# Interpreting Graphics

*Damrong Attaprechakul**

## Abstract

Graphics accompanying a text contain a wealth of information in a compact and attractive format. This paper sets out to define what a graphic is and to classify various types of graphics. The main discussion deals with how to interpret graphic information. Extracting information from graphics can be done at two levels: factual and inferential. Procedural steps for doing so are detailed, both theoretically and practically, through a sample graphic showing Asia's megacities of 1995 and 2025. Factual interpreting is straightforward and relatively simple. Thinking is an important element in determining the implied meaning. The ability to interpret the explicit and implicit messages from graphics plays a vital role in everyone's daily life in the information age.

Readers usually spend a great deal of time processing printed texts in their daily life either for work or for personal pleasure. For most people, there is a general feeling of not having enough time to do all the reading. New areas of interest spring up and attract their attention. At the same time, existing knowledge seems to be fading into obsolescence, requiring time for constant updating. The global society looks flooded with information.

Fortunately, new ways of data presentation also emerge. Text is rarely pages of purely words as it used to be. Charts and graphs often accompany a written piece. Such illustrations provide invaluable information besides making the text more appealing to readers. These visual

*Thammasat University Language Institute

aids simplify or clarify points of complexity. They highlight important ideas and communicate a great deal of data. These graphics demand careful and concentrated effort of any reader. The information gained is also highly rewarding.

This article deals mainly with techniques in interpreting graphic information. Readers will discover how to read a graphic at two cognitive levels. The first is at the surface level to gather relatively more obvious facts. The next is at a deeper level to draw conclusions that might not be readily obvious but highly meaningful.

## Definition

The term "graphic" as defined here refers to any visual display that conveys intended information in an organized manner. A graphic may appear in the form of a table or figure. It may consist of words, numbers, drawings, symbols or the combination of these. Color is often employed to highlight information presented in graphics (Allen, 1998).

The main purpose of a graphic is to illustrate, summarize or represent information in a quick and easy way to understand. A good graphic can readily clarify or simplify a concept. Some graphics, however, may pack a considerable amount of information at various degrees of complexity in the most economical space.

Some other terms currently used synonymously with "graphics" are visual aids and illustrations (Pfeiffer and Keller, Jr., 2000). The word "graphic" is perhaps the most general. The word is gaining much recognition as computer graphics software programs to generate graphic designs become popularized among the general public.

## Graphic Types

Graphics can be divided into two main types: tables and figures. Tables present information in rows and columns for easy reading and comparison. Most tables contain numbers, but it is not uncommon to have tables of purely words or groups of words.

Any visual displays that are not tables are collectively referred to as figures. These include graphs, charts, diagrams, maps and photographs (Wiener and Bazerman, 1999).

Graphs are often used to concretely present information plotted along two axes, the horizontal (or *x*) axis and the vertical (or *y*) axis. Graphs come in one of three forms: bar, line or circle. The last one is also known as a pie chart.

Charts show items in a certain relationship. For example, a pop music chart is a list of most popular songs at a certain time. Procedural steps in a process are frequently displayed in the form of a flow chart. An organization chart shows hierarchical relationships among workers. Events in history can be depicted through a time line chart. Charts are also used to present work schedules, i.e., how long and when a piece of work is to be completed. Bus and train schedules can be charted and posted at prominent places.

Diagrams are relatively simple drawings to illustrate certain points. Common diagrams we encounter are Venn diagrams (showing areas of similarity/difference or membership status), tree diagrams (showing classification or lineage), fishbone diagrams (showing main and supporting ideas of a text in an outlining attempt), and diagrammatic representations of some systems (e.g., a circuit diagram) or networks (e.g., subway routes).

Maps and photographs are most familiar to all. They are commonly used and have become an essential part of text illustration.

## How to Interpret Tables and Graphs

As texts can be read at both the literal and figurative levels, graphics can be interpreted at both the factual and inferential levels. Factual information is fairly obvious and simple to understand, provided a reader knows what type of graphics is employed and what that specific graphic intends to express (Atkinson and Longman, 1999). The inferred message is more difficult to get and requires much knowledge plus sound logical thinking.

