The Evolution of Instructional System Design Model

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***Abstract*- The Field of instructional design and technology contain the analysis of learning and performance problems, and the design, development, implementation, evaluation and management of instructional and non instructional processes and resources are intended to improve learning and performance in a variety of settings, particularly educational institutions and the workplace. Professionals in the field of instructional design and technology often use systematic instructional design procedures and employ a variety of instructional media to accomplish their goals.**

The intention of this paper is to present the evolution of Instructional System Design Model which has been developed in different period of time. And also present the development of a NIDA - New Instructional Design for Advance Learning is the framework which was developed in accordance with the ADDIE model and DISC behavior model. Its goal is to provide the educator with framework that can help them develop more effective e-learning system. The simulation of NIDA implementation is given and the prototype that simulate how to improve the system design by using NIDA also present in this report.

***Keywords*- eLearning, NIDA, Instructional System Design**

INTRODUCTION

The structure of this paper is as follows: Section II will briefly discuss Educational Theories, Section III will briefly discuss Instructional Systems Design (ISD) and History of Instructional Design. Section IV will present the Model of Instructional Design. And Final Section V will present NIDA – New Instructional Design for Advance Learning Model.

EDUCATIONAL THEORIES

Behaviourism, Constructivism and Cognitivism are three of the generally used educational theories today. Of these theories there are many exponents of each, all who have undertake extensive research and are viewed as experts in their respective field of research. Each theory has several component which has been describe in the table below:

Comparison by Psychological Foundation

TABLE1.
Educational Theories Comparison by Psychological Foundation (JaeHwan Byun, 2005)

	Behaviorism	Cognitivism	Constructivism
Epistemology	· Objectivism	· Objectivism	· Subjectivism
Definition of Learning	· Change of Behavior	· Change of Cognitive Structure	· Finding by an Insight

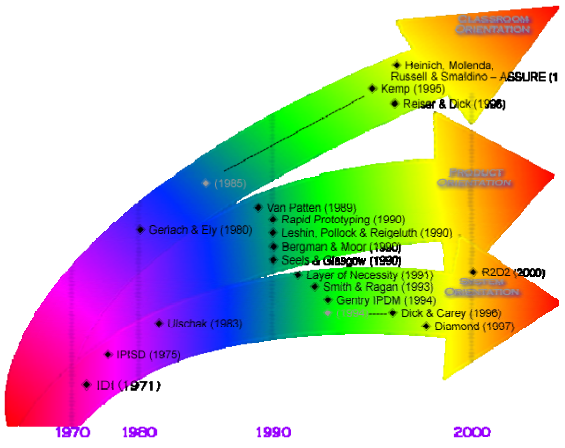
Principle of Learning	• Combination of Stimulus-Response	• From Short-term Memory to Long-term Memory	• Constructing Meaning by Individual Experience
Characteristic of Learner	• Passive	• Positive	• Independent
Primary Factor of Learning	• Systematic Arrangement of Stimulus-Response & Timeliness of Offering Stimulus	• Inducement of Mental Activities Promoting an Information Process	• Negotiation Between Individual Experience and Social Context
Pattern of Learning	• Discrimination, Combination, Generalization	• Short-term Memory, Long-term Memory, Cognitive Strategy	• Problem Solving, Creative Thinking
Strategy of Instruction	• Presenting Information, Exercise, Feedback (Reinforcement) Strategy	• Making Signification of Information, Symbolization, Drawing out Strategy	• Authentic Task, Situational Context, Presenting Strategy of Problem's Framework
Environment of Instruction	• Audiovisual Media, CAI (Computer-Assisted Instruction)	• Human Resources, CBI (Computer-Based Instruction)	• Opened Environment, WBI (Web-Based Instruction)
Type of Transferation	• Generalization	• Reasoning	• Contextualization

WHAT IS INSTRUCTIONAL SYSTEMS DESIGN (ISD)?

