

Component Display Theory

Although its theoretical foundations are in Merrill's earlier research in concept learning, Component Display Theory (Merrill, 1994) grew to maturity and was first implemented in the context of the TICCIT project; and to understand Component Display Theory, one must understand TICCIT.

In 1972-73 Victor Bunderson at the University of Texas was awarded a large NSF grant to study learner control in the context of interactive television. Together with MITRE Corporation, Bunderson began work on the Time-shared Interactive Computer Controlled Information Television, or TICCIT, project. Shortly after the award, David Merrill convinced Bunderson to come to bring the TICCIT project to Brigham Young University where they would work on the project together. Thus began one of the great intellectual partnerships in the history of educational technology.

Building a principled mechanism that effectively allowed learners to control their path through instructional content proved more difficult than originally imagined. Eventually Merrill and a small committee of graduate students were tasked with solving the learner control subsystem problem. Because the team felt that the problem was one of systematically generating alternative strategy options, they worked from an "algebra" metaphor in which different types of instruction could be represented as variables to be "added together" or concatenated to effect specific learning outcomes. This meant devising a taxonomy of choices: between what alternatives or categories of strategy building block would learners choose when exercising learner control? Merrill privately arrived at a two by two matrix which provided a separation of content and strategy, and in his own way called a public meeting of all department faculty and students to announce his discovery. (This meeting was the first time any other members of the team heard the Component Display Theory terminology.) Table 1 shows the original division of display content into generalities (defining statements) and instances (of the defining statements), and the division of strategies into telling about and asking about. Merrill's language is used in the table.

Table 1. The primary presentation forms of component display theory.

	Generality	Instance
Expository	Rule	Example
Inquisitory	Rule Recall	Practice

TICCIT "message authoring templates" were created for each of these "Primary Presentation Forms" which made authoring content very quick. Later, several screen

templates were also designed so that the display layout and paging (in cases of multiple screens of message) could be assigned by formula. In this way content authored correctly would simply “run” in the screen templates.

In addition to the Primary Presentation Forms, which are the core of Component Display Theory, the TICCIT system also offered varying levels of difficulty for the learner to choose between: easy, medium, and hard versions of the generality statement and easy, medium, and hard (to understand) instances. Learner control of the difficulty of instruction and other system features was enabled by a specialized keyboard, with keys labeled “Rule,” “Example,” “Easy,” “Hard,” *et cetera*.

Merrill’s team produced a number of sequences, including what they called the “All-American” instructional strategy: a rule statement followed by an example statement followed by practice, with help available at any point along the way. TICCIT Help was implemented as a huge state-based decision tree: if a learner missed a hard practice item, had they seen the hard rule and hard example? Had they successfully completed the medium-difficulty practice? Remediation was carried out by sending the learner back to the immediately previous uncompleted screen.

Initially, the project called for several such sequences to be designed and implemented. Merrill’s breakthrough on the learner control problem came when he realized that the sequence was too coarse a grain, and that learners needed control over the individual strategies instead of the larger sequences of strategies. It was like deciding to deliver bricks on demand rather than walls on demand.

Component Display Theory was an extremely significant contribution to the field of educational technology as it represented one of the first successful attempts at separating instructional strategy from instructional content. CDT is also an intellectual parent of many other important instructional theories, including Reigeluth’s *Elaboration Theory* and Merrill’s later *Instructional Transaction Theory*. ITT further specifies the format in which the instructional content is to be expressed (knowledge objects) and the ways in which pre-specified strategies (instructional transaction shells) should operate on knowledge objects. In this regard, Merrill, Bunderson, and other members of the TICCIT team foresaw the late 1990s “learning objects” movement almost thirty years earlier.

References

Merrill, M. D. (1994). *Instructional Design Theory*. M. David Merrill. David G. Twitchell (Ed.). Educational Technology Publications.