

Design Principles

Developing efficient and effective communication



Communication media

- Instructional resources (Handouts, Worksheets, Posters, OHPs, etc)
- Displays
- Presentation tools (PPP, Flash)
- Web Design



Design process for Communication artefacts

1. Learner Needs
2. Conceptual design
3. Structural design
4. Metaphorical design
5. Navigational design
6. Visual design



Learner needs analysis

Does learner need to acquire knowledge or skills, participate or contribute in tasks related to a domain, technology or the community?

	Domain	Technology	Community
Acquire			
Participate			
Contribute			



Learner Needs

- Acquire knowledge and Skills (play, download, search, read, view, listen, buy)
- Participate in knowledge sharing and building (Imitate: Communicate: Chat, Rate, Comment, Message; Share: Send Upload, Publish).
- Contribute to knowledge development (Facilitate: Recommend, Channel, Tag, Subscribe, Filter, mentor; Create: Customise, Design, Produce, Contribute, Program, model, evaluate.)



Conceptual Design

Definition of content elements required in communication artefact (CA) in order to meet user needs through efficient information exchange



Content is THE Problem

- Mistake 1: Media design is about the interface, and that content is what's added on later, or else it's "the user's problem".
- Mistake 2: the content must be changed to fit the way the CA was designed.
- Designing for the content should be the designer's problem and focus, because content is the key to success.
- Remember the purpose of design: **To enable communication between the user and the content.**
- Content is what it's all about.
- It's content that makes a medium work, flow and communicate well with the right tone. That makes it the designer's problem, because effective communication is the problem.
- Maximise a CA's effectiveness by understanding how users will interact with its content.

Determining learning objectives behind content design

- Write learning goal.
- Determine the types of learning of the goal
- Conducting an information-processing analysis of that goal.
- Conducting a prerequisite analysis and determining the type of learning of the prerequisites.
- Writing performance objectives for the learning goal and each of the prerequisites

Writing learning goal

- Include statements of what learners should be able to do at the end of learning experience.
- State in *performance terms* (the *doing* not the *knowing*) what observable things learners must be able to do, to show they have learned.
- Determine *what* to teach not the *how*.
- Refine by a reflective process of answering questions about the problem or need being considered, improving statement clarity, or resource availability

Refining Learning goal

- Write down the learning goal.
- Generate a list of all the behaviours the learners should perform to demonstrate that they have achieved the goal.
- Analyse the expanded list of behaviours and select those that best reflect achievement of the goal.
- Incorporate the selected behaviours into a statement or statements that describe what the learners will demonstrate.
- Examine the revised goal statement and judge whether learners who demonstrate the behaviours will have accomplished the initial broad goal.

Analysing learning goal

- Read and gather as much information as possible about the task and content implied by the goal.
- Convert the goal into a representative "test" question.
- Classify the goal statement according to the kind of learning that will occur.

Conceptual Design

Which learning outcomes you intend to promote?

- Declarative knowledge
- Intellectual skill
- Cognitive strategy
- Attitudes
- Psychomotor skill
- 'knowing that'
- 'knowing how (by thinking)'
- 'learning how to learn'
- 'knowing how to behave'
- 'knowing how (by doing)'

Conceptual design

What type of Information, Knowledge or Skill is being communicated through the medium?

- Verbal Information (Facts)
- Intellectual Skills
 - Discriminations
 - Concept
 - Relational rule
 - Procedural rule
 - Problem solving strategy
- Psychomotor skill
- Affective strategy
- Metacognitive skill



Verbal Information

Learning involves recognition (choosing from options) or recall, verbatim or paraphrased, and listed or summarized.



Intellectual skills and related learning goals

- Discriminations
- Concrete concepts
- Defined concepts
- Principles
- Procedures
- Problem solving
- 'similarities and differences'
- 'attributes and examples'
- 'abstract concepts'
- 'relational rules'
- 'steps to take'
- 'unique combinations of principles and procedures'



Discriminations

- differentiating between two stimuli
- rarely taught in schools
- Shown through action words such as: Distinguish, Determine if.



Concepts

- should reflect ability to classify and label ideas, objects, and events as examples/non-examples of a concept. May require stating how/why such classification was made.



Rules

Learners should be able to:

- use rule to predict, explain, or control something, or successfully complete a procedure defined by a procedural rule
- recognize if rule is correct/incorrect and why/why not.



Problem Solving



The learner should do:

- Assess the problem situation
- Determine which rules are applicable
- Synthesize these rules to solve a particular problem.

