Conceptualizing Unfamiliar Content

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Abstract. In order to participate effectively in the instructional development process, an instructional designer must quickly develop a conceptualization of the content to be included in the instruction. The conceptualization is based on content-related information acquired from a variety of sources, such as the designer's prior knowledge, a subject-matter expert, or printed subject-matter materials. This article provides an overview of techniques an instructional designer can use to examine printed subject-matter materials when conceptualizing unfamiliar content.

Conceptualizing Versus Learning

Conceptualizing unfamiliar content is related to, but not necessarily the same as, learning unfamiliar content. Two points of distinction are relevant. First, learning takes place within one or more domains — cognitive, affective, and/or psychomotor. Conceptualizing, on the other hand, is solely a cognitive activity, regardless of the subject-matter domain. Second, during the conceptualization process, the designer becomes familiar with the content but not necessarily to the point of being able to apply the cognitive domain knowledge (e.g., classify various dance routines), perform the psychomotor domain skill (e.g., execute a dance routine), or manifest the affective domain attitude (e.g., frequently attend ballet recitals). In the taxonomy of the cognitive domain, conceptualization is at the comprehensive level but not necessarily at the application level (Bloom, 1956).

Regardless of the subject-matter domain, conceptualizing content is a cognitive activity. It is not surprising, therefore, that the conceptualization process is similar across the three domains. When conceptualizing cognitive domain content, the designer identifies the major topics in the subject matter, identifies selected subtopics, and determines the relationships among the topics. The outcome of this process is an abstract description of the content generalized from particular topics and relationships within the subject matter.

When dealing with psychomotor or affective domain content, similar processes occur. With psychomotor domain content, the designer identifies the major components of the psychomotor task (e.g., steps in a routine), identifies selective refinements within the component (e.g., subroutines within a step), and determines the relationships among the components (e.g., sequence, coordination). Here, the outcome is an abstract description of the psychomotor content generalized from particular routines and relationships within the subject matter. With affective domain content, the designer identifies the general attitudes/values to be internalized, identifies behaviors associated with the attitudes/values, and delineates the conditions under which the attitudes/values are appropriate. The outcome is an abstract description of the affective content generalized from the behaviors and conditions associated with the subject matter.

While the newly developed conceptualization encompasses the subject matter, it is unlikely that the conceptualization will include all the associated details. In fact, content detail can obscure the conceptualization in much the same way that visual detail can obscure the essential elements in a photograph, making figure-ground separation and attention focusing more difficult. Detail in the form of examples can help develop the conceptualization but need not become a part of the conceptualization. Early in the instructional development process, when the conceptualization is being formed, the abstract description is more important to the designer than the subject-matter details.

In summary, conceptualizing unfamiliar content is a cognitive activity resulting in an abstract description of the subject matter. The description encompasses the major components and relationships within the subject matter but does not include the myriad of details associated with the subject matter. In the
In the following section, specific techniques aiding the conceptualization process are examined. Following a brief description of subject matter expert interviewing techniques, attention will turn to how a designer can systematically extract subject-matter information from print materials to construct a conceptualization of the content.

Techniques Aiding Conceptualization

Conceptualization techniques help the designer collect information needed to conceptualize the subject matter. The techniques include interactions between the designer and experts, and between the designer and subject-matter materials. Personal interactions are likely to center around the designer interviewing an expert; impersonal interactions are likely to center around the designer reading printed materials. While other interactions (e.g., touring facilities, attending demonstrations, operating equipment) are possible, these interactions frequently involve interviewing an expert and/or reading printed materials.

When interviewing an expert, the designer asks content-related questions. As mentioned earlier, Bratton describes a set of questions: descriptive, structural, and contrastive—appropriate for such an interview. Descriptive questions are global and help the designer to gather general information about the content. A common descriptive question is “What are the major topics you cover in your course?” Structural questions are more specific and are used to gather information about a topic and to confirm the designer’s understanding of the content. Structural questions might be “What specific things are included in the first topic?” or “Is there only one way to complete this task?” Contrast questions are very specific and are used to discover the meaning of facts and concepts, and the relationship among them. A contrastive question might be “How is the first technique different from the second?” Bratton suggests that the questioning sequence varies depending on the information needs of the designer.

When reading subject-matter materials, the designer is like a student with unfamiliar materials frequently not written with reading ease in mind. While it was argued earlier that the designer does not necessarily learn the content so that it can be applied, several similarities exist between a designer’s task to conceptualize the content from printed materials and a student’s task to comprehend information in textbooks. Both designer and student are unfamiliar with the material; both are expected to understand the material within a given amount of time; both have limited access to content experts. What techniques have been developed to enhance the interaction between readers and print materials?

