  |  |
|  | *Learning.* |  |  |
|  | *Development hours per hour (50-* |  |  |
|  | *500)* |  |  |
|  |  |  |  |
|  | *White/Chalk Board* | Can be seen by whole class. |  |
|  |  |  |  |

**Disadvantages**

****

Can be costly to provide a good bespoke product.

Many COTS packages are educational. Need to consider security risks (especially if using INTERNET).

Requires careful use and planning. Can become a scribbling pad. Not to be used in TBT environment.

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**ANNEX D TO**

**SECTION 5**

**METHOD/MEDIA SELECTION GUIDE**

1. Two questions generally come up sometime during the process of developing a program of instruction that are often difficult to answer. These questions are: “What method should I use?” and “What media should I use?” Both of these questions pose problems in that definite and precise answers don’t really exist. A response that is sometimes used to answer either of these questions is: “Use the one that works best.” Unfortunately, the one that “works best” is not always easy to identify. What follows is a guide to help in your method and media selection process. It should be noted that this guide is not to be used to identify training solutions for projects over the value of £100K where a full Training Needs Analysis must be carried out.
2. Method and media selection problems can be eased by proper placement of the decision process in the program-development cycle. Many times we are tempted to make the selection far too soon. When methods and media selection is made too early, we lack solid ground on which to make the decision. What follows in that case is a somewhat arbitrarily picked method/media that then limits instructor effectiveness. Our training objectives are often formulated around the strengths and constraints of the method and media we have decided upon. Placing the method/media selection process after the formulation of the objectives will help the program-development effort in two ways. First it will enable us to write training objectives that are not influenced by the method/media characteristics – which should produce objectives more closely linked to what it is we require the trainees to be able to do. Secondly, once we have established the objectives we have identified specific future competencies. This is valuable input information in the method/media decision process. It becomes apparent that certain competencies can be taught well by some methods and not so well by others.
3. Although training objectives clearly define learning outcomes, the kind of learning demanded of the trainee to perform each objective needs to be specified before meaningful methods and media can be identified. This will be identified during the KSA Analysis phase of Training Design where the learning required will result in a change in one or more of the following areas; knowledge, mental skills, physical skills or attitude. The four method and media flow charts that follow depict considerations essential in method/media selection. Each chart can be used in isolation so long as the strengths and limitations of each chart are known by the user. In addition, a simple pair-wise analysis technique is described.
4. Whatever chart is used, you are required to apply some degree of judgement and consider the appropriateness of the solution offered. The intent of flow diagram in this chapter is to guide your method/media selection process by emphasising the relationship of method/media to course objectives and requires student/trainee performance. At its best, any approach to method/media selection is imprecise and any selection must be compatible with your organisation’s training strategy and available resources.

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**Example 1**: Developed from Training Media Section RNSETT for TBT. This model attempts to simplify the selection process ignoring tasks that are mainly attitudinal training.

Strengths: Simple, easy to use.

Weaknesses: Does not consider attitudinal training. Mixes methods with media.

**Example 2**: Adapted from Article by D. Clark www.nwlink.com

Developed to lead user through major media directions. Described as a guide to that shows the various options for communicating and transferring learning objectives.

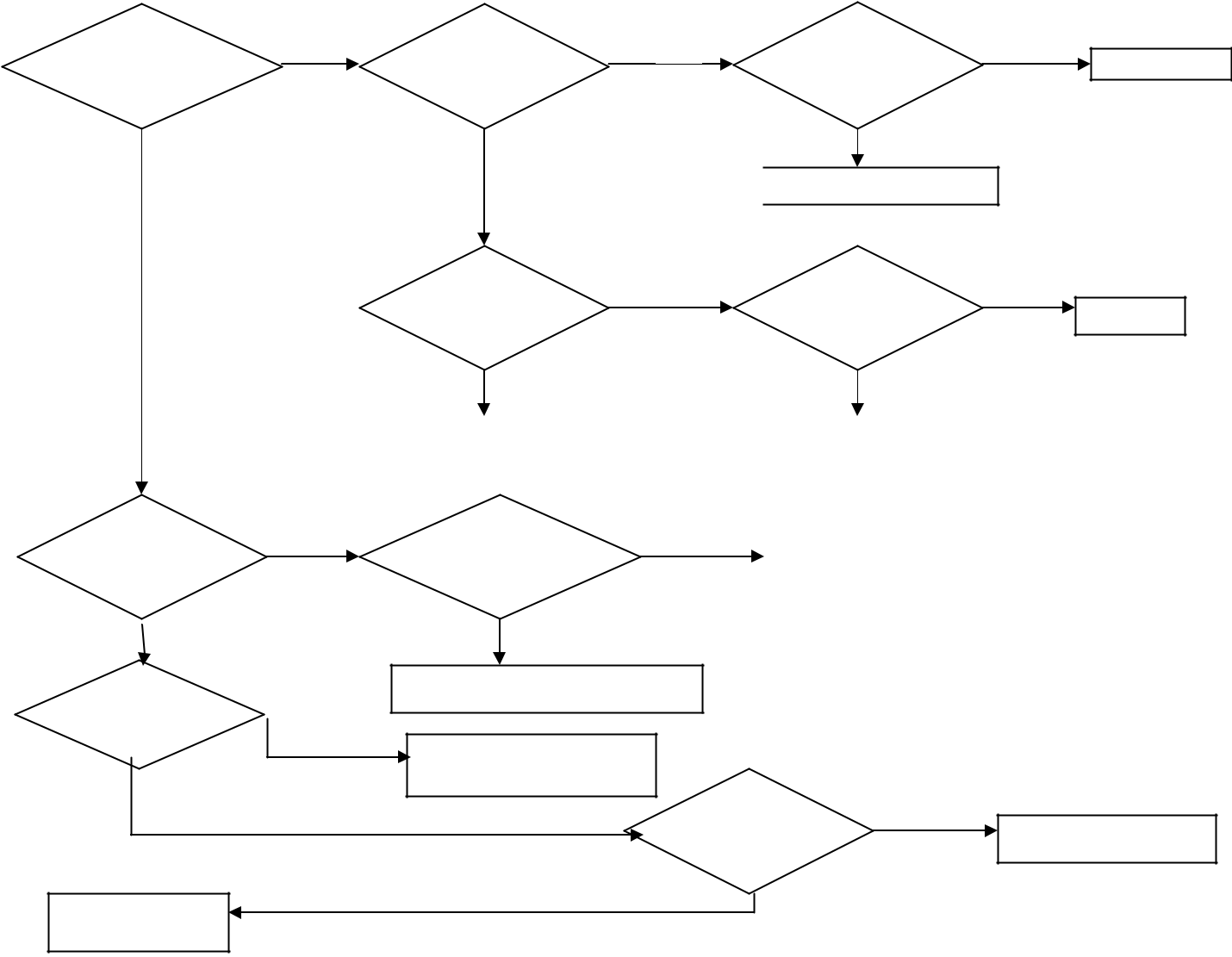
Strengths: Considers learners needs and resources combining both at task and subject level. Easy-to-follow. Solutions are pragmatic and sensible.