A systematic approach to the design, production, evaluation, and utilization of complete systems of instruction, including all appropriate components and a management pattern for using them; instructional development is larger than instructional product development, which is concerned with only isolated products, and is larger that instructional design, which is only one phase of instructional development. (AECT. 1977)

An organized procedure that includes the steps of analyzing, designing, developing, implementing, and evaluating instruction (Seels & Richy, 1994)

HISTORY OF INSTRUCTIONAL DESIGN



1940s: The Origins of Instructional Design

The beginning of instructional design procedures has been traces to World War II (Dick, 1987). During the war, a large number

of psychologists and educators who had training and experience in conducting experimental research were called on to conduct research and develop training materials for the military services. Among those who participated were Robet Gagne, Leslie Briggs, and other educational psychology researchers who are today considered the founders of instructional design. They used their knowledge of psychometrics to conduct testing and evaluation, often for the purpose of screening volunteers and placing them in the jobs that best suited their skills and knowledge. They also developed instructional resources, primarily employing behaviorist techniques (e.g., drill and practice, checklists), which reflected the dominance of behavioral psychology at the time. (Baker, 1973; Dick, 1987; Saettler, 1990)

1950s: The Formative Years

After the war, many psychology researchers continued to work with the military to develop more formalized instructional systems. In fact, it is during this post-war period that educational psychologists began to think of instructional design as a systematic process. Miller (1953) formalized detailed task analysis procedures, while Skinner (1954) proposed the use of programmed instruction, which entailed sequencing bite-sized amounts of information, prompting the learner with questions frequently, providing frequent feedback, and allowing self-pacing (Reiser), practices which are deeply embedded in instructional design procedures today. Bloom, Engelhart, Furst, Hill, and Krathwohl (1956) published their Taxonomy of Educational Objectives (more commonly known as Bloom's Taxonomy).

1960s: Objectives and Criterion-Referenced Testing

Mager (1962) formalized procedures for writing behavioral objectives (using behavior, standards, and conditions), a practice that had been in use since the turn of the century. Until the 1960s, most tests were norm-referenced, so that scores were spread around a normal ("bell") curve. Glaser (1963) was the first researcher to coin the term criterion-referenced testing, which involves testing learners against a given standard of performance (not against each other). Also, Scriven (1967) pointed out the importance of fomative evaluation (testing instructional resources before implementation), constrasting it with summative evaluation (testing the instructional resources after implementation). In modern instructional design, writing behavioral ("learning") objectives, applying criterion-referenced testing, as well as conducting formative and summative evaluation are critical (if sometimes overlooked) components.

1970s: The Systems Approach

During the 1970s, a variety of new models were developed for the systematic design of instruction, including the now famous Dick & Carey Model. For a description of this and other models, go to the ID Models section. By the end of the decade, Andrews and Goodson (1980) counted more than 40 models. During this decade, instructional design flourished, expanding its hold within the military branches; taking root in academia with the development of graduate degree programs in instructional systems and academic journals dedicated to instructional design issues; and gaining acceptance within educational and corporate settings as a way to improve the consistency and quality of instruction.

Over the past four decades, a variety of sets of systematic instructional design procedures have been developed and have been referred to by such terms as the system approach, Instructional System Design (ISD), instructional development, and instructional design. Although the combination of procedures often varies from one instructional design model, most of the model included the analysis of instructional problems, and the design development,

implementation and evaluation of instructional procedure and materials intend to solve those problems.

The main goal of an ID (Instructional Design) model or process is to construct a learning environment in order to provide the learners with the conditions that support the desired learning processes.

ID models differ from an ISD (Instructional System Design) model in that ISD models are more broad in nature. On the other hand, ID models are less broad in scope and normally focus on the first two phases of the ISD model - analysis and design. They focus on the analysis of a to-be-trained skill or knowledge-acquisition and then convert the analysis into a training strategy (design of the learning environment).

While ID models normally only account for analysis and design, ISD models normally cover five-phases:

Analysis - Design - Development or Production - Implementation or Delivery - Evaluations.

1980s: The CBI Era

The 1980s marked a downward trend in the influence of instructional design on educational settings (K-12 and higher education). On the other hand, it found more favorable conditions in corporate settings and continued to flourish in training departments and consulting firms across the country. With the advent of microcomputers, many instructional designers turned their attention to computer-based instruction. As computer technology became more powerful and more commonly available, CBI began to dominate the field.