Graphic organizers are visual aids that define relationships among topics, and are analogous to ‘thumb-nail sketches’; somewhat crude and imprecise, but depict the essence of the content.

Interacting with Print Materials

From early in this century, reading educators have advocated the broadening of reading programs to include what they refer to as “content-area reading” (Moore, Readence, & Rickelman, 1983). As a field of study, content-area reading is concerned with improving students’ ability to derive meaning from text. While much content-area reading attention focuses on instructional strategies for classroom teachers, some content-area reading techniques are relevant for the designer confronted with print materials about unfamiliar content.

A fundamental premise of content-area reading is that “what a reader brings to a text determines in large measure what a reader takes from the text” (Herber, 1982, p. iv). More strongly put, “only if the new information can be organized or associated with the previously known will understanding, or comprehension, take place” (Allington & Strange, 1981, p. 9). Thus, what a designer knows about the content before reading the materials will strongly influence his or her conceptualization of it.

Given the strong influence prior knowledge exerts on comprehending written information, designers are at a disadvantage if they attempt to read unfamiliar materials without the proper preparation. They are also at a disadvantage if they attempt to read the materials in the same manner as one would read a novel. And finally, they are at a disadvantage if, after reading the materials, steps are not taken to insure that their conceptualizations formed while reading are accurate and complete. The content-area reading techniques described below and summarized in Table 1 are discussed within an instructional development context.

Prereading Techniques

Taylor (1981) argued that vision of the whole is necessary for the parts to make sense. Because a reader’s prior knowledge of a topic facilitates future comprehension, prereading techniques help prepare the designer to organize and associate the new content within a broad, meaningful context.

With unfamiliar content, it is possible that the designer will have a very limited, and sometimes inaccurate understanding of the content. Before attempting to read materials about unfamiliar content,

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the designer should assess the accuracy and scope of his or her prior knowledge. In addition to the questioning techniques described earlier, accuracy and scope can also be assessed by asking an expert to construct, with the designer's assistance, a "graphic organizer" of the content (see Figure 1). Graphic organizers (Barron, 1969; Smith, 1981) are visual aids that define relationships among topics. Graphic organizers are analogous to "thumbnail sketches": somewhat crude and imprecise, but depicting the essence of the content.

Consider, for example, a graphic organizer for operating a computer printer. The expert might identify three broad topics: printer parts, printer set-up, and printer operation. Each broad topic might have several associated subtopics (e.g., tractor feed, print head, and DIP switches would be subtopics of printer parts). Furthermore, the topics and subtopics are related to one another. As shown in Figure 1, the graphic organizer indicates the main topics and subtopics and suggests their interrelationships. As the designer studies the graphic organizer and discusses it with an expert, misconceptions in the designer's prior knowledge can be identified and corrected before reading printed materials. Also, the designer can develop a feeling for the breadth of the content area, a necessary precondition for meaningful reading. As a precautionary note, graphic organizers should be kept simple and general; too much detail can create confusion rather than clarification.

Examples can play an important role in the prereading process. The designer can ask the expert to show or describe a simple example of the content. If the example is meaningful to the designer and representative of the content, then the subsequent reading will be facilitated by this newly established prior knowledge. In situations where meaningful examples are not readily available, Feature Analysis charts may prove helpful.

Feature Analysis (Readence & Searfoss, 1981) is a technique based upon assumptions about how human beings organize knowledge. Smith (1975) stated that as human beings process new information, (a) categories are established; (b) rules are formulated to place objects (words, ideas) into these categories; and (c) category interrelationships are established. Readence and Searfoss (1981) suggested that Feature Analysis can be used to refine and extend readers' understanding. Data charts (Moore, Moore, Cunningham, & Cunningham, 1986), a modification of Feature Analysis, can be used for the same purpose. Creating the charts is a prereading activity (see Figure 2). Filling in the chart used in Feature Analysis is a during-reading or postreading activity.

When creating the Feature Analysis chart, the designer asks the expert what major topics are included within the content AND what topic features are considered important. Consider, for example, a course being developed to acquaint sales personnel with the computer printers offered by a company. The designer first asks the expert to identify the major products and then to identify the products' features (e.g., variable print modes, alternate character sets, graphics output). This information is used to create the chart.