Weaknesses: Too broad, over simplified.

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**Basic Media Selection Tool (Example 1)**

****

Psychomotor

Skills?

Yes

Movement

required?

Yes

Team

training?

Yes

Consider High

Fidelity simulation

No

No

No

Self No Multi-media?

paced?

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Yes |  |  |  |  |  | Yes |  | |
|  |  |  | Consider lecture with CAI | | | | |
|  |  |  |  |
| Auto | No |  |  |  | Moving | | | |
|  |  |  |
|  |  |  |  |
| assessment |  |  |  |  | Image? | | | |
| ? |  |  |  |  |  |  |  |  |
| Yes |  |  |  |  |  | Yes | | |
|  |  |  |  |  |  |  |  |  |
| CBT/ Multimedia |  |  |  |  |  |  |  |  |
|  |  |  |  | Video | |  |  |
| High physical |  | No |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  | Part task trainer | | |  |
|  |  |  |  |  |
| fidelity? |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Yes

Consider Mock up/ real thing

Procedures trainer on

motion base

Simulation

affordable?

No

Yes

No

Lecture

No

Print

Consider real equipment

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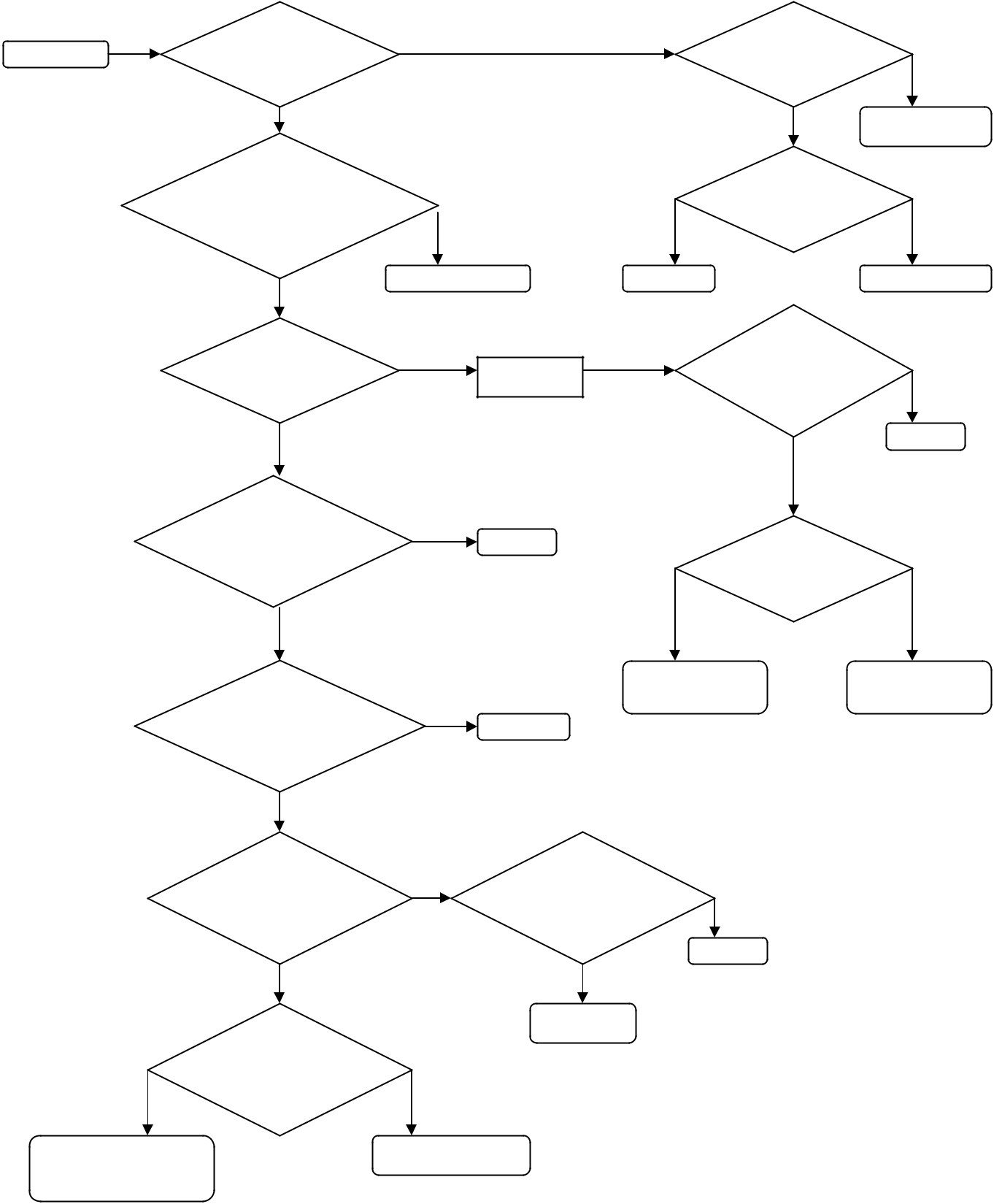
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**Methods and Media Tool (Example 2)**

