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INSTRUCTIONAL DESIGN MINI-MANUAL (5TH EDITION)

Background and Purpose

Instructional design and development involve many complex activities quite often accomplished by several persons. This manual is intended to provide those new to instructional design with a pragmatic perspective and meaningful instructional planning guidance. Since instructional design and development tasks vary widely, there is no way to provide a complete or comprehensive manual to assist all of those involved in the planning and implementation of instruction. Consequently, a short orienting discussion about the general nature of design is provided, followed by some more specific remarks about instructional design and development. These comments should be understood as primarily contextual rather than as definitive statements. There are templates included in order to assist in the specification and elaboration of courses and lessons. These templates are also meant to be suggestive rather than definitive. It is likely that an organization which engages in instructional design and development as a core or crucial enterprise will develop its own instructional perspective and associated templates to insure that quality and consistency are maintained at a high level. Individuals who gain competence in the design of instruction will also develop their own preferences, approaches and styles. The reference section at the end indicates where readers can find additional information.

The Nature of Design

Design activities cover a wide range of complex human planning activities, including the design of intricate and interrelated pieces of equipment, the design of buildings and bridges, the design of high fashion clothing, and the design of unique and appealing symbols and logos. In some cases, design is associated with subsequent development or production processes. In other cases, the design activity itself is the primary focus and results in a product of central interest, as in the case of designing a corporate logo. There are certainly creative and imaginative aspects to design, but there are also engineering considerations, especially in those cases involving subsequent development processes, which is the case with instructional design. Typically, design is a purposeful, goal-oriented activity. In most cases, there are means of determining to what extent the design activities achieve their goals (Reigeluth, 1983). In many cases, it is possible to extract lessons learned from previous experience and to develop heuristics, guidelines, rules and principles to guide future design activities (Gibson, 1977; Norman, 1990). Such general principles apply to the design of instruction just as they do to many other design activities (Merrill, 2002).

Instructional Design

Instructional design may be conceived broadly to include instructional planning and implementation activities. An on-going debate within the instructional design community concerns whether creativity or engineering is more prominent, relevant or fundamental in planning and implementing instruction (Dijkstra, Seel, Schott, & Tennyson, 1997; Merrill, 2002). The view herein is that instructional design principles, rules, guidelines and heuristics do exist, although they are sensitive to local conditions (learners, instructional setting, support and resources, learning cultures, and so on). Instructional design, in this sense, is goal-oriented and subject to many of the same planning, management and evaluation considerations found in other engineering disciplines (Spector, 2001). Nonetheless, many creative aspects are involved, and

the role of the designer's imagination should not be devalued. However, as in other systematic planning enterprises, it is important to observe and assess the quality of the design process, and subsequently to determine if the development and implementation processes are consistent with the system, course, or lesson specifications that emerged from earlier design activities. Finally, it is worthwhile to try to link outcomes and results with decisions made during the design activities. This is an especially difficult area of instructional design research (Reigeluth, 1983, 1999).

The terms 'instructional [systems] design' and 'instructional [systems] development' are often used interchangeably. In many uses, design refers to planning and analysis activities whereas development refers to implementation and production activities. Some use *ID* generically to refer to the entire process: investigating problems, identifying needs, determining and describing solutions, testing prototypes, evaluating outcomes, making and refining products, integrating solutions into organizational settings, phasing out older solutions, initiating new solutions, and so on. For this discussion, ID will be used in this broad sense. An important implication is that communication skills are especially important for instructional designers (Richey, Fields, & Foxon, 2001).

Many ID efforts (such as projects culminating in the deployment of an instructional system or learning environment) require project management skills and knowledge. In order to carry out such a project successfully, it is necessary to understand the needs of all involved (learners, instructors, sponsors, and others). This is ordinarily accomplished through a needs assessment and training requirements analysis. In higher education and school settings, this process is called curriculum design. A well designed curriculum provides an indication of the knowledge, skills and attitudes that learners are expected to acquire. In order to specify details of the curriculum, it is necessary to determine what knowledge, skills and attitudes learners can be expected to have at the outset, either as prerequisites or as a consequence of a prior curriculum. This process of identifying differences in existing and desired knowledge, skills and attitudes is called gap analysis, and it forms the basis for designing solutions that are intended to eliminate or reduce identified gaps and achieved desired outcomes.

When conducting a needs assessment for an adult training situation, speaking with workers and managers in an organization and examining the work environment may lead a design team to the conclusion that it is possible to achieve desired performance improvements without any instructional development or training (e.g., by re-designing work tasks or by providing job aids or by selecting different people for specific work activities). In educational settings, it is commonly assumed that some instruction will comprise the solution.

