A Cross-cultural Comparison of the Use of Graphics in Scientific and Technical Communication

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Communication styles differ among cultures. According to Hall (1997), cultures can be grouped along a continuum from low-context to high-context. "A high-context . . . communication or message is one in which most of the information is either in the physical context or internalized in the person, while very little is in the coded, explicit, transmitted part of the message. A low-context . . . communication is just the opposite, . . . the mass of the information is vested in the explicit code" (p. 47).

Considerable research has been done on the stylistic differences among cultures in terms of verbal and behavioral aspects (Stewart and Bennett 1991; Hall and Hall 1990; Yum 1997). Among other characteristics identified in high-context cultures, indirect instead of direct style is preferred in daily communication (Yum 1997), while in a low-context culture, communication tends to be problem-oriented, direct, explicit, personal, and informal (Stewart and Bennett 1991). As computer technology ushers in a new communication model that promotes a convergence of verbal and visual language (Search 1993), it makes sense to ask whether these stylistic differences are also reflected in visual communication.

This study explores differences in the use of graphics in China, a high-context culture, and the U.S., a low-context culture. Visuals from the two cultures will be compared and analyzed. Possible reasons for the differences will be discussed in terms of the larger cultural background.

APPROACHES TO VISUAL LANGUAGE
The prevalence of computer technology gives momentum to study of and research about visual communication. One issue under frequent discussion is the universality of graphics. Are pictures universal or are they culturally specific? Kostelnick (1995, p. 184) proposes a two-ended continuum along which to position various approaches:

Global ———— Culture-focused

With an interest in the universal features of pictures, the global approaches emphasize universal perceptual principles. Adherents of this approach believe that because visual elements such as lines and shapes are perceived the same way regardless of the viewers' cultural backgrounds, graphics can bridge people of various cultures (Horton 1993). On the other end, the culture-specific camp views visual communication as closely bound to experience; therefore, visual design must reflect social and cultural values (Kostelnick 1995).

Both approaches are supported empirically (for a summary of research on the universal approach, see Kostelnick 1994). However, with the rise of postmodernism, more research has focused on cultural diversity and its impact on communication, supporting the view that visual communication is shaped by culture. The same visual symbols presented to observers from different cultures may generate quite contradictory responses (Tzeng, Trung, and Rieber 1990).

For example, Maitra and Goswami (1995) examined the visual design of a Japanese company’s annual report and found very distinctive design features. For the Japanese, the design (page layout, pictures used, and formatting) is intended to show off, to impress the reader. It typically emphasizes esthetic effects and ambiguity, a rhe-
torical preference in that culture (p. 198). Because these concepts differ so much from American expectations and standards, when the document was presented to American readers, they were confused and indicated their disapproval of the design.

While these studies are revealing, additional case studies are needed to identify specific differences among cultures so that document designers can effectively adjust their style when communicating internationally.

**THIS CASE STUDY**

The research reviewed suggests that visual communication is influenced by convention and experience. Readers in one culture may have difficulty approaching the visual language of another culture. But how does one culture differ from another in using visual means for communication? Evidence can be obtained only through careful analysis. This study compares visuals (graphics, line drawings, photos, tables, and so forth) used in two distinct cultures, China and the U.S. The visuals cover both scientific and technical subjects and are intended for general readers. The purpose is to identify stylistic features or conventions specific to each culture. Two questions are addressed:

1. **How do these two cultures differ in their use of visuals to convey scientific and technical information?**
2. **What are the possible reasons for these differences?**

**Methodology and selection criteria**

Samples for comparison were selected from two sources: popular science magazines and instruction manuals for household products. So that the research can focus on stylistic characteristics, the visuals selected from the two cultures should be similar, if not identical, in such characteristics as subject matter, level of technical detail, and, for ease of handling, size.

For comparison of visuals used in scientific communication in the two cultures, I selected reports about Dolly, the sheep cloned from a single cell in 1997 by scientists at Edinburgh’s Roslin Institute. The breakthrough received wide coverage both in the U.S. and in China; thus, this topic was appropriate for a comparison. Specifically, the visuals chosen illustrate how Dolly was created. The visuals appeared in popular science magazines, so they were intended for general readers who are interested in the topic but who do not have much prior knowledge about the techniques used. The visuals are therefore not highly technical. Four visuals were selected, two from Chinese sources and two from American sources (see Figure 1, Figure 2, Figure 3, and Figure 4).

For comparison of visuals from technical manuals, I decided to select visuals from instruction manuals for small household electronic appliances. I also determined in advance that the manuals must be the size of a sheet of paper, not a booklet. These criteria would ensure that the visuals chosen would be similar in subject, low in level of technical detail, and small in size. Two Chinese manuals and two

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**Figure 1.** “Graphical of cloning,” by Xiaoyan Ding and drawn by Heshong Han, appeared in a Chinese magazine, Popular medicine, in 1997.

**Figure 2.** “The myth of a cloned sheep” by Zhao Shizhou appeared in the Chinese magazine We love science in 1997.
American manuals were chosen (see Figure 5, Figure 6, Figure 7, and Figure 8).