Psychomotor Skills



- Should reflect what 'new' muscular activities are required. The standards often
- reflect time or speed, or consequences or number of times the learner must
- correctly execute the motions.

Attitudes



- must reflect what the learner must do to demonstrate acquisition of an attitude. May also require that the learner tell why the performance is important.

Cognitive Strategies



Learners should:

- Assess the learning task
- Select (or invent) a strategy appropriate to the task
- Apply the strategy.
- Assess the success of the strategy.
- Modify the strategy if it is not effective.

Structural design



Structuring of the information space to facilitate intuitive access to content

- Identify steps to complete the goal, considering (mental processes) the learner goes through when performing the goal.
- Order steps, (identifying) using the shortest least complex path for completing the task, noting factors that require this simpler path.
- Note factors that may require a more complex path or more steps (these may indicate decision points).
- List the steps and decision points appropriate to your goal.
- Identify Prerequisite (Subordinate) skills for the steps identified to complete goal
- Determine entry behaviours

Structural Design

Structuring of the information space to facilitate intuitive access to content



- Based on Content or Task Analysis.
- Involves chunking and sequencing of information.
- Involves focussing and elimination of superfluous information (removal of deadwood).
- Representation of content based on rules of perception (layout, graphics, text, colour)

Structural Design for Blended Approaches

- Pre-requisites
- Content for 'Before phase'
- Content for 'Focal session'
- Content for 'After phase'

Metaphorical Design

- Organising symbolic representations, models, narratives, environments, characters.
- Mediating technology (VLE, Simulation, Game, Mobile/Flexible Learning, Educ TV)
- Help people understand and remember things by cognitive and affective contextualisation
- Should be quite common and familiar to users
- Should have a single primary implication
- Should be naturally, logically related to the activity to be performed

Metaphors in PAVE event

- Symbolism in Logo
- Terminology:
 - Workshop
 - ePortfolio



Metaphors of Icons

- Play a part in the development of a functional specification. A whole range of functions can be identified for which icons are required.
- Assist interface/Visuals design by providing ideas for individual icon designs.
- Provide cues for the recognition of iconic symbolism within an end-user interface.
- The appropriate use of metaphors can provide a framework in which users can identify the functional meanings of icons.

Which are your underlying metaphors?

- About the mind (Vessel vs Internet)
- Learning (conduit vs relationship)
- Teacher (sage on stage, guide by the side, organiser of learning context)
- Technology (Problem, tool, Medium)

This will determine your conception of the courses you develop.

Which metaphor are you going to use for your course?

- Classroom
- Workshop
- Forum
- Journey
- Exploration
- Game

Navigation design

Design of interface elements to facilitate the user's movement through the information architecture



- Modality of manifesting flow in part or whole of the Structural model.
- Facilitates sequence in learners' thinking based on information processing analysis of cognitive task.
- Developed through relevant flowcharts.
- Involves static symbols, icons or animation.

Navigating through different CAs



Using your structural design determine sequence of content chunks for developing a:

- Handout
- PPP
- Website (including webpages)

Visual Design: Influencing perception through design

Managing learners' Attention through skilful use of layout, text, colour and images.



Planning



- The more time spent on planning the better the quality of the final production and saves time during its creation.
- Planning done on paper should include:
 - Clear and precise specification of objectives
 - An analysis of the intended audience
 - A definition of the content to be included

General design principles for Visuals



- Practice restraint (decreases memory processing and bandwidth)
- Concentrate on proportion
- Achieve a balance between consistency and contrast
- Pay attention to detail
- Lester (1995): contrast, balance, rhythm, unity.

Content of visual



- Develop clean, attractive titles makes for each section.
- Make it clear to the user what is to come
- Keep each graphic simple
- Convey one major idea .
- Summarize content, but make sense.
- Avoid lengthy textual material.

Ration the information

- The amount of information processed at one time is limited.
- Limit display to one or few concepts.



Avoid Information overload

- Do not be tempted to put too much material in your display.
- This is a common mistake which almost always lessens the impact and effectiveness of a display



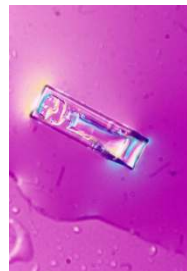
Chunk Information

- Information is divided by the learner into chunks.
- Designing in blocks helps learning.
- Divide a process of 10 steps into 2 blocks of 5 steps.