Based upon An article by Don Clark (www.nwlink.com)



Need

Is training needed

immediately?

No

Is task performed

infrequently & can it be

performed from reading a

manual, flowchart?

No

Must the

training be

No

Can the task be

learned at the

location it will be

performed at?

No

Yes

Yes

Job Performance Aid

Yes

Classroom

Yes

OJT

|  |  |
| --- | --- |
| **Small group that** |  |
| **your department** |  |
| **can handle?** | Yes |
|  |
| No | One to one or small |
| group coaching |
|  |
| **Does the training** |  |
| **require hands on** |  |
| **coaching?** |  |
| Yes | No |
| Boot camp | Telecommunications |
| **Do you have** |  |
| **staffing and SMEs** |  |
| **to develop the** | No |
| **training?** |
|  | Vendor |
| Yes |  |

**Is deep learning**

**required?**

No

Yes

**Is this developmental**

**and can it be**

**performed over a 6**

**month to 12 month**

No

Active or experimental Passive learning, such

training as lectures or video

Yes

Mentoring

No

Other forms of self study such as text instruction or task book

**Will the training be used for an extended period of time?**

No

**Must the lessons score at least 90% on a proficiency test?**

Yes

Yes

Personalised system of instruction

**Do the learners and**

**trainers need to**

**interact, such as** No

**through e-mail?**

CBT

Yes

Web based

training

|  |  |
| --- | --- |
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**PAIRWISE ANALYSIS**

This is a very simple way of comparing each method/media with every other. For each EO, list each method or media along the top & side of a grid. In the example below, A,B & C equate to different methods/media eg lecture, CBT, video.

Pairwise Analysis

|  |  |  |
| --- | --- | --- |
| A | B | C |

1. X
2. X

|  |  |
| --- | --- |
| C | X |
|  |  |

Methods & Media

The process is rather like a Football League where every option plays every other option once. Each method or media is compared with each other. Thus when A is compared to B, B is considered superior. When A is compared to C, C is considered superior. All the As are totalled, as are the Bs & Cs. The highest score wins. In the example, B is considered the best option.

Pairwise Analysis

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | B | C |
|  |  |  |  |
| A | X | B | A |
|  |  |  |  |
| B | B | X | B |
|  |  |  |  |
| C | A | B | X |
|  |  |  |  |
|  | A=2 B=4 C=0 | |  |

Methods & Media

All factors that will affect training should be considered, i.e. Availability, Safety, Fidelity, as well as what KSAs you are trying to get across.

|  |  |
| --- | --- |
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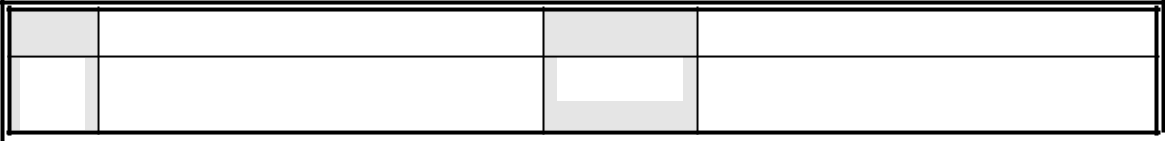
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**ANNEX E TO**

**SECTION 5**

**METHODS & MEDIA WORKSHEET**

**1.** **Job Details** (from job scalar)



**Job:**

**Task**

**:**

**Duty:**

**Sub-task:**

1. **Training Objective** (from TPS)

 **TO:**

**3.** **Enabling Objective** (state EO from KSA analysis. State primary learning domain and hierachy level)

**Enabling Objective**

**Learning Domain**

1. **Trainee Characteristics** (from early training analysis)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  | **Rank/Rate:** | |  | **Specialisation:** |  |  |
|  | **Numbers:** |  |  | **Typical learning** |  |  |
|  |  |  |  |  |
|  |  |  |  | **style:** |  |  |
|  | **Previous Experience:** | | |  |  |  |
|  |  |  |  |
|  | **Previous Training:** | | |  |  |  |
|  |  |  |  |
|  |  |  |  |  |  |  |