Once it is determined that there is a need for instruction, then specific learning goals, objectives and outcomes are specified, along with means for assessing progress towards those desired outcomes. Oftentimes, it is worthwhile to develop notional or partially functional prototypes so that all those involved in and effected by the instructional development effort (developers, planners, managers, learners, etc.) can provide early and frequent feedback to designers. This user-centered orientation ensures that the instruction that is developed will most likely satisfy the needs and interests of the organization and its learners.

Instructional Development

There are many models available to guide the development process and various implementation activities. Typical models have been adapted from other planning and engineering environments, ranging from architecture to software engineering. Unlike some other domains, however, there is no single accepted paradigm for instructional development. A commonly cited model is the waterfall model, which involves phases (e.g., Analysis, Design, Development, Implementation, and Evaluation, as in the ADDIE model) with some overlap but with little iteration and internal feedback explicitly indicated (Driscoll, 1998; Gustafson & Branch, 1997; Hall, 1997). More advanced models recognize that the process of instructional design and development follows a wide variety of paths, and frequently involves partial prototyping of various components, frequent user involvement in design and development reviews, and many iterations with gradually elaborated refinements of interim components of a final instructional or performance solution.

Instructional development is most typically a team effort. Instructional design and development efforts are more likely to stay on track and result in high quality courses and lessons when available expertise is shared and made available as early as possible and when users are involved frequently in the various refinements of the training materials and program (Spector, 2002).

Technology Considerations

Integrating technology into learning environments and taking technology into account in the daily experiences of learners and workers is a complex enterprise (Spector & Anderson, 2000). Instructional design and development efforts involving technology are notoriously complicated. There is a useful organizing principle with associated corollaries to guide the integration of technology into instructional solutions, or indeed to guide any large planning and implementation effort. These principles are known collectively as UUPS - the Universal Underlying Principle of all Stuff. Of course the acronym was selected to sound like the more familiar ‘oops’ uttered as an acknowledgement of an oversight of some kind.

UUPS: *Something has already gone wrong.*
A typical error is the determination of which technology to use prior to a complete analysis of the problem setting and learning requirements. Recognizing such an oversight should be done without recrimination. *Blame and shame do not generally improve the game.*

Corollary #1: *Mistakes never occur in isolation.*
This means that it is critically important to do careful and thorough planning. Involving end-users, learners, sponsors, and others early and often will minimize mistakes. *Mistakes not identified are likely to multiply beyond recognition masking the original source of the problem.*

Corollary #2: *There are never sufficient resources to do the job properly.*
The consequence of this principle is that compromises are necessary. The most frequent compromise is to fail to conduct an impartial external review so as to determine what kind of learning occurs as a result of various instructional interventions or in association with different learning activities. This information is crucial for improving future versions and is needed in order to develop a collective sense of what works and why. *Compromise without loss of quality whenever possible*.

Corollary #3: *Other people always have better ideas.*
Recognizing this principle places a premium on effective collaboration. Many people talk about collaborating, but working effectively with others so that the skills, knowledge, values, and creative energies of all are properly recognized and integrated is a challenge worth accepting in nearly all instructional design efforts. *We know less than we are generally inclined to believe.*

Course Planning

Course planning involves the determination of goals and objectives for the course, the identification of the scope of the course (what content to include and to what level learners are expected to master content), an indication of prerequisite knowledge required or assumed, a description of the types of learners for whom the course is intended, the kind(s)of environment in which learning will occur, a sequence of topics and activities, the instructional approach(es) to be used, and relevant learning activities.

Types of content vary and have an effect on how lessons are arranged. Gagné (1985) identified 5 different types of content: intellectual skills, verbal information, cognitive strategies, motor skills and attitudes. Gagné and Merrill (1990) argued that most lessons involve a combination of several of these types of content in the form of an 'enterprise' – an integrated set of purposeful activities. Van Merriënboer (1997) developed a particular instructional design scheme aimed at complex enterprises and distinguished two major types of enterprises with different problem-based instructional planning sequences for each: recurring activities (often these involve algorithmic procedures that are well supported with part-task and whole-task sequences, and non-recurring activities (these often involve heuristics and are better treated with whole-task methods such as worked examples and completion tasks).

