Minimalist Theory: a Practical Approach to Computer-Related Instructional Design

Introduction

The Minimalist learning theory was essentially developed in response to the incredible advancement in computer technology that has occurred within the last twenty years and the subsequent needs of individuals to quickly learn new computer-based skills (Pederson, 1997). This, in combination with annual increases in the number of U.S. businesses reporting greater reliance on computers (U.S. Bureau Statistics, 2005), it is not hard to imagine why an approach that provides the means of simplifying instructional attributes of learning computer operations and new types of software might be preferred over more traditional instructional methodologies. However, while the Minimalist theory has traditionally been utilized in the production of computer and software training programs, it has also been applied to other forms of technical documentation as well as non-computer related introductory training materials (Tech-Ed, 2004). Thus, it is the intent in this paper to submit an overview of the Minimalist learning theory, describe the historical relevance of why this theory was originally developed, and illustrate a number of examples of the use of this theory in comparative instructional programs.
Minimalist Theory: An Overview

Just as the field of learning psychology has changed so dramatically towards the end of the 20th century, so too has the field of instructional program design (Alessi and Trollip, 2001). Certainly this was in response to widespread advances made in the field of computer technology which ultimately included the emergence of interactive multimedia instructional programs that now provides improvements in screen design, interactivity, and user control (Alessi and Trollip, 2001). One specific learning framework that was introduced in light of such advancements was the Minimalist theory. The Minimalist theory, first introduced by J.M. Carroll and his colleagues in 1990, has been widely applied to instructional programs involving computer use, computer software training, and overall computer-assisted learning. Like many contemporary learning and related instructional theories, the Minimalist theory it is based on the constructivist model of knowledge acquisition and includes several key characteristics of learning that are the cornerstone of the constructivism approach; that is, learning occurs internally as the individual’s cognitive perceptions are challenged (Gredler, 2004). Specific to the Minimalist theory is the existence of pre-established goals that are based on authentic tasks which incorporates the student’s level of prior knowledge. Also, the instructional design must utilize tools which actively insure that any errors made by the student are used as sources of further corrective instruction. Additionally, the instruction must provide learners the opportunity to gain multiple perspectives or solve problems in numerous ways, including gaining the ability to transfer and apply this knowledge to other related and authentic situations (Lambrecht, 1999).
At the very least, any instructional program that is built upon the Minimalist theory must contain, according to Mappin, Kelly, Skaalid, & Bratt (1999), the following five main principle components:

1. the learning of tasks that provide meaningful and activities and be self-contained,
2. "real world" projects that are given to students as quickly as possible,
3. instruction that permits self-directed reasoning and improvising by increasing the number of active learning activities, (participative learning as opposed to more passive forms of learning.),
4. training materials and activities that provide for error recognition and recovery, and
5. a close linkage between the training and actual system.

Furthermore, learning materials incorporated in the instruction itself should be produced and structured in specific modules such that there exists a set of self-contained units that are systematically organized throughout the program in order to facilitate the student’s own strategies and preferences for directing the organization and acquisition of the content itself (Boyle, 1997). Finally, this theory requires that efforts are made on the part of the designer to develop the instruction so as to maximize the extent that the student, utilizing their existing (prior) knowledge, immediately begins to interact with the content during the instructional phase, and applies their newly-acquired knowledge independently and directly to their own authentic work environments (Lambrecht, 1999). Accordingly, as Horn (1999) indicates, the essence of the Minimalist model is "… to present the smallest possible obstacle to learners' efforts, to accommodate, even to exploit, the learning strategies that cause problems for learners using systematic
instructional materials. The goal is to let the learner get more out of the training experience by providing less overt training structure." (p. 77-78)

**Historical Significance of the Minimalist Theory**

As with so many other consequences of the rapid pace of development of computer technologies, the influence of computers on learning and instruction over the last decade has been monumental (Alessi and Trollip, 2001). However, with such profound changes influencing the distribution and dissemination of information, equally important in the field of instructional design are the various positions and ensuing debates on the paradigms of learning and teaching in today’s technologically driven world; namely constructivism versus cognitivism. Accordingly, minimalist theory exists in sharp contrast with other more traditional instructional models such as that of Robert Gagne’s Conditions of Learning (1985) where-by supportive prerequisites must be present in order for knowledge acquisition to take place (Gredler, 2004). Instead, minimalist methodologies are highly individualized, allowing the learner to determine their own pace and in many cases their own instructional sequence (Mappin, Kelly, Skaalid, & Bratt, 1999).