### Table 1

<table>
<thead>
<tr>
<th>Selected Content-area Reading Techniques</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prereading Techniques</strong></td>
<td></td>
</tr>
<tr>
<td>Graphic organizer constructed by an expert</td>
<td>Assesses scope and accuracy of designer prior knowledge and establishes subject-matter breadth</td>
</tr>
<tr>
<td>Simple, representative example described by expert</td>
<td>Establishes designer's prior knowledge of content</td>
</tr>
<tr>
<td>Feature analysis matrix or data chart designed by an expert</td>
<td>Provides broad view of subject matter in terms of main topics and features</td>
</tr>
<tr>
<td><strong>During-Reading Techniques</strong></td>
<td></td>
</tr>
<tr>
<td>Survey titles, subtitles, graphic aids, and selected paragraphs</td>
<td>Develops initial understanding of main ideas presented in materials</td>
</tr>
<tr>
<td>Covert headings to questions</td>
<td>Establishes designer's prior knowledge of content</td>
</tr>
<tr>
<td>Identify organizational patterns within materials</td>
<td>Guides comprehension</td>
</tr>
<tr>
<td>Write in text, complete Feature Analysis or data chart Analysis or data chart matrix, make sketches, construct graphic organizer</td>
<td>Facilitates interaction between materials and reader</td>
</tr>
<tr>
<td><strong>Postreading Techniques</strong></td>
<td></td>
</tr>
<tr>
<td>Present sketches, completed matrices, and graphic organizers to experts</td>
<td>Focuses conversation validating accuracy and scope of conceptualization</td>
</tr>
<tr>
<td>Make literal assertions and ask questions</td>
<td>Checks for literal-level comprehension</td>
</tr>
<tr>
<td>Paraphrase content and describe inferred relationships</td>
<td>Checks for interpretive-level comprehension</td>
</tr>
</tbody>
</table>

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tures). The chart is completed while reading the materials and provides the vision of the whole necessary for the parts to make sense.

During-Reading Techniques

Reading is an interaction between the thoughts and language of writers and readers (Readence, Bean, & Baldwin, 1981). Thus, reading printed material is, in a sense, interacting with an expert. The during-reading techniques described below help facilitate this interaction.

The first during-reading technique continues the above discussion of Feature Analysis. If the Feature Analysis approach is used, the designer examines the printed material and places a simple "1" or "0" in the Feature Analysis chart to indicate feature presence or absence. For example, if a particular printer has graphic-output capability, a "1" is entered in the appropriate cell. The designer can also write notes in the chart cells. More detailed notes in the Feature Analysis chart will be more helpful with very complex and unfamiliar content. The during-reading techniques discussed below will help extract the information needed to complete the chart.

As pointed out earlier, when reading printed materials, the designer is studying the materials. One widely recommended study technique is "Survey-Question-Read-Recite-Review," or "SQ3R" (Robinson, 1946). Applied literally, SQ3R would be inappropriate for the designer since one of its purposes is to cause readers to spend more time on task (Readence, Bean, & Baldwin, 1981). However, some parts of the procedure, specifically "Survey-Question-Read," are relevant to the conceptualization process.

Sometimes considered a prereading technique, surveying involves examining materials on a global basis to identify the main ideas in chapters or book sections. The technique involves analyzing chapter title and subtitles, analyzing visual aids (e.g., charts, graphs), reading introductory paragraphs, and reading concluding paragraphs. When the surveying is complete, the designer has an initial understanding of the main and supporting ideas presented in the text. In some instances, especially with relatively simple content, this initial understanding may be sufficient to formulate the conceptualization. With complex content, however, more depth of understanding, and additional study techniques, may be required.

After the designer surveys the materials on a chapter-by-chapter basis, chapter titles and subtitles are converted to questions. For example, the heading "Changing Character Sets" might become "What character sets are available and how are they changed?" By converting headings to questions, the designer is establishing a content-related purpose for reading the materials, a critical component in the reading process.

After surveying the materials and formulating questions, the designer reads the materials. Since a comprehensive review of reading techniques is clearly beyond the scope of this article, the following discussion is limited to two techniques that appear particularly relevant to the instructional development process. The first technique involves identifying patterns within text; the second involves overtly interacting with text materials.

Writers sometimes attempt to communicate their thoughts to readers through organizational patterns in text. Knowledge and recognition of these patterns appears to be related to increased reading comprehension (Pearsen & Camperell, 1981; Readence, Bean, & Baldwin, 1981). The obvious implication is that, while reading material, the designer should attempt to identify organizational patterns within the text and use these patterns, when present, to guide comprehension. Consider, for example, a manual for a dot-matrix printer. Some sections of the manual might use a step-by-step organizational pattern (e.g., installing a ribbon); other sections might use a problem/solution pattern (e.g., trouble-shooting printer problems). When present, organizational patterns can facilitate the initial understanding of the content presented in the manual.