**Description of sample visuals**

Figure 1, which appeared in the Chinese magazine *Popular medicine*, is a stand-alone picture with title and author information. This graphic is divided into three sections with the subtitles “Sexual reproduction,” “Embryo clone,” and “Body cell clone.” From top to bottom, it shows the development from natural reproduction to the newest technique in reproduction. In each section, an example is provided to illustrate the concept: humans for sexual reproduction, monkeys for embryo cloning, and a sheep for body cell cloning. Brief text in each section of the illustration explains the basic idea. Captions are placed around small images.

Figure 2, which appeared in the Chinese magazine *We love science*, is composed of four images titled as follows: 1. An egg, 2. Egg nucleus removed, 3. The nucleus of an udder cell inserted in the egg cell, 4. Developing into an embryo.

Figure 3, from the American publication *Science news*, consists of seven small images that show the steps of producing Dolly. From left to right, the visual begins with a sheep and an egg, and ends with Dolly.

In Figure 4, from the American magazine *Discover*, three photos illustrate the three essential steps in the cloning process.

Figure 5 shows graphics used in the manual for a ventilator manufactured in China. The graphic in the middle illustrates how to install the ventilator. On the right side are wiring layouts of three product models. At the bottom is a table of technical data.

Figure 6 presents a group of four graphics in the middle that illustrate how to assemble a radiator manufactured in China. On the left is a table of technical specifications. The illustration on the top right shows the switches in action. The drawing at the bottom shows the temperature regulator. Below the original Chinese texts, English translation is provided.

Figure 7 shows graphics in the manual for the Lasko table fan, manufactured in the U.S. At top right is a description of parts. The middle section illustrates how to assemble the fan. At the bottom left is a picture of the fan that illustrates operation.

Figure 8 reproduces graphics in the manual for a Black & Decker coffeemaker manufactured in the U.S. Two pictures show the reader how to use the coffeemaker.

**Analysis criteria**

These aspects of visuals will be analyzed:

**Verbal-visual integration**

Graphics may be used for various purposes. In technical documents, however, the main purpose is to help the reader visualize information (Tufte 1983). Graphics repeat the information presented in the text and clarify what might be vague or too abstract to grasp. In other words, they complement verbal presentation of the content, making it more accessible to the reader. There may be various ways to group and relate graphics with their corresponding texts. Conventions of the cultures chosen for this study may play an important role.
Information selected for graphics  What kind of information is selected for graphic presentation? Reader need is a primary consideration in manual design. The amount and type of graphic presentation may reflect the designer's view of potential readers and the designer's assessment of reader needs. This may not be the same in the two cultures selected for analysis.

Techniques used to enhance understanding and usability  To make a scientific piece easy to understand and a technical manual usable, many techniques are available. But convention and experience may, to certain extent, determine what methods are preferable in the two cultures studied here.

ANALYSIS OF VISUALS

Verbal-visual integration  Of the four visuals about Dolly, Figure 2, Figure 3, and Figure 4 illustrate ideas explained in the articles. Placed within a text, each of these graphics is part of the article in which it appears. Picture and text are integrated through positioning. In Figure 1, on the other hand, the picture is dominant. Short texts within the picture explain the small images. Text-visual integration is also achieved through positioning image and caption close to each other. In this group of visuals, no differences are found between cultures.

Significant differences are found in the instruction manuals, however. The American manuals show much better text-visual integration than the Chinese manuals. For example, to tell the reader how to assemble a fan (Figure 7), each action is explained in words and illustrated in picture. With the verbal explanation and the picture in a single cell, no one can miss the reference. The same approach is used in the coffeemaker manual (Figure 8). Each graphic is labeled and referred to in the caption.

In contrast, the Chinese visuals are not so well connected with the texts to which they correspond. In Figure 5, the graphic in the middle is meant to illustrate how to install the ventilator. But there is no direct correspondence between the illustration and the verbal explanation (on the left). On the left side, below the second heading "Installation," is a list of four steps. The steps, however, do not correspond to the picture, although the title above the picture reads "Illustration for installing." What the picture shows is how the frame of the ventilator should look and how the ventilator should be positioned in a window. The graphic in Figure 6 is not well integrated with text either.
Figure 6. Graphics in the manual for the Fei Tian Electronic Radiator.

Information selected for graphics
Since the topic of the Dolly visuals is identical, Figures 1 and 2 are similar to Figures 3 and 4 in terms of content except that Figure 1 contains more contextual information. Including contextual information in Figure 1 is a rhetorical strategy that will be discussed later in this analysis. A salient cultural difference in information selection shows up in the manual illustrations, however.

Both the Chinese and the American manuals include pictures on installing or assembling the products, but the Chinese graphics are few and small in proportion (see Figure 5 and Figure 6). More space is devoted to visuals that present technical information, such as the table at bottom of Figure 5, the table on the left, and the wiring layout at the top right in Figure 6. Visuals presenting technical data are not found in the American manuals; instead, prominent pictures show readers how to perform tasks (see Figure 7 and Figure 8).