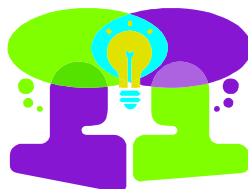
Highlight important facts

- Eliminate a non essential background feature
- Emphasise an essential part by colouring or enlarging it.



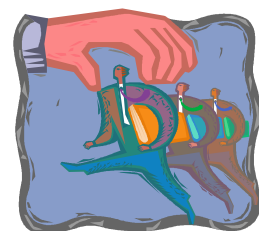
Link displayed info to Prior Knowledge

- What is the objective of the visual: novelty or familiarity?
- The difference is in the teacher's intent.
- To attract attention, use novelty
- To facilitate memory, use familiarity.



Be selective

- Always make sure that you are actually conveying what you intended.



Layout and Design



- Simpler, less-cluttered design is more effective
- Complex designs, with too many, or conflicting elements can be confusing.
- Create graphics for a display / screen that is wider than it is tall (landscape orientation) to fit most boards or terminals designed with such aspect ratio.
- Adequate margins and white space increase attractiveness and readability.

Layout and Design (cont.)



- Organise textual material from left to right, top to bottom, as in a book. Other arrangements will be confusing to users.
- Consistency (from section to section; slide to slide; screen to screen) helps user to follow development of a subject.
- For a single thread, avoid widely varying layouts (avoids confusion),

Build-up and Transitions



- Include fades, wipes, animated insertion of text etc.
- Quite useful in directing the user's to important elements in the current and succeeding slides / screens.
- Overuse or inclusion for entertainment of these elements can be distracting, boring, and counterproductive.

Highlighting



Bring attention to an area of text

"Nobody asked your opinion," said Alice.

"Nobody asked **your** opinion," said Alice.

Highlighting



"Nobody asked **YOUR** opinion," said Alice.

"Nobody asked **your** opinion," said Alice.

Highlighting



"**N**obody asked **y**our opinion," said Alice.

"Nobody asked **o**ur opinion," said Alice.

Highlighting

"Nobody asked **your** opinion," said Alice.

"Nobody asked *your* opinion," said Alice.

"Nobody asked your opinion," said Alice.



Legibility

Visual clarity of text

Based on:

Size

Typeface

Contrast

Text block

Spacing

Legibility – Font size

This is 9 point Arial
This is 10 point Arial
This is 12 point Arial
This is 14 point Arial
This is 16 point Arial
This is 18 point Arial
This is 20 point Arial
This is 24 point Arial
This is 28 point Arial
This is 32 point Arial
This is 36 point Arial

Legibility - Typeface

Serif typeface

- Times New Roman – print
- Georgia – web

Sans Serif typeface

- Arial – print
- Verdana – web

Legibility – Text-background contrast

The Mad Hatter from Alice in Wonderland

The Mad Hatter from Alice in Wonderland

The Mad Hatter from Alice in Wonderland

The Mad Hatter from Alice in Wonderland

Harder to read

Dark type on a
Light background
Is much easier to read
Than light type on a dark
Background.

Easier to read



Dark type on a
Light background
Is much easier to read
Than light type on a dark
Background.

Vertical Alignment



- If a line of type is all caps, it creates *more* white space below it. An all caps line also **HAS A TALLER HEIGHT THAN LINES WITH** mostly lowercase characters, creating *less* white space above it.
- This is a perfect example of the need for visual alignment
- Adjust the spacing above and below all cap lines until it looks right, regardless of what the numbers say.

Horizontal alignment



- Most easily apparent in flush left, flush right or justified copy.
- The spacing of certain characters, such as a cap T or A or the numeral 1, as well as periods, commas, apostrophes, dashes and quotations marks, create a visual hole or indentation in the beginning or end of a line relative to the characters above and below.
- Most noticeable in larger settings such as headlines, subheads and initial letters.
- To solve it, move the line in or out until it visually aligns.

Summary: Text in Visuals



- Keep to only a few lines.
- Use large text.
- Include only a few words per line.
- Key phrases are often more effective than complete sentences.
- Bulleted or numbered lists are often quite effective.
- Use parallel grammatical constructions (same number, same tense, same voice, etc.)

Fonts, Text Style and Size



- Less text is more effective.
- Edit text to trim it to the most effective key phrases.
- Avoid too much condensing that the text becomes cryptic and harder to understand.
(Compare next two slides).