1990s: A Time for Change

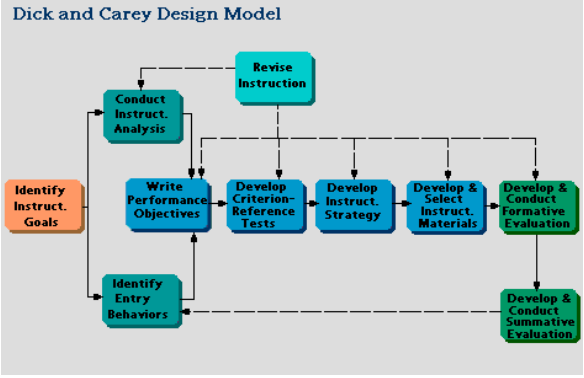
In the 1990s, instructional designers began to comprehend that not every performance problem can be solved by developing more instruction. In fact, as they began to focus more effort on analysis and evaluation, designers realized that most performance problems cannot be solved through training, and so they began to prescribe non-instructional interventions (e.g., workflow redesign, incentive plans, improved communication, etc.) to solve performance problems. This greatly expanded the role of instructional designers, paving the way for advancement within organizations to positions of leadership. A direct result of the increased presence of instructional leaders is the advent of knowledge management (and high-level positions like Chief Learning Officer, VP, Learning and Performance, etc.).

Another factor that has impacted the role of instructional design is the explosion of instructional technology. With the proliferation of personal computers and the Internet, instructional designers have been extremely busy developing/modifying instruction for delivery over intranets and the Internet in the form of stand-alone web-based applications and instructor-led online distance education.

MODEL OF INSTRUCTIONAL DESIGN

Many model of instructional design have been developed suitable for various instructional purposes and by differing levels of expertise of instructional designers, Each model will also be discussed for relevance for use in simulation,

THE DICK AND CAREY MODEL

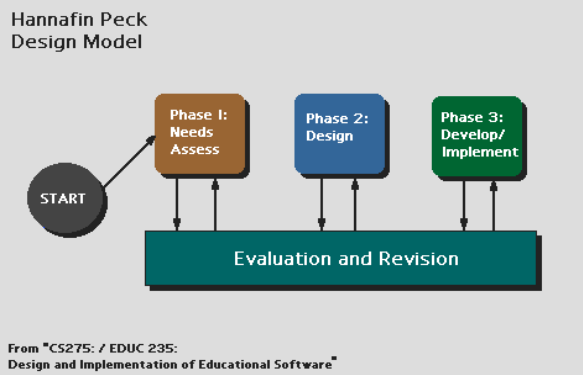


Dick and Carey Model involves all of the phases described previously in the ADDIE model, commencing with identification of instructional goals and finishes with summative evaluation. This model is suitable for a variety of context areas including

primary and secondary schools as well as business and government uses. It is also adaptable for a variety of users ranging from novice to expert, as the step by step descriptions aid with progress through the model.

Dick and Carey's model is one which would be suitable for use in the simulation environment. It is a straight forward linear process which allows a structured flow to development of instruction. By identifying entry behaviors and skills of participant's does not require a formal needs analysis to be performed, but instead allows for knowledge and skills of particular attending group to be analysed. Criterion referencing allows for instructional objectives to be developed from what is required of the participant in the clinical environment. From these, a scenario is able to be developed or modified to suits the level of expertise of the group. The type and format of simulation is also decided upon. This can involve part task trainers, low fidelity or high fidelity patient simulators, or may even take form or workshop or pause and discuss scenario. The delivery method is based on the objectives and the instructional goals. Formative evaluation should be undertaken following each stage. A pilot scenario is run to ensure that the goals and objectives are met. Modifications to scenarios also take place. Summative evaluation is undertaken following the pilot and allows areas for change to be highlighted prior to the establishment of program.

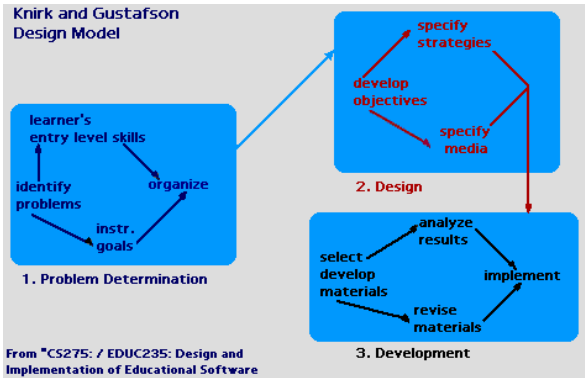
HANNIFEN PECK DESIGN MODEL



The Hannifen Peck Design Model differs from that of Dick and Carey model in that uses a three phase approach. Phase one involves a needs assessment being performed. This is followed by a design phase, and phase three where the development and implementation of instruction are performed. All phases include a process of evaluation.