Instructional strategies provide a general approach for selecting and sequencing learning activities, which are the things that learners will be doing during instruction in order to achieve desired objectives. A basic principle is that people learn what they do, so learning activities are crucial and strategies are central to structuring those activities. One might think of instructional strategies as the weapons in an instructional designer's arsenal; learning activities provide the ammunition for those weapons. Table 1 represents some typical strategies and associated learning activities.

Table 1. Instructional strategies and learning activities.

Instructional Strategies	Associated Learning Activities
Expository lectures	Note-taking, outlining, paraphrasing
Guided discussions	Articulating concepts and arguments
Problem-based tutorials	Solving problems and reviewing problem solutions
Drill and practice sessions	Practicing skills in well defined situations
Role-playing scenarios	Acting out a particular position or perspective
Collaborative project work	Exchanging ideas with others, critiquing alternative solutions
Interactive simulations	Formulating and testing hypotheses, predicting, observing, etc.

Lesson Planning

A useful way to plan lessons is to take into consideration Gagné's nine events of instruction (Gagné, 1985, 1995). These instructional events are derived from psychological research on learning and are founded in a cognitive model of human information processing. Gagné's nine events and their relationship to internal mental processes are depicted in Table 2.

Table 2. The nine events of instruction (Gagné, 1995).

Instructional Events	Internal Mental Processes
1. Gain attention	Activating receptors based on stimuli
2. Inform learners of objectives	Creating levels of expectation for learning
3. Stimulate recall of prior learning	Activating short-term memory and retrieving information
4. Present the content	Perceiving and organizing content materials
5. Provide "learning guidance"	Semantic encoding for storage in long-term memory
6. Elicit performance (practice)	Responding to questions to enhance encoding, reinforce associations and verify interpretations
7. Provide feedback	Reinforcing, monitoring and assessing performance
8. Assess performance	Retrieving content and reinforcing performance
9. Enhance retention and transfer	Retrieving and generalizing learned skills to new situations

It should be noted that these nine events are not intended to be followed by a designer in the ordered presented nor should they be considered discrete events. Indeed, Gagné (1993) argued that several of these events often occur together and that several often recur during the course of a lesson. Nonetheless, research suggests that lessons that omit one or more of these events are not as effective as lessons that include all nine (Gagné, 1985, 1993, 1995). Gagné (1993) identified some groupings that frequently occur together as follows: (a) events 1-3 often occur at the beginning of a lesson during a set-up phase of instruction; (b) events 4 and 5 often occur together as the primary lesson presentation – sometimes initial performance by students is also elicited together with 4 and 5; (c) events 6, 7 and 9 very often occur together - one of the most well-established instructional design principles is that practice with timely and informative feedback is effective; and (d) event 8 sometimes occurs alone and sometimes with 7 or 9.

Tom Shuell (1992) described 12 learning functions and associated instructional activities to support these functions. These learning functions closely parallel Gagné's nine events of instruction:

1. *Expectations* - supported by a description of the course with expected learning outcomes.
2. *Motivation* - supported through an explanation of what needs to be learned and why.
3. *Prior knowledge activation* - demonstrating techniques remind learners of prerequisite general knowledge or particular information.
4. *Attention* - the designer or instruction can help focus the learner's attention by highlighting or stressing particular items.
5. *Encoding* - can be supported by multiple representations, anecdotes, examples and mnemonics.
6. *Comparison* - comparing different cases or new cases to familiar cases supports the ability of learners to interpret information.

7. *Hypothesis generation* – can be supported by asking learners to generate alternative explanations or to predict what will happen in particular cases and then formulate a general rule.
8. *Repetition* - guided practice with a variety of cases can support the automation of procedural skills and promote transfer of learned skills to work settings.
9. *Feedback* – learners require feedback in order to take corrective actions and improve performance and understanding.
10. *Evaluation* – learners evaluate feedback in order to develop a sense of how well they are doing and assess their own learning processes.
11. *Monitoring* – learners have a general tendency to implicitly monitor their learning activities which instructors can reinforce by making monitoring functions explicit.
12. *Combination, integration, synthesis* – these higher level learning functions can be supported through a combination of demonstrations, paraphrasing activities, comparisons between established and new cases, hypothesis testing, and increasingly complex problem situations for learners.

A formative evaluation aimed at improving future offerings of a lesson or course is based partly on how well students achieved intended objectives, which is part and parcel of Gagné's event 8. Unless one measures outcomes, one does not know whether or not the instructional design has been effective. For this reason alone, assessment should not be taken lightly. It should be recognized that learners are typically occupied with other tasks and responsibilities and will often perform to the expected level of performance indicated in assessment criteria. In summary, a useful instructional design principle is: 'What You Measure Is What You Get' (WYMIWYG – pronounced 'whim-eee-whig' – this is also a reminder of the potential value of mnemonics).