Limit type fonts and sizes



- Usually one or two fonts and type sizes are entirely sufficient to distinguish levels of ideas.
- Additional fonts or sizes only distract from the message and may confuse user.
- Type weights and styles: do not overuse bold, italics, underlining, drop shadows, and SO ON. *(Compare next two slides).*

TYPEFACE

(Distracting)

● An Important Message

- Conveys mood
- Communicates attitude

● Reader Understanding

- Can help, or
- Can hinder



Typeface

(Clear)

● An important message

- Conveys mood
- Communications attitude

● Reader understanding

- Can help, or
- Can hinder



Type Size

- Use to indicate the relative importance of material.
- The more important the material, the larger the font.
- Simple block and sans serif type are much easier to read thus less distracting. *(Compare next two slides).*



Uses of Type

(Distracting)

● **Serif type**

- *Works well in smaller sizes, especially in the body of text*
- *Looks busy and cluttered when used in large sizes*

● **Sans-serif type**

- *Ideal for large headlines and other displays*
- *Difficult to read in long blocks of text*
- *Looks best when surrounded by lots of white space*



Uses of Type

(Clear)

● **Serif type (for example, Palatino)**

- Works well in smaller sizes, especially in the body of text
- Looks busy and cluttered when used in large sizes

● **Sans-serif type (for example, Helvetica Narrow)**

- Ideal for large headlines and other displays
- Difficult to read in long blocks of text
- Looks best when surrounded by lots of white space



Hyphenated lines

- Tend to interrupt the continuity of the message.
- Understanding is distracting because it is not clear.
- Bold type or italics should be used for emphasis.

(Compare next two slides).



For Further Reading

(Underlined and hyphenated).

Marr, David (1982). Vision: A computational investigation into the human representation and processing of visual information. W.H. Freeman: San Francisco.

Parker, Roger (1993). Looking good in print: A guide to basic design for desktop publishing (3rd edition). Ventana Press: Chapel Hill, NC.

Porkorney, Cornel, &* Gerald, Curtis (1989). Computer graphics: The principles behind the art and science. Franklin, Beedle & Associates: Irvine, CA.



For Further Reading

(Clear).

Marr, David (1982). *Vision: A computational investigation into the human representation and processing of visual information*. W.H. Freeman: San Francisco.

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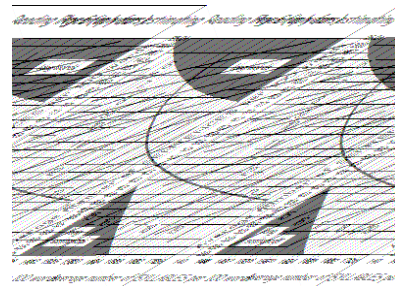
Spelling Mistakes

- Important to spell-check and proofread all text very carefully
- A spelling or grammatical error can detract disproportionately from the message and spoil the desired overall effect.



Readability

Understanding text based on complexity of words & sentences



Colour

To attract attention

Group elements

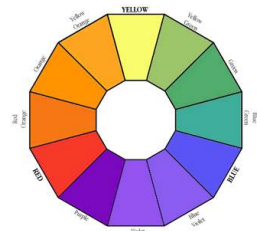
Indicate meaning

Enhance aesthetics



Colour Associations

- Yellow** Cheerful, Sunny, Cautious.
- Orange** Emotional, Positive, Exciting.
- Blue** Trustworthy, Stable, Serene, Cool.
- Red** Passionate, Negative, Dangerous, Hot
- Green** Safe, Environmental, Comforting.
- Purple** Opulent, Contemporary, Royal.
- Grey** Neutral, Mature, Cool.
- Brown** Wholesome, Organic, Down to earth.
- White** Pure, Peaceful, Clean.
- Black** Serious, Sophisticated, Elegant.
- Pastels** Youthful, Soft, Sensitive, Romantic



Three properties of Colour

Hue - Name of a colour

Value - Lightness or darkness of a hue (colour).
Change by adding black or white.

Intensity - Intensity is the brightness or dullness of a hue (colour). Pure hues are high-intensity colours. Dull hues are low-intensity colours.