This is suitable for simulation. The need analysis defines the goals and objective of the program. The design of program is based upon the findings from the needs analysis. The development part of stage three involves how program will be undertaken and implementation is the actual running of the program. Evaluation and revision are a continual process. This model is one that can be used by experienced or beginning instructional designer.

THE KNIRK AND GUSTAFSON DESIGN MODEL

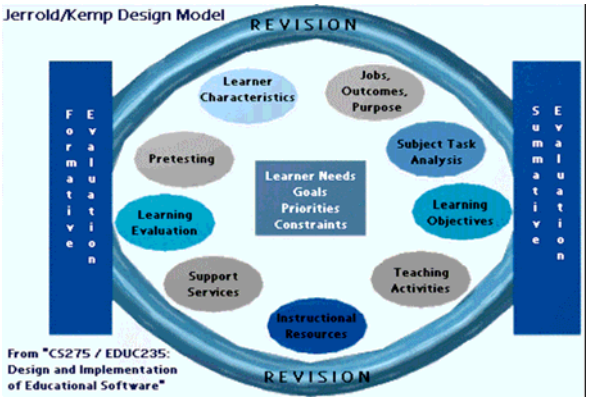


The Knirk and Gustafson Design model is a three stage process which involves problem determination design and development. Program determination involves the identification of a problem and setting of goals. Development of objectives and strategy specifications are included in the design stage. Development is where the materials are developed.

This model differs from the three stage Hannifin and Peck model in that there are individual processes or steps involved with each stage. This model is also good for simulation use, in particular that of scenario

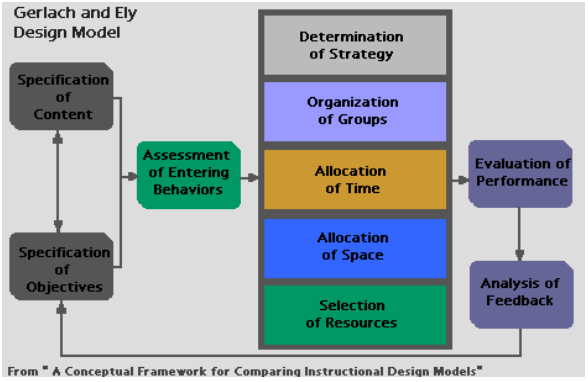
development as the stages lend themselves to that of software development. Again it is a model which can be used by novices or expert designers.

JEROLD KEMP DESIGN MODEL



The fourth model discussed here is the Jerold Kemp Model. This model discussed here is Jerold Kemp Model. This model takes an holistic approach to instructional design which focuses on analogies and discovery type learning. Kemp utilizes all factors in the learning environment including subject analysis, the learners characteristics earning objective teaching activities, recourses which will be utilized, support services requires as well as evaluation. This model allows for constant revision to occur.

THE GERLACH-ELY DESIGN MODEL



The Gerlach-Ely Design Model is a perspective model that is well suited to primary, secondary and higher education sectors. The model includes strategies for selecting and including multimedia during instruction. It is a model that is suitable for beginning instructional designers who have subject matter and expertise in a context specific area. It is prescriptive in the way that it outlines how a learning environment can be changed.

Because it is a procedural model, it is suited to simulation as it allows for focus on examples and practice to occur. This may be the way in which part task trainers are utilized within the instruction. It is also suited to small scale nodular type instruction which is also suited to the simulation environment.

NIDA MODEL

Instructional Design has been designed to create a learner-centered experience rather than the traditional teacher-centered approach, so, it encourages the better learning environment.

The NIDA Model is the model which included Analyze – Design – Develop – Implement – Evaluate based on the way that person perceives and processes information by using the DISC Model. The High Quality E-learning courseware development also refers to the courseware's positive impact upon student learning behaviors, attitudes, and achievements.