## Factual Information

Graphics are commonly used to describe as well as to compare facts. Graphics can describe state, process, trend, composition and direction. This description is the basis for comparison so that some kind of relationship can be discerned or established.

Different types of graphics are suitable for describing and comparing different types of information and relationships. In general, tables are best when the information must be shown accurately, compactly and with as much detail as possible (Sotiriou, 1996). The column and row format facilitates reading and comparing of data. A bar graph, on the other hand, can accommodate much less information, but it provides concreteness and prominence, though at the cost of precision. A line graph is suitable for depicting a trend or a gap in the movement of some facts. A pie chart is ideal for showing whole-part relationships, i.e., what parts constitute a whole and in which proportion.

The ability to identify the type of graphics used to illustrate the point is only the first step. The graphic type, however, does not tell about its content. A reader must next look at the title, generally printed in bold typeface and centered at the top of the illustration. The title announces the main point, telling in a nutshell what the graphic is about. It is usually written in a noun phrase. Sometimes a caption, a fuller description of the title, is added. Like a topic sentence of a paragraph, the caption expresses the main idea of the graphic.

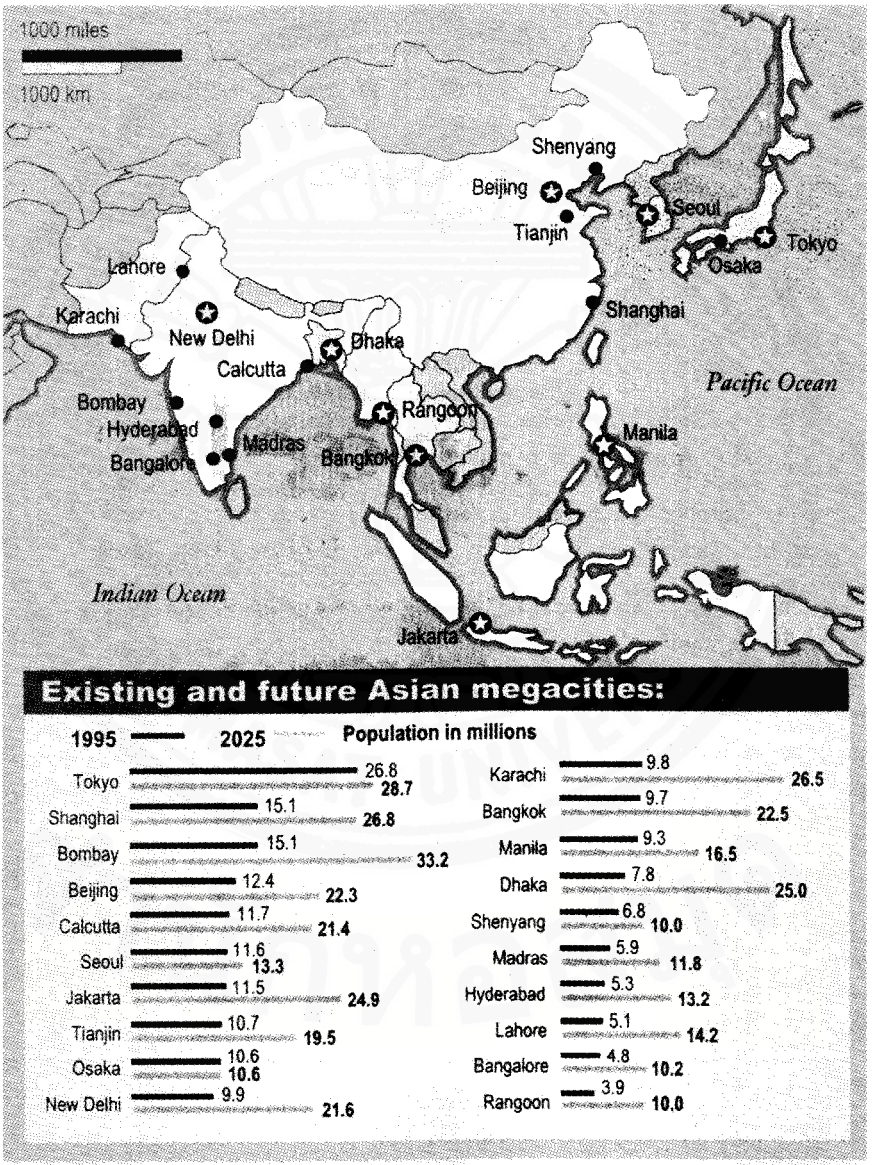
Having read the title, readers should glance at the labels for main divisions. Notice the unit of measurement for each label, e.g., kilogram or ton (weight), day or year (time), or *baht* or dollar (currency). It is also important to look at any notes for the items shown. A note may indicate different units of measurement or extra information.