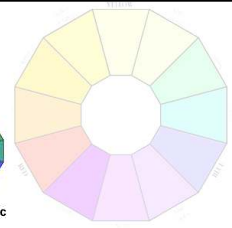
Colour



Monochromatic Colours



Complementary Colours



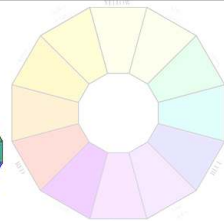
Colour



Analogous Colours



Contrasting Colours



Colour and brands

Certain shades of colors are associated by people with certain objects or concepts:

- the shade of a sports team's uniforms
- Racing car brands
- Blue / pink: boy / girls toys, school items
- Brands of clothes
- Commercial entities



Colour preferences

People's colour preferences vary with many factors such as:

- geography
- season of the year
- mood
- viewer demographics

Consider preferences of an audience
(test a sample)



Colour

- Excessive and improper use of colour can be distracting.
- The number of colours of text and/or monochrome images should be confined to two or three displayed on a plain, contrasting background.
- Bright colours (those high in saturation and luminance) should be used for the foreground.
- Pale colours should be reserved for the background.



Colour combinations

- Some colours, such as bright red and bright green, when displayed close together, may clash and cause eyestrain. Avoid such combinations.
- For increased readability, on a projected image, screen or printed material, use a dark type colour on a lighter background.

Images

- A poorly chosen image can be a distraction rather than an enhancement in the delivery of the message.
- An image should
- contain no confusion or any fine detail that is essential to make the point.
 - Not compete with the main message of the visual, and distract from the message.
 - Be cropped to its essential elements and placed in the portion of the visual where it is most effective.

Look and Feel –

how to increase appeal of a design

- Strongly determined by metaphors used
- Developed through skilful use of 'rules of the thumb' from psychology of perception.
- Based on knowledge of brain neuro-cognitive and neuro-affective processing.
- Aesthetic Usability effect

Aesthetic Usability effect



- a condition whereby users perceive more aesthetically pleasing designs to be easier to use than less aesthetically pleasing designs.

Verbal Information

Declarative Knowledge

- Requires a learner to recall in verbatim, paraphrase, summarize facts, list, name or organize information.
- Learners are not required to apply the knowledge that they have acquired but merely to recall or recognize it.
- Shown through action words such as: Recall, paraphrase, summarize, list, name, organize, describe.

Intellectual skills and related learning goals

- Discriminations
- Concrete concepts
- Defined concepts
- Principles
- Procedures
- Problem solving
- 'similarities and differences'
- 'attributes and examples'
- 'abstract concepts'
- 'relational rules'
- 'steps to take'
- 'unique combinations of principles and procedures'

Concepts - grouping things into categories.

- **Concrete concepts** - ability to classify things into categories by their physical characteristics.
 - if acquired demonstrated by examples of the concept.
 - **Defined Concepts** - concepts that match a definition or a list of characteristics (eg. Democracy, Marxism ...)
 - - if acquired demonstrated by the ability to classify
 - previously unencountered examples and nonexamples
 - of concept.
- Shown through ability to:
- recall critical attributes (characteristics) of a concept.
 - sequentially compare attributes of an instance to attributes of the concept. (If instance does not have the required attributes, then it is not an example of the concept).
- Typical action words:
 - Recall the characteristics of ...
 - Determine if this resembles

Rules (principles)

Relational Rules - "if then" statements

- help predict, explain, or control circumstances in our environment by describing either natural or volitional responses to those circumstances.
- Ex. If gas is heated, then it expands.

Shown through ability to:

- Determine which concepts or variables are involved.
- Determine the rule or principle that relates those concepts or principles.
- Recall the rules or principle.
- Determine which concept or variable has varied and the direction or magnitude of its variation.
- Determine which concept or variable has been affected. Then determine the magnitude and direction of the effect on the affected concept or variable.
- Confirm that the value is reasonable.

Example:

- An instructional goal in which a learner could apply Boyle's law:
- When the temperature remains constant, the volume of a confined gas varies inversely as its pressure.

Procedural Rules - tell in what order certain steps should be taken.

- Ex. Procedure for calculating an average or operating a digital camera
- Shown through ability to:
- Determine whether a particular procedural rule is applicable.
- Recall the steps of the procedural rule.
- Apply the steps in order, with decision steps if required.
- Confirm that the end result is reasonable.

Example:

- A procedural instructional goal might be that learners are able to operate a video camera to shoot a short video clip

Problem-Solving - Higher-order rule learning

- Learners select from a number of possible rules, whether relational or procedural, and apply those rules in a unique sequence and combination to solve a previously unencountered problem.
- If acquired, they can be applied to similar types of problems.
- Shown through ability to:
- Determine the knowns, the givens.
- Determine the unknowns, the problem.
- Determine the relational rules that relate the knowns and unknowns in the situation,
- Determine the procedural rules that determine the application of the relational rules.
- Apply the procedural rules and the "embedded" relational rules.
- Confirm that the problem is solved; unknowns are determined.
- Example: Developing of a training program for adults with a particular training need.