Figure 1 represents the NIDA Adaptive Instructional Design Model which is start from Learning Analysis, Adaptive Design, Develop, Dissemination, and Feedback. In every stage has specific task and Sample Outputs from each task are shown on Table 1.

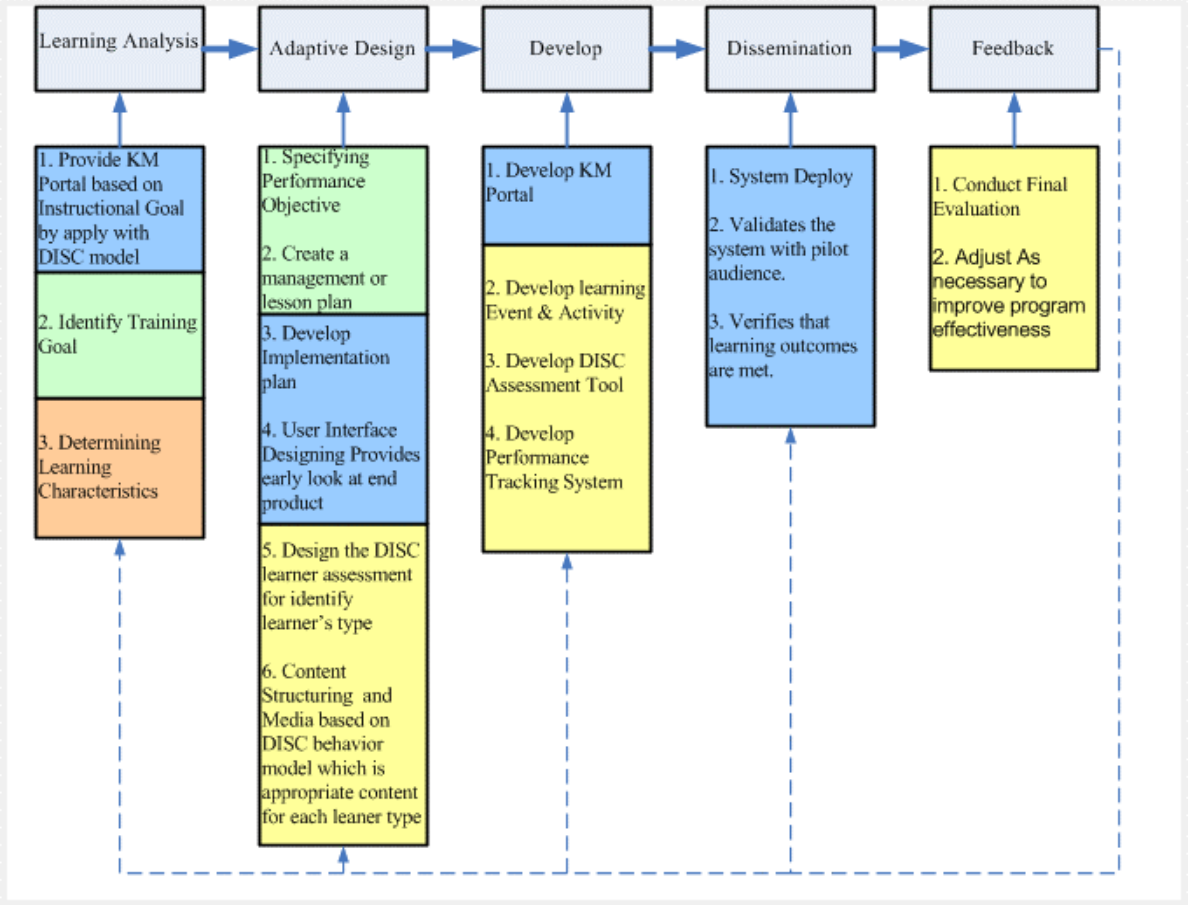


Figure1. New Instructional Design for Advance Learning

TABLE 2.
Task and Sample Outputs from NIDA Model

	Task	**Sample Output**
1. Learning Analysis	Provide KM Portal based on Instructional Goal by apply with DISC model.	E-Learning Hybrid Model
	Identify Training Goal	Identify Training Needs Training Scope
	Determining Learning Characteristics	Identify learner type
2. Adaptive Design	Specifying Performance Objective	Learner's Performance Objective
	Create a management or lesson plan.	Curriculum
	Develop Implementation plan	Implementation Plan
	User Interface Designing Provides early look at end product	User Interface
	Design the DISC learner assessment for identify learner's type	Assessment Method
	Content Structuring and Media based on DISC behavior model which is appropriate content for each leaner type**.**	Content for each Learner's type