The title and labels of the graphic provide readers with the main headings or framework necessary for making sense of detailed information. Readers are to extract specific facts according to their need for information.

A graphic depicting Asian megacities is used to illustrate how to interpret tables and graphs (see Figure 1).

**Figure 1:** Bar graph showing existing and future Asian megacities

*Existing and Future Asian Megacities (population in millions)*




**Source:** *The Bangkok Post,* Sunday, October 12, 1997, p. 5 (Perspective)

# Megacity Graph: Understanding Fact

## *Step 1: Graphic Type*

The first step in getting factual information from the graph shown in Figure 1 is to identify the type of graph. It is clear that this is a bar graph. Its purpose is to describe and compare.

## *Step 2: Title*

The second step is to read the title, which is ***"Existing and Future Asian Megacities."*** So this is the topic the graph deals with: large cities in Asia now and in the future.

## *Step 3: Labels*

The third step is to look at the labels. There are three main labels: city names, population in millions, and years.

The name of each city is a label or heading for each pair of bars. These cities are located in Asia and are considered ***"megacities."***

The label, ***population in millions,*** means the number of people. The unit of measurement is a million people. The number of people in millions is shown by the length of each bar in the graph. Though the length of all bars is scaled, it is quite difficult to determine how many million people each bar stands for, unless the exact number is added at the end of each bar. This is a limitation of a bar graph compared to a table.

The graph shows the facts in 1995 and 2025. The word ***"Existing"*** in the title is matched with 1995, meaning existing facts since 1995. The year 2025 is apparently the ***"future."*** The facts of 2025 are estimated or projected values, which might vary during the course of time.

To summarize, labels indicate major divisions of information as displayed by the bar graph. The labels are to be interpreted in relation to the title. In this case, the label ***"population in millions"*** is key to interpreting detailed information represented by the length of each bar.

### *Step 4: Facts*

The fourth step is to examine separate facts and make comparisons. This usually requires readers to observe extreme cases, e.g., the largest or the smallest of the top twenty megacities in Asia in 1995 and 2025. Sequencing of facts is also indicative of the importance of that fact in relation to others. It is obviously noticeable that cities are shown in order of their 1995 status. The largest megacity, Tokyo, with 26.8 million inhabitants, is the first one, and then the next largest city all the way down to the smallest one, Rangoon, with 3.9 million people.

Note that the ranking for 2025, thirty years afterwards, will not remain the same.

If the projected population for 2025 stands, the largest megacity will be Bombay (33.2 million people), replacing Tokyo. The smallest megacity, Rangoon, will more than double its present size. In fact, the minimum size of ten million people is a pre-requisite for a metropolis to qualify as a megacity in 2025.

By now readers should be able to obtain most or all factual information presented in this bar graph. This is fairly simple and straightforward.

The above discussion centers on getting the basic facts from the megacity bar graph. This is only one side of the coin. The other side is its implied meaning. Readers will have to determine what else this bar graph shows implicitly and how to read it at the inferential level.

## Inferred Message

Graphics also suggest much more information than basic facts. Readers are supposed to read between the lines and gather the hidden meaning. This requires considerably higher thinking skill.

There are three main steps in understanding the inferred message. Firstly, readers must have a definite purpose when examining the data. Secondly, they must possess background knowledge relevant to the topic of illustration. Such knowledge might be facts acquired through years of formal and informal education, commonly shared beliefs and values

in society, and even highly technical expertise on the subject. Thirdly, readers must be able to apply existing knowledge to draw valid conclusions and to evaluate the information.