As stated earlier, reading is an interaction between writer and reader. The best method of actively interacting with print materials is writing in the text (Readence, Bean, & Baldwin, 1981). Underlining main ideas, writing questions, and making comments in the margins are response modes readily available to the designer.

Written responses need not be limited to text margins. While reading, the designer can make sketches of content elements. The sketches not only aid the conceptualization process through active interaction with the material, they may also prove valuable when designing instructional materials. Graphic organizers can also be constructed while...
reading, providing a visual depiction of perceived relationships among content elements. These overt responses are indicators of an emerging conceptualization. They play a critical role in the postreading techniques described below.

Postreading Techniques

After reading the subject matter material, the designer must validate the accuracy and scope of his or her conceptualization formed while reading. In conversation with an expert, the designer attempts to describe the newly formed conceptualization. Sketches, graphs, completed charts, and other overt responses made while reading the material can help focus the conversation. During this time, the designer should make sure that he or she understands the content on the appropriate levels of comprehension.

Reading researchers commonly refer to three levels of comprehension (Herber, 1978; Readence, Bean, & Baldwin, 1981). While the labels for the levels vary from researcher to researcher, the basic ideas appear to be congruent. For purposes of this discussion, the three levels will be referred to as literal, interpretive, and applied.

Literal-level comprehension involves determining what the author said and identifying important information within the text. Literal-level comprehension is limited if the designer does not know the meaning of the vocabulary used in the materials, a common problem in technical areas. Literal comprehension is sometimes referred to as simply “reading the lines.”

Interpretive-level comprehension involves determining what the author meant by what was said and perceiving the relationships which exist in the information. Interpretive-level comprehension is limited if the designer does not recognize the implied relationships among content elements. Interpretive comprehension is “reading between the lines.”

Applied-level comprehension involves taking what is already known and applying it to what has just been learned. It also involves developing ideas which subsume the new and prior knowledge and extending both of them (Herber, 1978). Applied-level comprehension is directly related to prior knowledge and experience. Applied comprehension can be thought of as “reading beyond the lines.”

Of the three levels of comprehension, only two are required for conceptualizing unfamiliar content—literal and interpretive. Both levels must be validated through interactions with an expert.

When validating comprehension on the literal-level, the designer makes assertions (e.g., “There are only five major product categories.”) and/or asks questions (e.g., “Is the final step in the process to run a printer test?”) The assertions and questions are text-based; that is, they can be traced directly to parts of the materials read. Rather than an exhaustive listing of all content elements, validation on the literal-level should be a representative sampling of the main content elements presented in the text. Failure to validate comprehension on the literal-level risks including incorrect content or excluding critical content from the instruction.

When validating comprehension on the interpretive-level, the designer draws inferences from the content and presents the inferences to an expert for verification. Inferences can be presented by paraphrasing content and by stating relationships not directly presented in the text. Failure to validate comprehension on the interpretive-level risks the formation of an inaccurate or incomplete conceptualization.

Interpretive-level comprehension enables one to perceive the relationships which exist in information, conceptualize the ideas formulated by those relationships, and express those relationships in either written or oral form (Herber, 1978). Interpretive-level comprehension is the essence of content conceptualization. In other words, when a designer successfully engages in interpretive-level comprehension, the conceptualization process is complete, thus making applied-level comprehension unnecessary.

Summary

This paper provides an overview of how a designer can conceptualize unfamiliar content by reading subject-matter materials. Drawing from the content-area reading literature, prereading, during-reading, and postreading techniques are suggested for facilitating the conceptualization process. Prereading techniques help prepare the designer to organize and associate new content within a broad, meaningful context. During-reading techniques help facilitate the indirect interaction between the writer of subject-matter materials and the instructional designers. Postreading techniques are primarily concerned with validating the designers newly formed

<table>
<thead>
<tr>
<th>Variable print mode</th>
<th>Character sets</th>
<th>Graphics output</th>
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<tbody>
<tr>
<td>Printer 1</td>
<td></td>
<td></td>
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<tr>
<td>Printer 2</td>
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<tr>
<td>Printer 3</td>
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<tr>
<td>Printer 4</td>
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</tbody>
</table>

Figure 2. Features analysis (or data chart) matrix for operation various printers
conceptualization. When used in conjunction with subject-matter expert interviews, these information collecting and processing techniques should improve the conceptualization process.

References


