

The Course Design Methodology (CDM) is a set of steps used to produce a course, including the target/goals, means of achieving them, and a system for measuring performance so that the course's intended learning and growth outcomes are achieved.

Shifting Focus: From Technology to Course Design

As a software company in the 1980s, one of Pacific Crest's primary goals was to help faculty enhance classroom learning with the use of technology; "...to help schools improve educational outcomes by improving the process by which students learn" (Pacific Crest Software, 1992). To justify the use of technology we needed to provide evidence that more significant learning occurred in a course that incorporated the technology compared with a course that did not. It was clear that technology could be used to improve student problem solving skills (see article section, **Role of Technology**); but justifying its inclusion in a course required us to answer the question, "What are the components of a course that produce not only significant learning, but also **evidence** of that learning?" In short, technology was only part of the answer; if the overarching goal was to improve educational outcomes by improving the process by which students learn, then a far larger and more critical issue was to determine what comprised an optimally designed course.

In the process of designing the structure and content of a course that not only produces significant learning but also evidence of that learning, the Course Design Methodology was developed (see Figure 1).

Origin and Refinement of Steps in the Course Design Methodology

Many steps in the development or refinement of the CDM evolved the design process to its current state. As will become obvious, the course design process was heavily influenced by other research areas of Process Education; scholarship focused on a variety of topics which led to the addition of new steps, the revision of existing steps, or the connection of steps within the methodology.

In 1993, Beyerlein, Ford, and Apple outlined the course design process in their paper, *Using a Learning Process Model to Enhance Learning with Technology*. They noted that the Learning Process Model contains steps for identifying prerequisites (pre-assessment), selecting key

Figure 1 Course Design Methodology

ANALYSIS	DEVELOPMENT
<i>Learning-Outcome Driven Instructional Design</i>	<i>Construction and Selection (con't)</i>
1 Construct professional behaviors.	12 Allocate time across the themes.
2 Identify course intentions.	13 Sequence the activities across the term.
3 Construct measurable learning outcomes.	14 Create individual activities from a prioritized list.
4 Construct a knowledge table.	15 Enhance activities by using technology.
DESIGN	16 Ask peers to review the activities you create.
<i>Activities/Knowledge to Support Learning Outcomes</i>	17 Produce key performance criteria.
5 Choose themes.	18 Locate or build key performance measures.
6 Create the appropriate methodologies.	19 Design a course assessment system.
7 Identify a set of activities.	20 Design a course evaluation system.
8 Identify a set of specific learning skills for the course.	21 Design a course syllabus.
DEVELOPMENT	IMPLEMENTATION
<i>Construction and Selection</i>	<i>Facilitating Learning</i>
9 Identify activity preference types.	EVALUATION AND ASSESSMENT
10 Match the activity types with the chosen activities.	<i>Instruction that Learns from Itself</i>
11 Choose the in-class and out-of-class activities.	

concepts, producing a concept map, building concept models, constructing skill exercises, and integrating problem solving projects. The model was integrated into *Teach for Learning — A Handbook for Process Education* (Apple, 1993) and was used in Pacific Crest's Teaching Institutes to help faculty create learning opportunities (courses and activities) that strongly supported the learning process.

It is important to note that the learning process was not assumed to be implicit nor was it considered to be a function wholly in service to disciplinary content. Nearly from the beginning, the assumption was made that, as students became more accomplished learners, their performance as learners in and with any disciplinary context would likewise improve (see article section, *Learning to Learn*). A respect for process, specifically the learning process, is therefore maintained even as a disciplinary context for that process is supported through learning activities, course materials, or program curricula.

At the course level, the selection of the most important concepts became the basis for **constructing a knowledge table** (CDM Step 4), and many of the steps of the Learning Process Model were critical to the evolution of the **activity design process** (Step 14).

During the Teaching Institutes in 1993, concept maps were used as tools to help faculty **sequence learning activities** (Step 13). The handbook for these teaching institutes also offered an assessment guide to help faculty measure progress in learning by “think(ing) about **assessment of students’ learning processes in a more organized way**” (Step 19) (Apple, 1993). In 1995, Step 14, **create individual activities from a prioritized list**, was advanced with the creation of a methodology for designing process-learning activities, where the forms of knowledge were also identified as a way to **categorize knowledge items** (Step 4) (Apple, 1995).

