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An Instructional Design Model for Blended Higher Education

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ABSTRACT

Instructional design models that are used by many higher education institutions to guide course design are insufficient for the unique opportunities of blended learning. Many established models are not practical tools for college faculty to use independently in the design of courses. Models like A.D.D.I.E., use a linear approach that can translate more easily into practical stages of course design, yet are historically rooted in the rapid prototyping of educational technologies or for designing military training and are inadequate for the complex demands of higher education, where learning outcomes are geared toward higher order thinking, scientific/clinical reasoning, and a syntheses of ideas into new knowledge. Presented here is an instructional design model that strategically incorporates the nuances of higher education, yet is practically framed to assist faculty with design challenges.

Keywords: *instructional design, model, higher education, blended course, course design*

INTRODUCTION

As blended learning becomes more ubiquitous across college campuses, the limitations of traditional instructional design models become acute when utilized in the design of the blended/flipped college course. The instructional design models that are commonly used by many higher education institutions to guide course design are insufficient for the unique opportunities of blended learning. Many established models are visually presented using a circular layout to convey the dynamic relationships among the components of the system. While this is helpful to instructional design theorists, the circular representation of models does not translate well into a practical tool for college faculty to use in the design of courses. Other models like A.D.D.I.E., use a linear approach that can translate more easily into practical stages of course design, yet these models are historically rooted in the rapid prototyping needs of the development of educational technologies or for designing military training and are inadequate for the complex demands of higher education, where learning outcomes are geared toward higher order thinking, scientific/clinical reasoning, and a syntheses of ideas into new knowledge.

What is needed is an instructional design model that is primarily a system-oriented one, but that can lend itself to the practical needs of college faculty who would benefit from having clearly defined stages of course design. The model presented here reflects this type of flexibility. The ten components, Assess Needs, Analyze Learners, State Goals, Analyze Resources, Develop Objectives, Blending and Sequencing, Design Learning Activities, Develop Assessment Strategies, Deliver and Get Feedback, and Analyze and Revise, are basic to a system orientation, yet are organized so that emphasis can be given to individual components and not disrupt the implied linearity.

When the development of instruction is for creating a college course, less emphasis is needed on the front-end analysis, since answers to many questions about needs, learners, and resources are typically provided by accreditation standards, admissions standards, course prerequisites, and an institutional standardization of classroom and technology configurations. While these areas should still be accounted for in the design of a course, more time and attention is typically given to the creative process of developing objectives, designing learning activities and assessments, as well as making informed decisions on blending, sequencing, and delivery technologies. The model presented in Figure 1 compensates for this shift in effort without reducing the importance of

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designing a course informed by the analysis at the front end.

Figure 1. New instructional design model for blended higher education

The Model as a Pyramid

The first noticeable feature of this model is that it is in the shape of a pyramid. Many models incorporate some form of circular shape to illustrate the relationship among components, with arrows indicating multi-directionality. With a pyramid the linear, chronological progression is implied from left to right and from bottom to top, and the levels of the pyramid illustrate a dynamic relationship whereby each level is built upon the previous one (Figure 2). When the lower levels haven't been fully accounted for, it becomes difficult to implement the components of the higher level. In order to fully understand this relationship a closer look at each component is necessary.

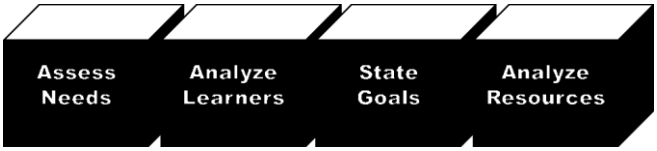

Figure 2. First level of new instructional design model

Level 1

In higher education, much of the work related to this first level is prepared in advance for the instructor. Needs related to accreditation, certificates, and curriculum are typically identified by a college's curriculum committee and are easily accessible. Learner characteristics and resources are often handled in a similar manner through admissions committees, technology committees, advisory groups, classroom support, etc. Given that a lot of the data collection for Level One is prepared in advance, it would be easy to consider skipping these steps in the model, however they must be accounted for so that they can inform directly and indirectly the rest of the course design.