In order to ensure that inferences are properly derived, readers should observe extra information provided through notes that explain the title or labels in the graphic, if there are any notes. It is also important to check the source of information for degree of objectivity and the reliability of facts provided.

Interpreting graphics at the inferential level is no easy task to accomplish. This involves thinking. It is the heart of education in the modern time.

Let us return to the graph, *Existing and Future Asian Megacities,* and see what hidden meaning there is to infer.

## Megacity Graph: Inferring the Hidden Meaning

More challenging than getting basic factual information is being able to draw inferences and evaluate what the graphic shows. Two powerful techniques readers depend on are analyzing and synthesizing the given facts.

### *Analyzing*

To analyze is simply to break the information down into various parts, and examine those parts in order to draw valid conclusions.

Since making inferences is a reader-based process, readers must have a definite purpose in mind when approaching the graphic at hand. Readers scrutinizing the data in the megacity graph, for example, may want to know how each megacity changes from 1995 to 2025. This is relevant because readers will have observed that the twenty megacities will rank differently in 2025.

Readers can easily see from the graph that population in 2025 tends to grow from 1995. This is true of all cities, except for Osaka, whose population remains stable over the thirty-year period. Thus, by analyzing

the data shown in the graph, readers may be able to make the following conclusions:

1. Most cities will continue to grow from 1995 through 2025.
2. Osaka is unique in that its population will remain somewhat the same.
3. Some cities will show a small growth rate.
4. Some cities will experience a rapid growth rate.

If readers try to analyze further, it becomes clear that cities such as Dhaka and Lahore will face a much faster pace of growth than other cities, especially Tokyo and Seoul.

### *Synthesizing*

To synthesize is to combine or group separate facts together so that a larger, and thus a more meaningful, picture becomes evident. Synthesis leads to generalization, a useful summary statement governing a set of underlying data. The twenty cities in the graph, for instance, can be grouped according to the country in which the cities are located.

It is necessary to draw on prior knowledge to enhance one's understanding of the graphic material. In this case of Asian megacities, it is crucial that readers have a knowledge of geography and be able to recognize and associate cities with countries. With this knowledge, readers may certainly draw the following conclusions concerning the twenty megacities:

1. The information shown represents ten countries: India, China, Japan, Pakistan, South Korea, the Philippines, Indonesia, Thailand, Bangladesh and Myanmar.

2. India has the most megacities with six: Bombay, Calcutta, New Delhi, Madras, Hyderabad and Bangalore.

3. Four cities in China, namely Shanghai, Beijing, Tianjin and Shenyang, are megacities.

4. Japan (Tokyo and Osaka) and Pakistan (Karachi and Lahore) have two megacities each.

5. One megacity exists in each of the remaining countries.

6. A capital city may not always be the largest city of the country. Neither New Delhi nor Beijing is the largest city in India or China.

7. The capital city of Pakistan does not have enough people to qualify as a megacity.

These conclusions, though rather simple, will enable readers to gain more complex and more significant insights.

### *Inferencing*

The next question readers might ask is: ***Which countries will experience the most rapid urban population growth rate?***

Having set up such a purpose, readers need to refer to the length of the two bars for each city (see Figure 1), observe the change and work out the growth rate. Take Madras as an example. Madras had 5.9 million people in 1995 and would be home for 11.8 million in 2025, an increase of 5.9 million. That means the population growth rate for Madras is 100 percent.

By repeating this observation, it is possible to approximate the growth rate for each city. The final results are shown in Figure 2. The table represents the exact data as depicted by the bar graph in Figure 1. The last column, labeled ***% Change,*** has been added to show the population growth rate.