1. **Training Methods** (select training method(s) in order of suitability for EOs using the Methods and Media flowchart and Annex B to Section 5 of handbook)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  | **Training Method** | **Selection** | **Justification** (link each method to EO domain in para 3 and explain its |  |
|  |  |  | selection) |  |
|  | Lecture |  |  |  |
|  |  |  |  |  |
|  | Discussion |  |  |  |
|  |  |  |  |  |
|  | Seminar |  |  |  |
|  |  |  |  |  |
|  | Demonstration |  |  |  |
|  |  |  |  |  |
|  | Lesson (theory) |  |  |  |
|  |  |  |  |  |
|  | Case Study / Field |  |  |  |
|  | Trip |  |  |  |
|  |  |  |  |  |
|  | Role Play |  |  |  |
|  |  |  |  |  |
|  | Simulation |  |  |  |
|  | (exercises) |  |  |  |
|  |  |  |  |  |
|  | Lesson (practical) |  |  |  |
|  |  |  |  |  |
|  | CBT |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

|  |  |
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Self study (distance

learning)

1. **Use of Senses** (required for the EO; rank each sense in order of applicability and importance to EO)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  | **Sight:** |  | **Hearing:** |  |  |
|  | **Touch/Movement:** |  | **Smell:** |  |  |
|  |  |  |  |
|  |  |  |  |  |  |

1. **Training Media** (select training media in order of suitability for EO using the Methods and Media flowchart and Annex C to Section 5 of handbook)

|  |  |  |
| --- | --- | --- |
| **Training Media** | **Selection** | **Justification** (link each media to EO domain(s) in para 3; explain its |
|  |  | selection by cost, audience, domain and senses used) |
|  |  |  |

CCTV/TV

Video

Projected Visuals

35 mm slides/ OHP/

Powerpoint

Models

Chalk/White board

Wall charts

CBT/VR

Handouts/Print

Operational

equipment

Simulators

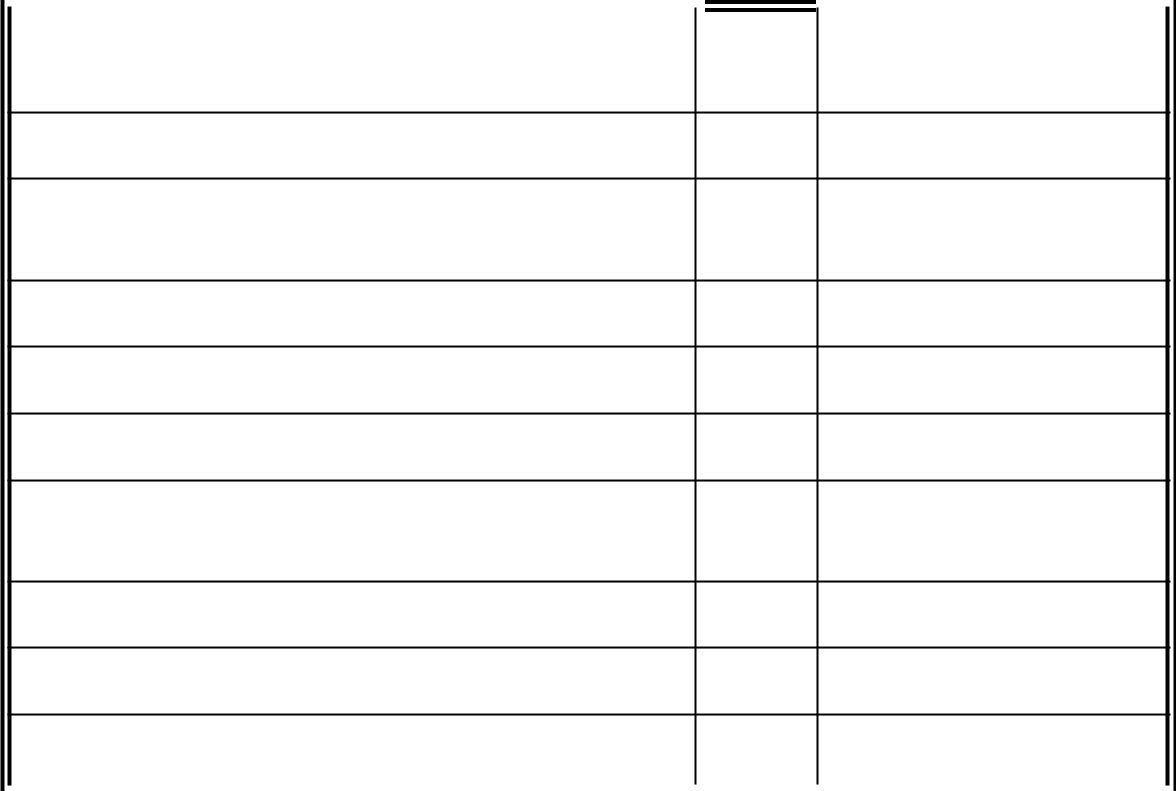
1. **Media Selection** (state the media selected for group and individual training)

**Group Training:**

**Individual Training:**

|  |  |
| --- | --- |
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|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | **ANNEX F TO** |  |  |
|  |  |  | **METHODS & MEDIA CHECKLIST** | | | | **SECTION 5** |  |  |
|  |  |  |  |  |  |
|  |  | **Methods** |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  | **Criteria** | | **Yes/** |  |  | **Notes** |  |  |
|  |  |  |  | **No** |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |



Job, duty, task & sub-task statements are listed

Numbering system & statements taken directly

from job scalar

Training objective listed

Enabling objective(s) listed

Domain of each enabling objective is identified

Trainee characteristics are based on training

analysis profile

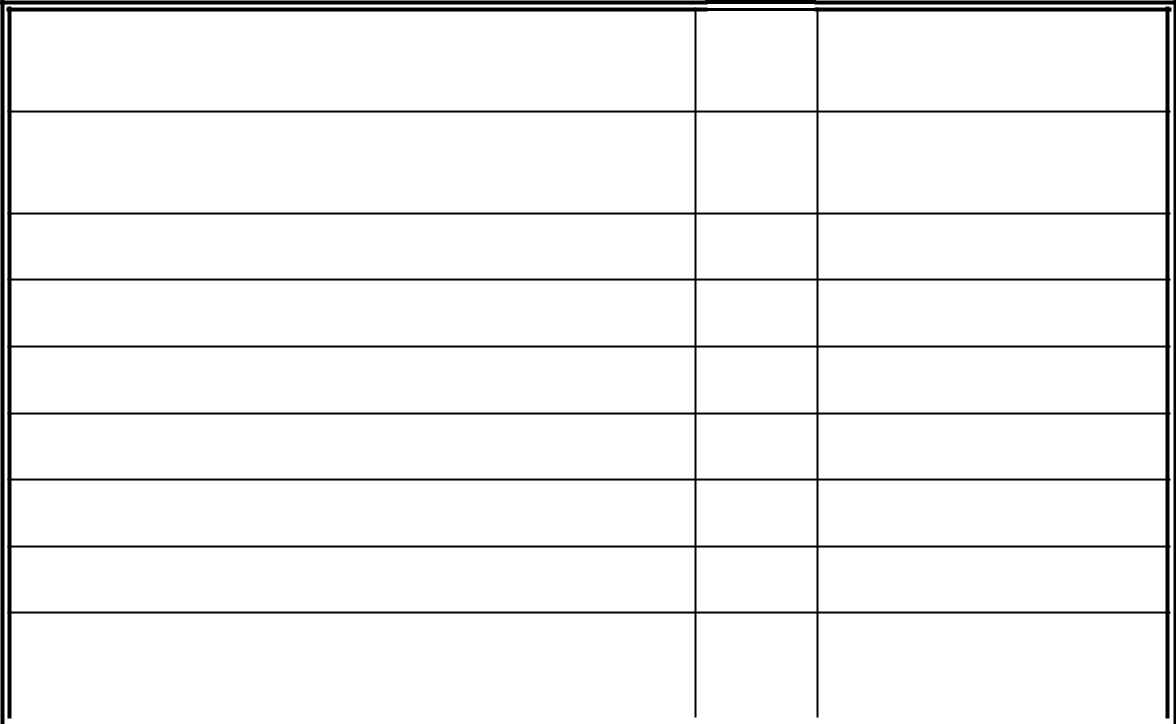
Suitable training method(s) identified

Each method has been analysed

Each method selected has been justified



**Media**

****

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **Yes/** |  | **Notes** |
|  | **No** |  |  |
|  |  |  |  |

Senses used are ranked in order of applicability and importance

Suitable range of training media are identified

Each medium has been analysed

Each medium selected has been justified

Media is appropriate to learning outcomes (KSA)

You have an audit trail for media selection.

Media appropriate to desired level of fidelity.

The media selected are compatible with the

method(s) to be used



|  |  |
| --- | --- |
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**SECTION 6 - INSTRUCTIONAL SPECIFICATION**

**INTRODUCTION**

6.1 **Background**. A fundamental part of any training system is training execution, i.e. the actual instruction delivered to trainees. Any instruction that takes place should be based on the result of all the previous analysis and design. A document is needed therefore to ensure all these aspects are brought together into an effective lesson plan. The document that performs this role in the DSAT is the Instructional Specification (ISpec). The ISpec is the document from which the lesson must be delivered and provides instructors with the information needed to deliver training. ISpecs define the content, structure and sequence of instruction. Approved and in-date ISpecs are to be used by all instructors.

**6.2** **Scope.** This chapter will cover the following topics related to ISpecs.

1. Purpose.
2. Content.
3. Compiling an ISpec.
4. Management of ISpecs.

**PURPOSE**

6.3 The main purpose of the ISpec is to control the execution of training, i.e. what is taught and how it is taught. The use of such a document has a number of benefits:

1. It ensures the material taught is based on the Training Objectives (TO) and therefore assists trainees in the achievement of the TO.
2. It provides instructors with details of suitable methods and media, so the material is delivered in an effective manner.
3. It helps ensure consistency between instructors and different courses.
4. It saves instructors preparation time because they have a comprehensive document that should be easily used, even by new staff.

**CONTENT**

6.4 The content of an ISpec must be comprehensive, in order to be a useful tool and fulfil its purpose. The minimum content is laid down15 but different training locations may adopt variations of format, though within establishments the format should be the same. There are elements of content that should be common to all ISpecs. All ISpecs should be compiled in 2 main sections:

1. Section 5.27 to DTSM1 dated 11 May 04.

|  |  |
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1. Section 1 - Administration.
2. Section 2 - Execution.