These first four components collectively comprise the first level of the model. While they are listed as separate components, this does not mean that they are isolated design events. In many cases they can be analyzed concurrently. A designer might be able to simultaneously analyze the learners and the resources while conducting the needs assessment, or the establishment of a goal could easily be an extension of the needs assessment effort.

It is important to note that the development of the next three levels is contingent upon how well this first level was completed. This level serves as the foundation; any weakness here will certainly show up later in the course design.

Level 1: Assess Needs

With instructional design the process is usually initiated with some sort of problem or need, where a need is a discrepancy between what is and what should be. A needs assessment is the procedure where all the characteristics and symptoms of the need are analyzed to better understand the cause and define the need. In corporate or training environments, there are several methods for conducting a needs assessment, the most common being the Delphi, Fault Tree Analysis, or Critical Incident Technique. These techniques "use some form of questionnaire, survey, or interview as their base instrument for collecting data, and they are subject to the criteria that research has determined as appropriate to such instruments" (Gentry 1994, pp.16-17).

The needs of higher education are much more diverse, and are compounded by the great number of sources influencing the need. For example: a college of pharmacy needs to graduate pharmacists who can participate in the pharmaceutical field

with a high level of clinical reasoning. Since the pharmaceutical field is continuously evolving, a task analysis is often completed by an accrediting body such as the Accreditation Council for Pharmacy Education, which is then reflected in the accreditation standards used to evaluate the college. Meeting a subset of these standards would be a need to consider when designing a course for this college.

Additionally, sometimes societal pressures can impact institutions of higher education by creating a need that must be met. For instance: a state legislature could pass a law requiring all Pharmacists to have obtained a Doctor of Pharmacy degree within 5 years to remain in pharmaceutical practice. The best way to meet such a need would be to provide an online Doctor of Pharmacy program so that working professionals could participate. This type of need would certainly drive other design considerations such as delivery format and how to analyze learners.

Using the same pharmacy example, other factors that influence the need could be technological advances in the profession, course enrollment requirements, inter-departmental or inter-college programs or certifications, and meeting prerequisites for more advanced courses.

Data to identify other types of needs are collected through objective observations of conditions and then used to systematically identify deficiencies. These types of needs typically identify gaps in a curriculum or where programmatic goals are not met. A major reason for conducting the needs assessment is to decide whether or not the redesign of instruction will meet the identified need (Kemp, Morrison, & Ross 1999). Not all needs require instructional intervention. An institution may be able to remedy a need through a change in personnel, an increase in funding, new equipment, etc., and pursuing the design or redesign of instruction when the need can be resolved by other means would waste valuable time, resources, and money. Other benefits to conducting a needs assessment are the establishment of data that can be used to evaluate the instruction, the discrimination of critical needs over other needs, and the identification of needs associated with certain tasks (Kemp et al.1999).

Level 1: Analyze Learners

Analyzing the learners consists of gathering data so that the attributes of the learners can be accounted for in the design of instruction. This can partially take place during the assessment of the needs, but it is crucial that a more complete analysis take place. There are several sources of data that can be used: admissions interviews, pre-course surveys, direct observation, academic records, colleague observations, or outcomes achieved in a Learning Management System (Gentry 1994).

Heinich, Molenda, Russell, and Smaldino (1996) describe three major categories of learner characteristics:

1. The first category is general characteristics, which is comprised of information such as gender, age, cultural background, educational or work experience, and social experience.

2. The second category is specific entry competencies. This category consists of the attitudes and prerequisite skills that a learner brings to the instruction.

3. The third category is learning styles. Learning styles are the predispositions that learners have to acquiring and processing information.