Concluding Remarks

There is no simple road to successful instructional design and development (Spector & Anderson, 2000). It is vital to have sincere and dedicated people who are willing to learn new techniques and approaches, who are open to constructive criticism, and who are able to work well with a variety of individuals, including subject experts, learners, and others. As a rule, one should always conduct internal reviews, involve users and learners in design and development, conduct field tryouts, and conduct final program evaluations in order to develop a basis on which the instructional effort can succeed and on which future efforts can build. Insist on thorough, timely and accurate documentation of all aspects of the project. Recognize the ideas and achievements of your project members. Good luck with your instructional design effort!

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APPENDIX A: COURSE PLANNING GUIDE

Course Title: _____
(Make the title meaningful and specific.)

Subtitle/Slogan: _____
(Indicate a key theme or focus in the subtitle.)

User Information:
(This information assures continuity of the effort over time and through personnel changes.)

Primary user contact: name, title, tel/fax/e-mail

Alternate contact: name, title, tel/fax/e-mail

Course manager: name, title, tel/fax/e-mail

Instructional designer name, title, tel/fax/e-mail

Instructor: name, title, tel/fax/e-mail

Instructor: name, title, tel/fax/e-mail

Course Overview

Provide a short (preferably one-page) explanation of the major aims and scope of the course. This might include a description of the need created by a gap in skills and knowledge along with relevant context pertaining to learners and their situations. Explain how the course is intended to fill that gap. The course overview is typically used to inform organizational leaders and sponsors about the general nature of the course. It may also be used as the first step in integrating others into the effort. In addition, the overview has many public relations uses. As a consequence, the language should be simple, the message straightforward, and the purpose clear.

Course Description

Background/Context

Identify and briefly describe the organization (nature of the organization, organization culture, learning culture, etc.) for which this course is being developed. Describe the reasons you have selected a particular instructional approach or overall strategy (e.g., for an online Internet-based course possible explanations include the geographical distribution of learners, the need to access multiple sites at different locations, the need for just-in-time training while working on complex tasks, etc.).

Opportunity/Problem Statement

Describe the gaps in performance, skills and knowledge identified in a needs assessment or in an analysis of training requirements. Explain how filling these gaps will provide an opportunity for improved learning or job performance, safer working environments, and so on.

Targeted Audience

Describe the intended audience or learners. Define learners in terms of previous knowledge and skills and/or in terms of job titles or short job descriptions. Provide details regarding the expected level of relevant knowledge and skills of learners based on the needs assessment, and indicate anticipated ranges of other relevant learner characteristics (e.g., age, cultural differences, etc.).

Goals and Objectives

Use simple, ordinary language to state the goals of the course and indicate the scope of the content. Inform readers what participants will be able to do after they have completed this program. Think about how progress towards these goals might be assessed as you develop goals and objectives. Goals are important to instructors as well as to learners who will eventually want to monitor their own progress. Indicate the high-level objectives that describe in detail what participants will be able to demonstrate, under what conditions, and to what degree of mastery at the conclusion of the course. These will become the basis for individual assessments and course evaluation. While the overall goals might involve things not directly or easily observed (e.g., improved understanding), there should be more specific objectives that can be linked to observable things (e.g., faster performance of routine procedural tasks, fewer mistakes on critical tasks, changes in conceptual representations, more complete arguments to justify conclusions, recognition and evaluation of alternatives, etc.).

Instructional Strategies

Provide an overview of the overall instructional approach of the course (e.g., a tutorial with embedded interactive simulations, a structured sequence of problem-solving activities of increasing complexities with embedded tutorials, etc.).

Information Presentations

Describe how the content of the course will be presented (e.g., tutorials, simulations with feedback and critique, role plays, text-based tutorials, collaborative problem solving, etc.).

Student Participation/Interactions/Generative Strategies

Describe how learners will participate during lessons and what interactions and activities will be involved in different parts of the course (e.g., reading texts, engaging in Internet chat sessions, solving problems and doing exercises, engaging in dialogue with instructors and other students, problem-solving sessions, project activities, etc.).

Assessment and Evaluation Strategies

Describe how the learner's mastery of the content will be determined (e.g., tests, quizzes, on-the-job performance, project portfolios, etc.), who will conduct the assessments, when the assessments will occur, and what the consequences of various assessments are (e.g., refresher training, advanced courses, etc. – WYMIWYG). Develop a plan to use this information as part of a formative evaluation to improve the course over time.