**SECTION A - ADMINISTRATION**

6.5 This section outlines the administrative details of the course under the following headings:

* Course Details (title, number)
* TO performance & EO performance conditions & standards.
* Key Learning Points
* Duration of lesson
* Lesson venue(s)/location(s)
* Resources required (equipment, documentation and references)
* Associated assessment
* Lesson specific H&S, Environmental Protection and all Risk Assessment references and titles.
* Issue No. and Review details.

6. 6 As this section lists all the essential details of the lesson, including a summary of the structure through listing the Key Learning Points (KLPs), it can also be used by management as a record sheet of the lesson.

**SECTION B - EXECUTION**

6.7 There are 3 parts to the execution section:

1. Introduction.
2. Development.
3. Consolidation.

6.8 **Introduction.** The introduction has 6 different elements:

**I**nterest

**N**eed

**T**itle

**R**ange

**O**bjective

Safety Brief – to include reference to all Risk Assessments

6.9 The **INTRO** formula provides the instructor with an easy to use structure and sets the scene for the trainees.

6.10 **Development.** This is the most important part of the whole ISpec, because it deals with the material to be taught and includes the structure of the main body of the

|  |  |
| --- | --- |
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lesson via the sequencing and development of Teaching Points. It should include all essential information on content, with reference to the use of any methods, media and teaching activity. All the material delivered is based on 2 factors:

1. **The Enabling Objective.** Where possible**,** each ISpec should be based on an Enabling Objective (EO), which contributes to the main TO. However, there may be instances where more than one EO is covered within one ISpec where the material is very closely related and should therefore be taught as an integrated whole. An ISpec may also cover more than one instructional period.
2. **Key Learning Points (KLPs).** The material required to achieve the EO is broken down into a number of relevant KLPs. The KLPs provide a sequenced framework for the development of the lesson. Each KLP is a block of information and should tell the instructor the following:
   1. What information should be covered and the points to emphasise.
   2. When and how to use the selected methods and media.
   3. How to conduct specific activities or exercises.

6.11 **Consolidation.** Similar to the introduction, the consolidation has 5 different elements, which provides the instructor with guidance on the following:

1. How to summarise the lesson.
2. What technique to use to confirm achievement of the EO – assessment.
3. Checking for further questions.
4. Clarifying any links to other lessons.
5. Providing any references for the lesson, e.g. the relevant handbook chapter.

**COMPILING AN ISPEC**

6.12 As previously stated, ISpecs are the result of extensive analysis and design. Therefore, in order to compile an effective ISpec, there is a need to refer to other documentation. The following should be used to assist:

1. The Training Performance Statement (TPS).
2. The KSA Analysis.
3. The Method and Media Analysis.
4. The Assessment Spec.

|  |  |
| --- | --- |
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e. OPS Trg Categories.

6.13 Each of these provides an important input to the ISpec and are discussed more fully below.

**TRAINING PERFORMANCE STATEMENT**

6.14 The TPS is obviously the source of the main TO, to which all EOs and KLPs should contribute. The TPS also provides the following information:

1. The general conditions the training environment should be trying to achieve.
2. The standard of performance required from the trainees. This will strongly influence how much the subject needs to taught and how trainees will be tested.

**KSA ANALYSIS**

6.15 The information on the KSA Analysis sheets provides the lesson content, because it gives the detailed breakdown of what needs to be taught. From the sheets the following are selected:

1. The EO for the lesson(s).
2. The associated KLPs, which are drawn from the knowledge, skills and attitude columns.

**METHOD AND MEDIA**

6.16 The methods and media analysis provides information on the best way to achieve / teach the material. The “how to do it” is then included on the ISpec, to guide the instructor and to ensure effective and appropriate techniques are being used, e.g. a practical lesson for a practical EO.

**SUBJECT MATTER EXPERTISE**

6.17 Another element that assists the production of good ISpecs is the subject matter expert (SME). Whenever possible, a SME should be used to compile an ISpec or be available to provide valuable advice and input. The SME will have essential information about the “big picture” and also the detail required at KLP level.

**ASSESSMENT SPEC**

6.18 The assessment spec will give guidance on the elements of the ISpec that relate to assessment.

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**OPS TRG CATEGORIES**

6.19 The OPS Trg Categories are derived from the DIF Analysis and the Early Trg Analysis. As such, they will give guidance to instructional designers on the level of emphasis and priority accorded to different subject areas.

6.20 The main components that contribute to any ISpec can be summarised in the diagram below:

**KSA**

**ANALYSIS**

**SME**

**→**

****

**TPS**

**↓**

**ISPEC**

****

**OPS TRG CATEGORIES**

* **METHODS & MEDIA**

****

**Assessment**

**Spec**

6.21 A suggested procedure for writing ISpecs is summarised in the table below:

|  |  |  |  |
| --- | --- | --- | --- |
| **ACTION** | **TOOLS** |  | **COMMENTS** |
|  |
| Select the EO(s) for the | **KSA Analysis sheet** | Lessons may have more | |
| lesson |  | than 1 EO. EOs may | |
|  |  | require more than 1 lesson | |
|  |  | to cover. | |
|  |  | Use the KSA Analysis | |
|  |  | sheet in the following order | |
|  |  | to find EO: | |
|  |  | • | knowledge column |
|  |  | • | mental and physical |
|  |  | • | skills columns |
|  |  | attitude column |
|  |  | • | individual task elements |
|  |  | • the sub-task | |
| Select the KLPs for the EO | KSA Analysis sheet |  |  |
| Place the KLPs in a logical | Instructional Scalar |  |  |
| sequence |  |  |  |
| Conduct M & M analysis | M & M worksheet | Trg Categories will give | |
| on the EO | OPS Trg Categories | guidance on amount of | |
|  |  | emphasis to be placed and | |
|  |  | thus M&M to be employed | |
| Write the development | KLPs | Compile each KLP in | |
| part of the ISpec | SME | sequence building in all | |
|  | **TPS - conditions** | the necessary information. | |
|  | - standards | Trg Categories will give | |
|  | OPS Trg Categories | guidance on amount of | |
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emphasis to be placed