In order for instruction to be successful, the learners must be at the center of the design. This can be seriously hindered when the attributes of the learners are not taken into account. Factors such as age, gender, experience, learning style, or ability all affect how a learner interacts with the instruction and whether they master the instructional objectives. Additionally, if learners do not bring enough prerequisite knowledge to a course, then enabling instructional objectives will need to be written that bring learners up to an appropriate level of competency to progress toward a course's terminal objectives. The information gathered in a learner analysis will also affect the sequencing and blending, the type of learning activities to be used, and the evaluation strategy (Kemp et al. 1999). Without sufficient data describing learners, it

would be impossible to make informed decisions regarding the instructional design process.

Level 1: State Goals

Given the needs identified in the needs assessment, the next step is to establish the goal for the instruction. The goal gives intent and purpose to the instruction and is a broad statement of the desired outcome. A goal addresses the needs of the institution and the needs of the learners.

One commonly used method to establish a goal is a goal analysis. Robert Mager (1984) identifies five steps to a goal analysis: 1) Write down the goal; 2) Write down everything someone would have to say or do for you to agree he or she represents achievement of the goal; 3) Sort the items listed in step two, deleting duplicates and abstractions; 4) Write a complete sentence to describe each of the items on your final list; and 5) Test the sentences for completeness.

Other procedures that can be used in the establishment of a goal are the setting of aims, which are intents that give direction, and the ranking of desired outcomes (Kemp et al.1999). Whichever method is used, the goal for instruction should describe an end result and reflect the characteristics of the learners as well as the needs of the institution.

The importance of establishing a goal rests in the purpose and direction it gives to instruction. "There is no way to decide what action to take until we know what the purpose of the action is--until we know what we are trying to accomplish" (Mager 1984, p. 3). Further, it is important that both the designer of instruction and the college agree on the goal so that miscommunication about the end result can be avoided. In higher education, this is typically moderated through a curriculum committee.

It should be noted that if a task analysis has been completed by the accrediting body, it can greatly inform the goal statement. It can identify the steps of a competent performance, which in turn aids in the identification of what a learner must say or do to represent achievement of the goal.

Level 1: Analyze Resources

An analysis of the resources involves composing a list of resources that will be available to the instruction and the entire course. Once this list is completed it can be compared to the instructional goal, the characteristics of the learners, and the identified needs to determine how these resources can best be used for the successful completion of the course. The term resources typically include the funds available, the facilities available, the materials, technology, personnel (TA's), communications, supplies, and the time frame allowed for completing the course. These items all impact the success of the instruction.

The rationale for analyzing the resources is that in order to make appropriate decisions regarding the development of objectives, the design of learning activities, decisions regarding blending, the development of assessment strategies, or the collection of data for analysis, the resources required for these components must be considered. The designer of the instruction must be able to recognize the limitations and constraints under which the course will be developed and delivered (Kemp et al. 1999). Some sample questions the designer must consider are: Will the budget allow for certain activities or the purchase of certain materials? Will there be specific technology on hand for the type of instruction prescribed? What will be the size and accommodations of the facilities? Will the deadline for completion of the course affect synchronous versus asynchronous decisions?

Figure 3. Second level of new instructional model

Level 2: Develop Objectives

While the goal of the instruction gives intent and purpose, it is the learning objectives that paint a clear picture of what changes will occur in the students (Figure 3). Good learning objectives are statements that identify the student, the desired behavior achieved as a result of the instruction, the

conditions under which the behavior is performed, and the degree to which the behavior is learned (Gentry 1994).

Objectives are focused solely on the learner and provide the instructional designer a specific guide to what the instruction is to accomplish. They are grouped as either terminal objectives, which reflect the outcome of the instruction, or as enabling objectives, which reflect lower level skills needed to achieve the terminal objective.

There are many advantages to developing good learning objectives. They provide the blueprint for the design of the instruction. Without them it would be impossible to efficiently evaluate the success of a course or learning sequence, and there would be no effective basis for choosing materials, instructional methods, blending, or sequencing content. Objectives communicate to the learner and the instructor just what is to be learned, which in turn allows both parties to have the same expectations. Objectives guide the selection of evaluation items that measure the acquisition of desired information or the performance of desired skills under specified conditions or degrees. Without this guidance evaluation items could be misleading, irrelevant, or useless. Objectives also allow the learner to evaluate their own progress at any time during instruction. For example: a learner may view the enabling objectives, deciding whether or not he or she has achieved them, and then determine what work still needs to be done to achieve the terminal objectives.