Visually heavier than words, pictures are usually used for emphasis. The graphics in the two sets of manual illustrations indicate a difference of emphasis, the American on task performance and the Chinese on product information.

Techniques used to enhance understanding and usability
To enhance comprehension of the Dolly experiment, the strategy in Figure 1 is to move from familiar to unfamiliar and from basic to advanced. The picture begins with the idea of natural reproduction (the first section), then introduces an early cloning technique (the second section), and then moves on to the technique of cloning from a body cell (the third section). In this way, the first two sections set the stage for the new concept.

Figure 2 does not show this stage setting in itself, but the verbal description in the article follows exactly the same pattern. First, it describes how plants such as sunflowers are pollinated to produce seeds, and then how plants such as willows and low-order animals can be reproduced in a non-sexual way, and finally how Dolly was cloned. This rhetorical technique is not found in the American visuals and articles. The American visuals are focused and direct.
In the manuals, the American graphics are prominently numbered or labeled to help the user complete a task. In this sense, the Chinese manuals are less user-friendly; the illustrations are very brief. But by displaying technical information, the Chinese manuals meet the needs of another group of users, mechanics whose job it is to repair the product.

**FINDINGS**

The comparison reveals several differences in the way the Chinese and the American use visuals.

When presenting a new idea to general readers, the Chinese tend to provide more contextual information, while the Americans tend to be direct.

There is a difference in emphasis. The American manuals emphasize task performance. Illustrations are more detailed, larger in size, and prominently marked. The Chinese manuals, with tables and a wiring layout, give greater weight to technical information.

The American manuals show better text-visual integration. In the Chinese manuals, there is no clear one-on-one correspondence between a graphic and a verbal explanation.

**DISCUSSION**

The results of this comparison correspond to the general communication styles in the two cultures. Chinese thought patterns are usually described as holistic and relational (Granet 1950). This type of thinking strives for unity between objects or events. An event is viewed and related to other events. Context, therefore, is always an important part of understanding and communication in this culture. This may account for the stage-setting in the first Dolly visual (Figure 1). The other Chinese visual about Dolly (Figure 2) does not include this stage setting in the illustration itself, but in the accompanying article, the description follows exactly the same pattern. This pattern is not found in the American visuals or the articles that accompany them.

Although in a subtle way, this Chinese style is also shown in the manuals. The task, assembling or installing a product, is illustrated briefly. The assumption may be that with real objects around and the knowledge of a user, it is not necessary to spell out every detail.

The American visuals also correspond to the general style of how Americans communicate. Stewart and Bennett (1991) summarize the typical American communication pattern as “problem oriented, direct, explicit, personal, and informal” (p. 155). This style is clearly seen in the manuals. In the American culture, the purpose of a manual is to help the user solve a problem. Therefore, the steps to perform the task are clearly identified and explained.

A major difference between the Chinese manuals and the American manuals is the inclusion of visuals that contain technical data. In China, it is conventional to include tables with this kind of information in manuals for electronic products. Even for a small item like a telephone, a wiring layout would be included in the manual. This information seems irrelevant to a user, but it is certainly useful to repair personnel, who would find that the technical specifications would help them repair broken or malfunctioning products.

In analyzing the visuals, some other differences in manual design also surfaced. For example, in the American manuals, more emphasis markers are used (bold font, icons) for notes and warnings. Tools for performing a task are always specified. These features were not found in the Chinese manuals.

Do the differences in Chinese and American approaches to visual communication affect understanding or performance? When a Chinese Dolly graphic (Figure 1) was shown to American viewers, they said they could under-
stand the visual components. But in visual communication, the issue is often in the affective domain. In other words, do the viewers like the illustration? Perhaps they regard the stage-setting approach used in the Chinese illustration as redundant, reflecting an underestimation of the reader's intelligence. Another question is whether the detailed American illustrations used in the table fan manual enable the user to complete the task more easily than the illustrations in a manual for a Chinese product. Perhaps readers would think that economy, a principle of communication, suffers if they are presented with too much information. Empirical studies are needed to investigate these issues.

CONCLUSION
A comparison of the use of visuals in China and the U.S. reveal several differences. These stylistic differences have roots in the very different cultural backgrounds of the two countries. The findings suggest that visuals used in technical and scientific communication, domains often characterized as universal and neutral, are not free from cultural influence.

The findings from this study are particularly relevant to technical communicators. Computer technology is making intercultural communication increasingly faster, more frequent, and more visual. More than ever, technical communicators are involved in global communication, which requires them to reach out to readers who do not share their background. Knowledge of the target culture—including conventions, patterns of thought, behavior, or even the philosophy that prevails—will help them make good decisions.

In short, the findings suggest that when communicating to the Chinese reader, technical communicators should use visuals and text that provide an overview or context. When designing an instruction manual, technical communicators should include information about technical aspects of the product. When communicating to the American reader, the technical communicator should be direct and focused. In an instruction manual, the emphasis should be on performing tasks.

REFERENCES


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