during instruction

6.22 The completed ISpec can be assessed against the criteria listed on the ISpec checklist at Annex A.

**MANAGEMENT OF ISPECS**

6.23 A system is required in all training organisations to ensure ISpecs are controlled and managed. This is necessary for the following reasons:

1. There is a recognised amendment procedure, to avoid unauthorised, incorrect changes.
2. The correct issue of an ISpec is being used in the classroom.
3. A record is kept of the current amendment state.

6.24 If a system is not in place, there is a risk of losing control of what is taught. Inconsistency develops and trainees may fail to achieve the EOs, TOs and consequently the TPS. This would be a major failing on the part of the training organisation and could effect the overall operational capability.

Annex:

1. ISpec Checklist.

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**ISPEC CHECKLIST**

**Section A: Administration**

Criteria

Course, module & lesson title, training objective

Enabling objectives with conditions and standards

Admin (time, location, lesson references) is specified

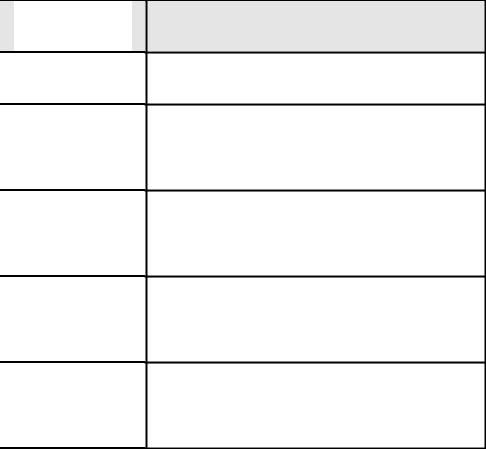
Support (handouts, exercises, equipment, preparation) specified

Key Learning Points listed in sequence providing a lesson summary

**ANNEX A TO**

**SECTION 6**

Yes/No Notes



**Section B: Execution (Part 1 - Introduction)**

**Criteria**

**I**nterest effectively stated

**N**eed for the lesson effectively stated

**T**itle of the lesson is stated

**R**ange (Q&A, questions, notes, visual aids, range) is stated

**O**bjective(s) (enabling) for the lesson are stated

Safety Brief including reference to Risk Assessments

**Section B: Execution (Part 2 - Development)**

**Criteria**

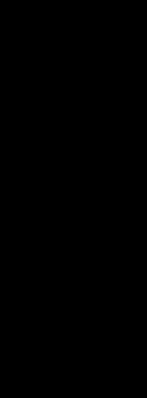
Teaching points are listed & numbered to structure the lesson

Method is stated & a framework is provided for each key point

Media is stated & a framework is provided for each key point

Notes are provided to conduct & debrief activities

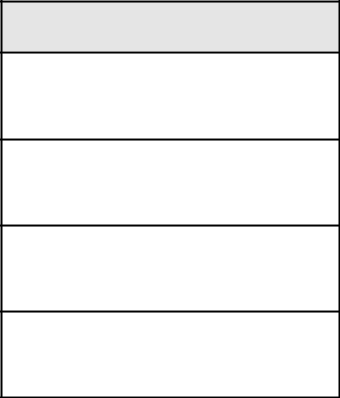
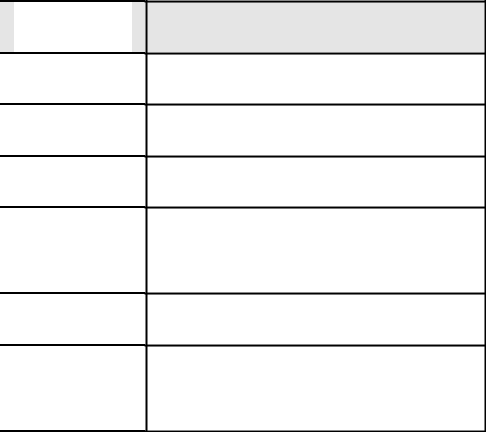
**Yes/No**

****

**Yes/No**

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**Notes**

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**Notes**

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**Section B: Execution (Part 3 - Consolidation)**

**Criteria**

Statement on how enabling objectives to be assessed & achieved

Statement on how to deal with student questions

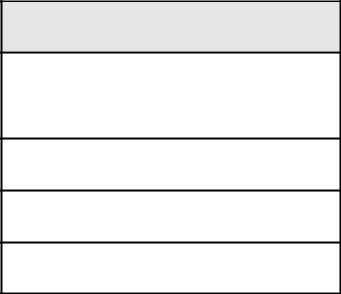
Link to the next session stated

Lesson references stated

**Yes/No**

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**Notes**

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**SECTION 7 – PILOTING INSTRUCTION**

**INTRODUCTION**

7.1 **Background.** The DSAT provides a comprehensive system for analysing and designing training courses. Despite this, it would be unwise to assume the first course will run completely smoothly without any problems. To help identify these problems early, a pilot course is conducted.