Course Schedule/Calendar of Course Events

Provide a calendar indicating when instructional events will occur, what assignments are involved and the relevant learning activities associated with these events.

APPENDIX B: LESSON PLANNING GUIDE

Goal(s)	Describe the goals of this lesson in one or two short sentences.
Objectives	Indicate the specific objectives for this lesson. Objective 1 Objective 2 … Objective n Objectives should be linked with observable or measurable outcomes and used to guide the development of appropriate evaluation instruments. Some designers prefer to indicate outcomes rather than objectives to make this link very clear and explicit. Use active verbs to describe what will be measured.
Length	E. g., This lesson will take approximately ____ minutes to complete.
Content Outline	❑ Topic o Subtopic ▪ Point one ▪ Point two
Learning Activities	Learners will engage in the following activities during this lesson: ❑ Activity 1 - description ❑ Activity 2 - description … ❑ Activity n - description
Assessment Methods	Demonstration of learner understanding or mastery will be determined by learner demonstration of the relevant procedures.

Notes: It may be useful to describe the lesson in terms of the nine events of instruction or in terms of major phases of the lesson, in which case a table such as the following can be constructed as further elaboration of the content and associated learning activities:

- ❑ Set-up phase
  - o Gain attention – describe what will be done to gain and maintain attention
  - o Objectives - indicate what the objectives are and how these will be conveyed to learners
  - o Recall – indicate relevant prior learning and what will be done to help students recall this knowledge
- ❑ Primary presentation
  - o Content – describe the content (topics and subtopics and the associated knowledge, skills, and attitudes involved) and indicate how and in what order and how it will be presented
  - o Guidance – indicate anticipated support and guidance to help students master or understand the content
- ❑ Practice with feedback
  - o Practice – indicate when and how practice sessions will be structured
  - o Feedback – indicate what form feedback will take, when it will be provided, and perhaps a strategy for varying feedback over the course of the lesson or with learner progress
- ❑ Resolution phase
  - o Assessment – indicate how learning outcomes for this lesson will be determined and conveyed to individual learners
  - o Retention and transfer – indicate a strategy to help promote long-term retention of the content and assist learners in applying the content in a variety of related situations somewhat different from the learning context.

APPENDIX C: SAMPLE LESSON DESIGN DOCUMENT

Designer: *Wye Too Kaye* Date: *31 Dec 1999*

Course: *Introduction to Systems Thinking* Lesson: *1*

Course goal(s)/aim(s): Introduce participants to the fundamentals of systems thinking, including the concepts of positive (escalating) loops, negative (balancing) loops, causal loop diagrams, stock and flow diagrams, relationship of system structure to system behavior, feedback, delays in the system, non-linearities in the system, complex decision making, policy formulation, and system equilibrium.

Description of target audience: Experienced managers with backgrounds in accounting and business, mostly college graduates with more than 10 years of real world business and management experience. All are reasonably fluent in English although many countries and cultures are represented. Approximately 60% male and 40% female.

Lesson purpose/objective(s): The purpose of this lesson is to convince participants that even an apparently simple system can exhibit complex behavior that does not easily lend itself to easy solution. The problem of creating a stable growth pattern for a small company in a typical market sector will be presented by means of an interactive simulation. The objective is to have participants make decisions pertaining to expenditures on marketing.

Instructional approach(es)/strategy(ies): The overall approach is guided discovery learning, with a preparatory tutorial on key concepts (specify those concepts here), followed by an introduction to an interactive simulation environment, followed by a small group tryout with a single specific objective (specify …), and then a debriefing session. This is a situated learning environment with a great deal of learner control and initiative in the middle part of the lesson, preceded an followed by a great deal of instructor guidance.

Desired outcome(s): At the end of this lesson, students should be able to state the nature of the complexities of this apparently environment, to formulate initial hypotheses about specific decision making policies which be effective in achieving the desired goal of the microworld, and to test those hypotheses in the microworld. At the end of the lesson, students should demonstrate increased sensitivity with regard to the need to examine feedback loop structures and relevant delays, will be able to identify all second delays in a system, and will be able to state a policy to avoid oscillations in a system.

Assessment measure(s): Students will be given a pre-test to establish a basis for assessment. The pre-test will contain knowledge questions pertinent to the domain and it will also contain a problem scenario in which students are asked to formulate a decision and then to explain the rationale for that decision. A similar post-test will be used to assess and establish progress towards desired outcomes.