Taking Cues from Curriculum Design

The Course Design Methodology was significantly advanced with materials and experiences from the Curriculum Design Institutes (Apple & Krumsieg, 2001); the process of designing high quality curricula is very similar to that of designing a high quality course, especially with

respect to design specifications and supporting activities that achieve learning outcomes.

We discovered that transformational learning requires behavioral change, and as we clarified this we developed Step 1 of the CMD: **construct professional behaviors**. The identification of course learning objectives became part of Step 2: **identify course intentions**. The development of a methodology to **define learning outcomes** became the foundation of Step 3. The structure and presentation of the **knowledge table** (Step 4) became more refined and the identification of **key themes** for the curricula became the equivalent step for a course design (Step 5). As the methodology for creating methodologies was developed, this thinking supported the creation of a variety of curricular activities and also supported Step 6 of the CMD: **create appropriate methodologies**. Step 7: **identify a set of activities** is based on defining a course as consisting of learning activities. Step 8: **identify a set of specific learning skills** evolved from comfortably blending the learning process with disciplinary content and carefully selecting the 15 most appropriate **learning skills** from the Classification of Learning Skills. Step 9 came from the idea that a curriculum or course should offer a **variety of types of learning activities** and that these activities correlate to general content and types of knowledge.

We found that it is helpful to construct an activities table to better organize and structure the content of a curriculum or a course and to thereby more easily **match an activity’s content with activity types**, determine which activities work best **inside or outside of class, allocate time across themes**, i.e., align each activity to a specific theme, and to appropriately **sequence the activities (Steps 10, 11, 12, and 13)**. Step 8 was also more fully supported and represented in the activities table by including three **learning skills** (of the 15 previously chosen) to intentionally develop during each activity. Figure 2 shows how these steps of the CDM correlate to the structure of a sample activities table.

Deliberate Focus on Courses

The Course Design Methodology was completed in order to fully support a *Course Design Institute* (Apple, Krumsieg & Beyerlein, 2006). The steps mentioned to this point give us a strong course with identified learning outcomes and purpose-built activities. Obviously lacking are the criteria

Figure 2 Sample Activities Table (excerpted from *Foundations of Learning Curricula/Course*)

Activity	Type & Venue	Knowledge Table Items	Theme	Learning Skills	Purpose
1.1 Building Learning Communities	Collaborative Learning (In-class)	Tool: Interview response Form Context: Educational goals	Collaboration	taking an interest in others, attending, recording	Create an interactive learning environment that is responsive to student needs
1.2 Analyzing a Course Syllabus	Guided Discovery (Outside class)	Tool: Syllabus Context: Educational goals	Personal & professional development	clarifying expectations, inquiring, prioritizing	Develop shared understanding of course expectations and procedures
2.1 Creating your Life Vision Portfolio	Portfolio Building (Outside class)	Process: Planning a portfolio Tool: Life Vision Portfolio worksheet	Personal & professional development	prioritizing, committing to future, defining purpose	Create an organizational structure for creating and maintaining a vision portfolio

Table 1 Faculty Guidebook Modules and Other Scholarship Correlated with Steps in the Course Design Methodology