Level 2: Blending and Sequencing

There are several approaches to take when making decisions on how to blend a college course. The first and most common approach is to identify all the lecturing activities and place them online as videos or narrated slide presentations, coupled with bringing problem exercises that were previously practiced outside of class into the face-to-face classroom. While this represents a typical blended/flipped model, it is not optimal for helping learners master a course goal unless other considerations are addressed.

Another approach is to stratify the learning objectives and take the ones that reside in the lower levels of Bloom's taxonomy (Knowledge, Comprehension, and some Application) and mark them for online or technology delivery formats, leaving the higher levels for face-to-face instruction. Like the first approach, lectures are typically aligned with lower level objectives and can easily be shifted to online or technology delivery. However, this approach gives more flexibility in that lectures can be replaced with more interactive, online activities that address Knowledge, Comprehension, and Application. It also allows the designer to use face-to-face lectures for objectives in the Affective domain of learning as well as for bringing in guests who can inspire and enculturate students into a discipline or field. In this approach, most of the face-to-face time is reserved for activities such as solving ill-defined problems, clinical reasoning, case studies, social negotiation, guided coaching, and building mental models.

Still another approach is to utilize the online or technology delivery options for learning activities that serve as prompts and preparation experiences for the face-to-face classroom. In this way they serve as a catalyst for deeper, social negotiations of topics, as probes to deepen ill-defined problems or cases that will be addressed in the face-to-face classroom, and as facilitators of more rich and meaningful expeditions into the defining debates of a discipline or field of practice. This approach often calls for more creativity in the design of learning activities, especially when ensuring alignment with all of the learning objectives.

When making blending decisions, there is no perfect approach or formula. The information gathered about needs, resources, goals, and learners should serve to inform the best combination of approaches to be used for a particular course design.

When an instructional designer chronologically orders the content of the instruction in such a way so as to assist the learner in achieving the objectives, it is called sequencing (Kemp et al, 1999). This can be done using several methods such as the Posner and Strike Sequencing Scheme, Elaboration Theory, Objective Trees, or Robert Gagne's Prerequisite Method. A basic strategy would be to establish a hierarchy of the content, which places all of the prerequisite competencies in an ascending order, with competencies that are

dependent upon subordinate skills placed on higher tiers. If a task analysis has been done, this will make sequencing somewhat easier for instruction in all domains, but just because an expert in a certain task performs it in a certain sequence does not mean that the instruction should follow that same sequence.

Some simple guidelines to use would be to teach simpler procedures before complex ones, teach simple principles before complex ones, teach principles before their related steps, teach coordinate concepts together, teach prerequisites just before target content, and have a Subject Matter Expert critique the sequence (Leshin, Pollock & Reigeluth, 1992).

The argument for sequencing content lies in the necessity, efficiency and convenience in designing instruction according to preceding, concurrent, and succeeding relationships. The process of sequencing will also aid the recognition of the need for additional objectives that have not been considered (Gentry, 1994). A disastrous situation could occur, if complex skills were taught by the instructor without having first established all of the prerequisite skills.

Level 2: Design Learning Activities

After having developed the objectives and decided upon blending and sequencing the content, it is time to design the learning activities. This includes reviewing each objective and its related content to determine the best instructional strategies and delivery methods. It is important to remember that instructional strategies should always align directly to the learning objectives and match the level of learning associated with each. The characteristics of the content can inform the decision for a particular learning activity, but should always be a secondary consideration.