Developed specifically from the empirical research that Carroll conducted during his tenure at IBM in the mid 80’s, the Minimalist theory was forged to off-set the growing collection of unnecessarily and lengthy training documentation that accompanied newly developed computer software. As a result of these materials and existing methods, Carroll observed specific tendencies in learners when they confronted these types of training resources. These ‘learner’ tendencies included skipping over
critical steps of written instruction, avoiding any careful planning and training organization, overlooking specific detailed systems of the written instruction, experiencing learning confusion between similar tasks, and having difficulty recognizing, diagnosing, and recovering from their errors during instructional operations (Eiler, 1997). In response to these tendencies, Carroll devised a set of five initial guidelines in an effort to develop more efficient software training materials. They include: 1. reducing the verbiage contained in such documentation, 2. forcing the user to recognize the link between the system and the training, 3. expecting the user to make mistakes and ensure a recovery path is available, 4. focusing on real tasks and activities that the user can relate to, and 5. encouraging the user to learn by discovery and through their own experimentation (Graham, 2000).

Prior to the development of the Minimalist theory, the standard approach to learning new computer skills and/or software programs was the systematic (or guided) teaching practices adopted directly from traditional ISD models (e.g. the ADDIE model). Because the goal of most computer-related instructional programs is to support the transfer of knowledge to different settings (namely, within the work place) where new challenges may be encountered and dealt with accordingly, the Minimalist theory has been applied more often to job-related computer training programs rather than to the type of learning that occurs in traditional classroom settings (Lambrecht, 1999).

**Applying Minimalist Techniques to Instructional Design**

Over the years since Carroll developed his theory, numerous computer-based instructional programs have been developed utilizing the Minimalist model (De Yereo
and Kauffman, 2004). Perhaps, the most significant aspect of instruction where the Minimalist theory has made the greatest contribution is in the area of instructional documentation that accompanies new computer programming. According to De Yoreo and Kauffman (2004), Minimalist documentation should be simplified, in order to minimize unnecessary verbiage, and be written modularly rather than linearly so as to allow the user to skip from one section to another without undermining the overall efficacy of the instruction itself.

In the Minimalist theory, training manuals and user guides for new software products released in the later half of the 1990’s became significantly shorter in length (often down to only 60-100 pages) compared to those produced during the 1980’s (before Carroll introduced his theory). These earlier counterparts commonly exceeded 350 pages in length (Graham, 2000). Furthermore, many online manuals nowadays incorporate Minimalist attributes, containing hypertext link features (to avoid linear formatting) which are programmed into the navigational design of these references (De Yoreo and Kauffman, 2004). Similarly, the Minimalist approach has been also used in the design of online graphical interfaces in assisting students to more efficiently grasp the concepts of the content being presented; many by the use of onscreen dialog boxes, status indicators, and error recognition tools (Elser, 1994).

In one example of software training development, Minimalist principles were applied to the production of a task-oriented online user guide (i.e. HTML help system) for WebSphere, a web design software package produced by IBM. After numerous revisions to the user guide, the latest version of this online instructional product not only included a minimal amount of substantive written instructional content but indeed
required a strict adherence to effective and well-established design principles in light of employing Minimalist components to the design of the training material (Mazzara, 2001).

A considerable amount of attention has been devoted to the design of online course materials using Minimalist theory, specifically in user interfaces, such as the layout and organization of the website in which online instruction is to take place. Good web page design principles inherently take advantage of Minimalist fundamentals (Pederson, 2007). As in the case of any instruction where Minimalist principles have been applied, the aim of computer-based instruction utilizing the Minimalist approach is to educate the user without him or her necessarily being aware of it. Furthermore, in order to facilitate student exploration and maximize learning, online instruction must fuse the learning process with task completion that can be facilitated with simple and consistent text and graphics elements, minimum scrolling, and efficient downloading times (Pederson, 2007).

**Summary**

J.M. Carroll’s Minimalist Theory is essentially a student-centered learning model which was originally formulated based on his research of how users responded to a wide range of computer hardware and software documentation issues. Carroll originally applied his theory to instructional programs and manuals in the computer operation and software development industries. However, later others would use his Minimalist theory as a basis of the development of user guides, reference cards, tutorials, manuals, web page design, web-based (HTML) help systems, and eventually online instructional programs.
The underlying premise of the Minimalist theory is that students can obtain the knowledge they seek if they are given the opportunity to search for it in a manner that they deem relevant and when their learning is not hindered by exorbitant quantities of written technical instruction or information. Rather, the Minimalist approach suggests that learners are far more likely to learn when they are given opportunities to immediately apply their prior knowledge, explore and experiment with the content, and make errors and immediately recognize and learn from these errors during the instructional process.
References


http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&arnumber=347526&isnumber=8046