Methodology Step	Scholarship	
	<input type="checkbox"/> Faculty Guidebook Modules (all 2007)	<input type="checkbox"/> Other
Overview	<i>Overview of Instructional Design</i> (Davis) <i>Methodology for Course Design</i> (Davis)	
1. Construct professional behaviors.	<i>Long-term Behaviors</i> (Ellis)	
3. Construct learning outcomes.	<i>Learning Outcomes</i> (Beyerlein, Davis & Apple)	
	How Universal are Capstone Design Course Outcomes? (Beyerlein, Davis, Thompson, Gentili & McKenzie, 2003)	
	Deriving Design Course Learning Outcomes from a Professional Profile (Davis, Beyerlein & Davis, 2005)	
4. Construct a knowledge table.	<i>Forms of Knowledge and Knowledge Tables</i> (Quarless)	
	Development of Knowledge Tables and Learning Outcomes for the Introductory Course in Transportation Engineering (Bill, et al., 2011)	
6. Create appropriate methodologies.	<i>Methodology for Creating Methodologies</i> (Smith & Apple)	
8. Identify specific skills for the course.	<i>Classification of Learning Skills</i> (Apple, Beyerlein, Leise & Baehr)	
	Improving the Professional Skills of Engineering Graduate Students through Capstone Project Mentoring in IEWorks (Odom, Gerbus, Cordon, Beyerlein & Rink, 2002)	
	Integrated Design Engineering Assessment and Learning System: Piloting Teamwork and Professional Skills Development Instructional Materials (Trevisan, et al., 2012)	
9. Identify activity preference types.	<i>Overview of Learning Activities</i> (Wasserman, Davis & Astrab)	
13. Sequence the activities.	Methodology for Selection, Sequencing, and Deployment of Activities in a Capstone Design Course Using the TIDEE Web-based Assessment System (McCormack, et al., 2009)	
14. Create individual activities.	<i>Designing Process-Oriented Guided-Inquiry Activities</i> (Hanson)	
	<i>Writing Critical Thinking Questions</i> (Hanson)	
16. Ask peers to review the activities.	<i>Assessing Learning Activities</i> (Loertscher & Minderhout)	
17. Produce key performance criteria.	<i>Writing Performance Criteria for a Course</i> (Hinton)	
18. Locate/build performance measures.	<i>Fundamentals of Rubrics</i> (Bargainnier)	
	Creating and Using a Performance Measure for the Engineering Design Process (Beyerlein, et al., 2003)	
19. Design a course assessment system.	Assessment Framework for Capstone Design Courses (Beyerlein, Davis, Trevisan, Thompson & Harrison, 2006)	
	Assessing Professional Skill Development in Capstone Design Courses (McCormack, et al., 2011)	
20. Design a course evaluation system	<i>Course Grading Systems</i> (Lawrence, 2007)	

and measures we need to include if we want to provide the “evidence of learning” that was identified as being part and parcel of a high quality course. What had been a methodology for **creating performance criteria** for a course formally became Step 17, and Step 18 emerged from the identification and **creation of performance measures**

as a way to determine whether learning outcomes and performance criteria were being met.

The finishing touches consisted of adding steps in order to,

- Determine if each activity could be **strengthened with the use of technology** (Step 15)

- Reap the benefits of **peer assessment of activities** before implementation (Step 16)
- Enable performance in the course to be constantly improved through the design and implementation of a **course assessment system** (Step 19)
- Meet any evaluation-based needs (grading and grades) through the design and implementation of a **course evaluation system** (Step 20)
- Trigger creation of a **course syllabus** (presentation of selected aspects of the course design to students) (Step 21)

The *Course Design Handbook* (Apple, Krumsieg & Beyerlein, 2006) provides an example of each of the steps as well as a presentation model of an activities table.

Scholarship on Course Design

Section 2.4 of the *Faculty Guidebook* is titled, “Instructional Design” and between the modules in this section and modules elsewhere in the book, there are many that further support or advance the course design process (Beyerlein, Holmes & Apple, 2007). These are correlated with steps in the CDM in Table 1. In addition to what is available

in the *Faculty Guidebook* there is much scholarship to support the course design process; numerous articles are also shown in Table 1.

While courses are usually designed for a specific context, foundations and capstone courses are transferable across disciplines. The design of processes for each of these are discussed in additional modules: *Designing a Foundations Course* (Newgren, 2007) and *Creating a Capstone Course* (El-Sayed & Beyerlein, 2007). A strong example of a course design document generated through the application of the Course Design Methodology is available for *Foundations of Learning* (4th ed.) (Redfield & Hurley Lawrence, 2009) at www.pcrest2.com/fo4/cd.htm

Lessons are still being learned about how to strengthen each of these steps to improve course quality in order to make possible both increased learning as well as stronger evidence of that learning. Additionally, many of the steps in the Course Design Methodology have become the focus of research in their own right, especially transformational learning, learning outcomes, performance criteria, learning activities, learning skills, performance measures, assessment systems, and methodologies.

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