Cognitive Strategies

- Managing one's learning - learning how to learn.
 - Effective across content and across domains.
- a. **Rehearsal Strategies**
- used for basic/complex learning tasks.
 - aid in selection of information to be recalled and
 - enhance retention of that information.
 - Typical activities:
 - *Recall and repeat names and facts in a particular order.*
 - *State selected notes in verbatim. (personally constructed notes, highlighted or underlined sections).*

Elaboration Strategies

- Used for basic/complex learning tasks
- Tie new information to prior knowledge.
- Typical activities:
 - *for basic activities - write or state paired associates*
 - write or identify keywords.
 - *for complex activities - paraphrase, summarize, create analogy.*

Organizational Strategies

- Used for basic/complex learning tasks.
- Select information to be retained and define the relationships among this information so that it may be integrated into memory.
- Typical activities:
 - *for basic activities - construct an organised framework (table, diagram, chart etc.) for clustering given items.*
 - *for complex activities - construct an organised framework (table, diagram, chart, database etc.) for clustering given items. State clearly the internal connections among items/ideas.*

Comprehension Monitoring Strategies (metacognition)

- Student's knowledge about their own cognitive processes.
- Their ability to control these processes by organizing, monitoring and modifying them as a function of learning outcomes.
- Typical activities:
 - Compare and contrast personal cognitive / thinking style, study style, writing style, reading style, social style with that of colleagues.
 - Describe personal cognitive / thinking style, study style, writing style, reading style, social style. Identify assets. Identify shortcomings.
 - Develop thinking / studying / writing / social strategies that further exploit and develop your assets.
 - Develop thinking / studying / writing / social strategies that compensate for your shortcomings.

Affective Strategies

Used to focus attention, maintain concentration, manage performance anxiety, establish and maintain motivation, and manage time effectively.

- Typical activities:
 - Fear reduction
 - Envy reduction
 - Anger reduction
 - Sympathy increase
 - Pleasure increase

Attitudes

- Mental state that predisposes a learner to choose to behave in a certain way.
- Influence learning across content and domains.
- Have cognitive, affective and behavioural components that interact.
- Instructional strategies cannot be designed for attitude changes, but they can be influenced by particular experiences:
 - simulation games in which a learner is actually playing a role.
 - films followed by a discussion.
 - the way instruction is conducted.
- Shown through ability to:
 - Evaluate the situation, and consider possible courses of action.
 - Determine which course of action is valued.
 - Choose that course of action.
 - Perform that course of action.
- Example: The learner will choose to solve class disputes in a nonviolent way.

Psychomotor Skills

- Coordinated muscular movements that are typified by smoothness and precise timing.
- Dependent on cognitive component, usually a procedural rule that organizes the kind of sequence of actions.
- Information-processing analysis for a psychomotor task is very similar to an analysis for a procedural rule.
- Shown through ability to:
 - Determine whether a particular psychomotor action is required (although this may be automatic).
 - Recall the steps of the procedure (although this may be unconscious).
 - Execute the steps of the psychomotor procedure in order, with decision steps and consequent actions, if required.
 - Confirm that the steps have been correctly applied.
- Example: Use of any physical tool (Completing a tennis serve).

Writing performance objectives



- Three-component objectives are verbal statements of learning outcomes that include three parts:
- A description of the terminal **behaviour** or performance. This includes action verbs such as *select, identify, list, solve, repair, and write*.
- A description of the **conditions** of demonstration of that behaviour. This describes tools or information that the learners will be given when they demonstrate their learning. Often this component is at the beginning of the objective statement, usually including the word *given*.
- A description of the performance statement or **criterion**. Describes how well the learner has achieved the objective. These standards may refer to the following:
 - Accuracy, e.g., "student's answer must be within +/- 3 degrees"
 - Number of errors, e.g., "with three mistakes or fewer"
 - Number of correct responses, e.g., "with at least 80 percent correct"
 - Time, e.g., "in 12 minutes or less"
 - Consistent with an established standard, e.g., "in the order listed in the text"
 - Consistent with a stated standard, e.g., "that includes the following three descriptors: plane, closed, and straight-line figure"
 - Consequences, e.g., "so that the customer walks away satisfied"

Examples of Performance objectives for Various Learning Outcomes



- What are the intended learning outcomes in identified tasks?
- Which specific behaviours are to be shown by the learners at the end?