In general, the terminal objectives of the course are typically at the higher learning levels of Bloom's Taxonomy, and students are more likely to master them through rich, meaningful, interactive, and social methods that include elements of mentoring and mental model construction. Example learning activities that work well for higher learning are:
Problem Based Learning
Case Studies
Project Based Learning
Team Based Learning
In-Class Cognitive Mapping Activities
Role Playing
Guided Simulations
Service Learning

Enabling objectives are easily aligned to a plethora of different learning activities. While rich, meaningful types of learning activities work well for these objectives, which are generally at the lower levels of Bloom's Taxonomy, other learning activities can be more efficient and just as effective. Example learning activities that work well for lower levels of learning are:

Independent Reading
Demonstrations – recorded or face-to-face
Narrated Slide Presentations
Video Presentations
Tutorials
Web Quests
Think Pair Share – online or face-to-face
Wiki Creation

Decisions need to be made on how to present the information. Should first exposure to content occur individually, in groups, or in the presence of the instructor? What type of advance organizers should be given to students before first exposure? Will the content be delivered through a one-way presentation, hands-on experience, small group interaction, or independent study? What visuals or technology will be needed to facilitate comprehension? Are two channel presentations more appropriate or unnecessary for certain content? Decisions will also need to be made regarding the strategies used to make the learning more meaningful. What strategies will be incorporated into the instruction to assist the learner in making the connection between what he or she already knows and the new information? Will techniques such as recall, integration, organization, or elaboration be used? What types of instruction are most appropriate for teaching facts, concepts, principles, procedures, interpersonal skills, or attitudes? Once these decisions are made, the next step is to design the message so as to create the most efficient interface between the instructional materials and the learner. The instructional messages should be designed so that they communicate clearly to the learner.

The rationale for designing learning activities rather than relying solely on existing materials and methods is to create instruction that is reliable and effective. This is done by designing learning activities that meet the particular needs of the identified learner. This may include accounting for particular learning styles, backgrounds, motivations, or developmental levels (Willis 1993).

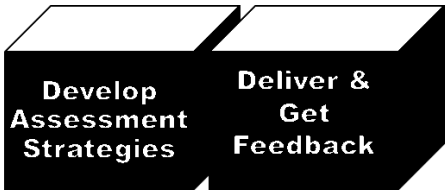

Figure 4. Third level of new instructional model

Level 3: Develop Assessment Strategies

Developing an assessment strategy means determining the methods to be used that measure the effectiveness of the instruction (Figure 4). Thus, "evaluation compares a measurement with a standard and passes judgment on the comparison" (Mager 1984, p. 8). Ideally, assessment should measure whether the learner demonstrated the performance identified in the objective, under the same conditions and to the same degree. This can be difficult when objectives are written in ambiguous language or are described processes rather than measurable outcomes.

Assessment is an ongoing process. A diagnostic assessment should be conducted prior to instruction so that an appropriate starting point can be determined and baseline data can be established for comparison. Formative assessments, both formal and informal, should occur at regular intervals during instruction to aid the instructor in pinpointing any problems as they occur. Summative assessments should take place after instruction has been completed to measure the overall achievement of the learner and the success of the instruction. Based on the length, breadth, and scope of the instruction, the strategy for assessment can include items as simple as the instructor observing behaviors during an instructional activity or something as complex as a multitask performance that is measured against a rubric of identified competencies.

The reasons for developing an assessment strategy are many. The primary reason is to measure student success in learning (Kemp et al. 1999). However, assessment is used to provide guidance for improving the instruction, to ascertain whether the instruction is teaching what was intended, to determine which elements of the instruction need improvement, and to pinpoint problems that learners may be encountering. Without a clear assessment strategy, the data collected from tests and assessment items cannot be interpreted effectively, thus the results of the instruction cannot be interpreted effectively.

Level 3: Deliver and Get Feedback

Delivery begins once enrolled students start interacting within the course (Figure 4). From this moment forward, feedback from the course is available for analysis. This includes information from the designed assessment strategy as well as mid-course evaluations of student perceptions, anecdotal feedback, analytics provided by a Learning Management System, and instructor or TA insights into the dynamics of the course.