7.2 **Scope.** This chapter will cover the following topics related to pilot courses:

1. Purpose.
2. Planning Requirements.
3. Data Collection.
4. Data Analysis.
5. Responsibilities.

**DEFINITION**

7.3 A pilot course is defined as the first delivery of a newly designed course under ‘realistic’ conditions.

**PURPOSE**

7.4 The aim of piloting instruction is to establish how well the following perform when used for real with actual trainees:

a. The course documentation.

b. The course materials.

c. The course programme.

7.5 The purpose is not only to prove what works but also to highlight problem areas so they can be evaluated and revised. Checking the course in this manner will ensure it is both efficient and effective and, therefore, meets the requirement.

**PLANNING REQUIREMENTS**

7.6 The course documentation will have been developed using the analysis and design tools of the DSAT. Within a Defence Training Establishment (DTE), the Course Development Cell (CDC) is responsible for the documentation and the overall co-ordination of the pilot course. They will be responsible for liaising with all the interested departments to obtain answers to the following questions:

a. When will the pilot course be conducted?

b. Which trainees will be on the course?

c. Which instructors will be used?

d. How much time is required?

e. Are all the resources available and allocated?

f. What revisions can be made during the course, i.e. what alternatives are

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available?

7.7 Ideally, there should be 3 stages to the pilot:

1. **One-to-One Trial**. The designer conducts an initial assessment of the instructional material, using 1-3 SMEs as ‘guinea pigs’.
2. **Small Group Trial**. 6-12 persons, who are representative of the intended student group, undertake the instruction together as a class. The designer observes closely and frequently gathers student and instructor opinions by questionnaires and interviews.
3. **Field Trial**. The first ‘production’ course, fully staffed, with genuine students and all the allocated training resources and admin support. The designer (with assistance) monitors 100% of the training.

7.8 In practice, resources rarely permit the full application of one-to-one and small group trials, and courses tend to commence with a field trial. Nonetheless, these procedures should be applied to test and revise at least those portions of a course that involve high cost methods and media, such as video or CBT.

7.9 Because the CDC in a DTE manage the pilot course and co-ordinate the activities, they must ensure all the key players are briefed and aware of their responsibilities.

7.10 Another planning consideration is safeguarding the interests of the trainees. What can be done to try and avoid any shortcomings in their training because they are on a pilot course? The following actions should be considered:

a. Trialling parts or all of the course materials on individuals or other groups before the course, e.g. a particular demonstration to ensure it works and how much time it takes.

b. Allocate additional time to the pilot course to allow for changes and revisions.

c. Adopt intensive Internal Validation procedures during the course, so problems are identified early and where possible rectified.

**DATA COLLECTION**

7.11 A major activity during the course will be data collection. A comprehensive system of obtaining feedback is the only way of interpreting what is happening on the course. The designer should make use of 3 data collection techniques to gather the following information:

1. By observation of instructional lessons:
   * Time used.
   * Instructional items requiring clarification.
   * Items causing student hesitation.
   * Items drawing incorrect student responses.
2. Noted by individual students during sessions:

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* + Omissions of content.
  + Difficulties with concept.
  + Difficulties with sequence.
  + Typographical or spelling errors in text & PPT.
  + Inadequate graphic or visual presentations.
  + Unclear directions.

c. From interviews with students and instructors after sessions:

* + Level of interest
  + Level of difficulty.
  + Level of understanding of objective or teaching points.
  + Potentially irrelevant material.
  + Sufficiency of student practice.
  + Adequacy of feedback to the student.
  + Detail and clarity of directions.
  + Particular learning problems.
  + Suitability of visual aids.
  + Suitability of tests.
  + Likes and dislikes.
  + Student confidence.
  + Course admin.
  + Recommended changes.

7.12 Additional questions relating to data collection might be:

a. What data is required before the course, e.g. trainee entry level or instructor’s background?

b. What methods will be used, e.g. daily questionnaires, Post Course Discussions etc?

c. Who will collect the data?

d. How often will data be collected?

e. What statistical methods or supporting software is required?

7.13 It is vitally important that the methods designed and chosen provide appropriate data that can be evaluated and be used successfully to assess the course.

**DATA ANALYSIS**

7.14 All data collected has to be analysed, to determine what conclusions may be drawn, to determine their importance and what implications they may have. The result of this process is a list of realistic recommendations, supported by the data. The data analysis for the pilot course must consider the following points:

a. How will the data be analysed, e.g. using statistical methods on test results?

b. How often will the data be analysed during the course and recommendations provided?

c. How will the data be presented, e.g. bar charts, summary tables etc?

d. Who will be involved in the analysis and final recommendations?

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7.15 The results of data analysis should be compiled as a report and submitted to management for approval and action.

**RESPONSIBILITIES**

7.16 There are 5 key players involved in the pilot course:

1. Training Management.
2. Instructional Design.
3. Internal Validation.
4. Instructors.
5. The Trainees.

7. 17 Each has distinct responsibilities, but few are mutually exclusive. The success of the pilot course relies heavily on a joint approach to achieve all the tasks. Many activities rely on input from more than one player.

7.18 Clearly, feedback from InVal will result in changes to the course during its lifetime. It must be made explicit who is responsible for implementing these changes and maintaining the course.

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