3. Develop	Develop KM Portal	KM Portal
	Develop learning Event & Activity	Learning Web System
	Develop DISC Assessment Tool	DISC Assessment tool
	Develop Performance Tracking System	Performance Tracking System
4. Dissemination	System Deploy	KM portal,Web System has been used.
	Validates the system with pilot audience.	Validation Result
	Verifies that learning outcomes are met.	
5. Feedback	Conduct Final Evaluation	Evaluation Summary
	Adjust As necessary to improve program effectiveness	

NIDA MODEL

This model introduces several instructional design concept implementations, which focuses on finding the fact of learner's behavior and learner's type. Regardless of what type of learners they are, this NIDA E-learning program will support them with an exclusive content, which have been modestly engineered to promote learning efficiency among every type of learner's behavior.

ANALYSIS

During the analysis, designer must has clear understanding of learning objective and student's existed knowledge. Content and assessment instruments will be created in design phase. The actual learning materials will be crafted in development phase. After all, learning materials will be delivered and distributed to the student during implementation phase followed by effectiveness evaluation.

The Analyze phase includes define the problem, indentify the source of the problem and determine possible solution. This phase is the foundation for all phase of instructional design. The outputs of this phase often include the instructional goals or list of tasks to be instructed. These results are input for the design phase.

The phase may include specific research techniques such as needs analysis, job analysis and task analysis.

We analyze the content by set the criteria for developing the media for each type of learner. Table2 is represents Content Design Usage for the each learner's type DISC Type which conducted from questionnaire survey from 20 students.

DESIGN

The design phase uses outputs from the analyze phase to plan a strategy for developing the instruction. During this phase, designer will create an outline of how to reach the instructional goals and expand the instructional foundation. More importantly, Designer have to concern about the implementation of NIDA, where it must be integrated into every design element included target population description, conducting a learning analysis, objectives, selecting a delivery system and sequencing the instruction. The outcomes from design phase will be the inputs for the develop phase.

TABLE 2.
Content Design Usage for the each learner's type DISC Type

DISC Type	D	DC	DS	DI	C	CD	CS	CI	I	ID	IC	IS	S	SD	SC	SI
Description Voice																
Interaction																
Conversation																
Precision of information																
Statistic and Graph																
Animation																
Story																
Examples																
Games																

DEVELOPMENT

The develop phase builds on analyze and design foundation. During this phase, lesson plans and lesson materials will be created, all media and supported system such as software and hardware will be fully developed.

IMPLEMENTATION

The implementation phase is the actual delivery of the instruction. The purpose of this phase is to deliver the instruction effectively and efficiently. The good implementation will promote the student's understanding of materials, support the student's mastery, and ensure the students' transfer of knowledge from the instructional setting of the job.

EVALUATION

This phase measures the effectiveness and efficiency of the instruction. Evaluation will occur throughout entire instructional design process- within phases, between phases and after implementation. In this project we will use Summative Evaluation- the test of overall effectiveness of the instruction after released the final version.

CONCLUSION

The success of electronic learning depends on many factors, one of them being the quality of the design of the learning system. In order to achieve its objectives and goals, electronic learning needs a rigorous design process. This may solve challenges like performance level, adaptation issues, dropping school. Also, a rigorous design leads to lower development costs, consistent quality control and standardization. The instructional design is a process that analyzes the needs and goals in the development of a training system. NIDA is a framework that illustrates the idea of implementing the learner's behavior study with ISD model in order to create a more effective E-learning course. Developer and User will ultimately receive the benefit of using NIDA, it will help them reach to the next level of their potential. We intend to continue our efforts to improve NIDA to be one of a comprehensive framework, so that eventually it becomes a useful framework the next generation of Instructional System Design Model.

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