In a blended course environment, it is particularly important to monitor feedback from the online components as well as the face-to-face components to ensure that problems in learning are not due to an imbalance or an improper synchronization of the two. Some adjustments can be made during the semester to correct for unseen variables that were hard to predict during the design of learning activities. A common phenomenon to blended courses that often surfaces midterm is an overly heavy course load. This can affect the students' performance as well as the instructor's ability to facilitate learning through adequate feedback and assessment.

Another phenomenon to monitor during the semester is the self-efficacy of the students. Since blended learning tends to put more responsibility for learning upon the students, it is paramount that they enter learning activities with the expectation that they can be successful in mastering the objectives. Direct interactions and monitoring course communications are the best sources for feedback on self-efficacy. If a low level is detected,

or an unusual level of anxiety exists, adjustments may need to be made.

Using the designed assessment strategy, the collection and analysis of data generated from the assessments begin immediately upon implementation of the instruction. The data generated in diagnostic and formative assessments is used to make decisions regarding content starting points and the improvement of instruction while the process is ongoing. Data generated in the summative assessment are used by decision makers to determine the instruction's overall effectiveness. In general, data should be collected immediately to increase its chances of being used in decision making. Other guidelines for the collection of data include: 1) Collecting data at regular intervals to encourage consistent attention to the assessment process; 2) Making the findings easily accessible to people who will use them; 3) Providing clear suggestions regarding future actions that improve the instruction; 4) Individualizing the recommendations for the decision makers in order to increase the likelihood that they will be used; and 5) Eliminating all personal biases to ensure that recommendations are securely grounded in the data collection and analysis effort (Willis 1993). Typical sources of data can be portfolios, surveys, written tests, performance tests, observations, ratings, focus groups, interviews, and exhibitions (Kemp et al. 1999).

In the data analysis process several methods can be used to promote interpretation. A quantitative analysis focuses on a statistical manipulation of the data. When large amounts of data are collected in a large enrollment course, this method can be particularly useful. Two types of evaluations that are commonly used are norm referenced (where students' performances are measured against other student's performances) and criterion referenced (where student performances are measured against an objective standard). A qualitative analysis consists of gathering detailed information and anecdotal data and focuses more on the depth of information. It is typically used when the number of responses or learners is small or when an uninterpretable phenomenon calls for exploration. Without the collection and analysis of data, it would be impossible to make decisions about the effectiveness of the instruction and what changes should be made to improve it. Further, in order to truly understand how learning is taking place, it is necessary to study learning as it is occurring. This allows the designer to interpret outcomes and processes, and is made possible through an analysis of the data.

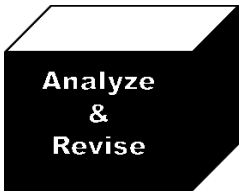

Figure 5. Fifth level of new instructional model

Level 4: Analyze and Revise

If you have completed every component of the model without error or omission of detail, and if your course has delivered an outcome that needs no improvement on the first try, then you can skip this component. However, unless you wear a cape and leap tall buildings, then you will need to revise like the rest of us mere mortals.

Revision should be anticipated. It requires rigorous effort to locate the source causing deficiencies in the learning and make changes as necessary. Hopefully the analysis of the data will help to pinpoint the problem, but this may not always be the case. A good source for revision ideas is the instructor's reflections on the strengths and weaknesses of the course. If you have given due attention to every component in the model, the revisions should be minor, but if the revisions become substantial, it is important to prioritize them.

It is easy to justify revision as the process that makes the course better, but it goes further than that. The reason for revision is due to the dynamic relationship of all the components in the model. These components can change over time. The needs and goals may change over time. Also, the learners and resources may change frequently. Every time one of these components is altered, the whole model is affected, and in order to insure that the effectiveness of the instruction is not lost, revision must occur.

Summary

Adhering to a systematic approach for designing instruction can be a demanding task, but the results should justify the methods. Additionally, blended learning can be a very effective format for delivering a college course, but only if done strategically, utilizing the benefits of guided instructional design.

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