**Figure 2:** Table showing the growth rate of Asian megacities

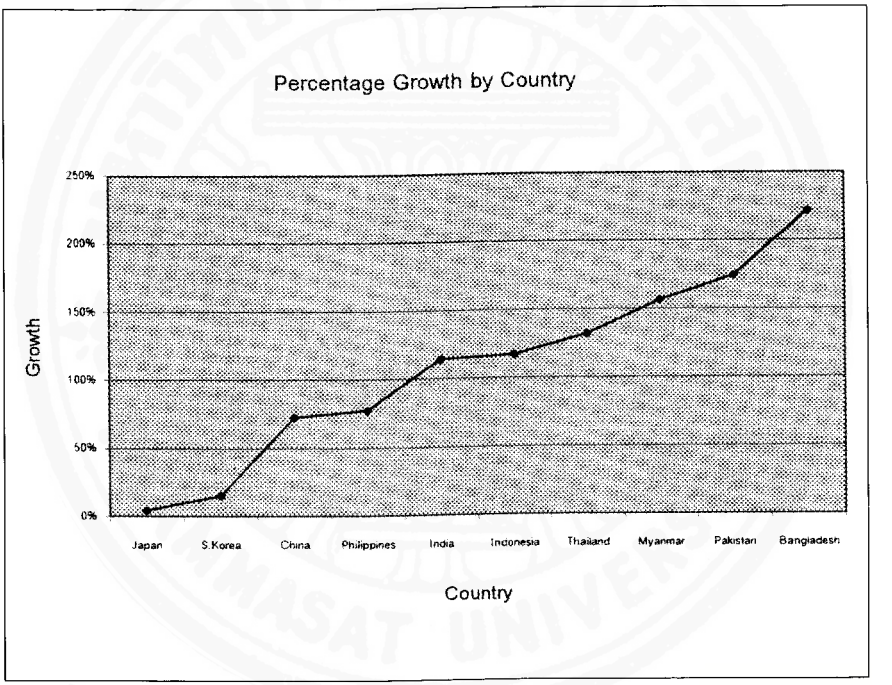
*Existing and Future Asian Megacities*

| City | population in millions | | % Change |
|---|---|---|---|
| | 1995 | 2025* | |
| Tokyo | 26.8 | 28.7 | 7 |
| Shanghai | 15.1 | 26.8 | 77 |
| Bombay | 15.1 | 33.2 | 120 |
| Beijing | 12.4 | 22.3 | 80 |
| Calcutta | 11.7 | 21.4 | 83 |
| Seoul | 11.6 | 13.3 | 15 |
| Jakarta | 11.5 | 24.9 | 117 |
| Tianjin | 10.7 | 19.5 | 82 |
| Osaka | 10.6 | 10.6 | 0 |
| New Delhi | 9.9 | 21.6 | 118 |
| Karachi | 9.8 | 26.5 | 170 |
| Bangkok | 9.7 | 22.5 | 132 |
| Manila | 9.3 | 16.5 | 77 |
| Dhaka | 7.8 | 25.0 | 221 |
| Shenyang | 6.8 | 10.0 | 47 |
| Madras | 5.9 | 11.8 | 100 |
| Hyderabad | 5.3 | 13.2 | 149 |
| Lahore | 5.1 | 14.2 | 178 |
| Bangalore | 4.8 | 10.2 | 113 |
| Rangoon | 3.9 | 10.0 | 156 |

*estimated

Interpreting the city growth rates in terms of countries, Japan shows the smallest growth rate while Bangladesh has the fastest growth rate. The line graph in Figure 3 shows how fast the cities in ten Asian countries will grow, from the slowest to the fastest.

**Figure 3:** Line graph showing percentage growth of megacities by country




The answer to the question posted earlier, ***"Which countries will experience the most rapid urban population growth rate?"*** is crystal clear now: Bangladesh and Pakistan. Dhaka, capital of Bangladesh, has a projected growth rate of 221 percent. Pakistan's megacities, Karachi and Lahore, will grow an average of 174 percent. This is in sharp contrast to Japan (3.5 percent) and South Korea (15 percent).

To summarize, the bar graph shown in Figure 1 not only describes the size of existing and future Asian megacities but also reveals the pace of population growth. By means of analysis and synthesis, readers with

a specific purpose are able to infer that Pakistan and Bangladesh, unlike Japan and South Korea, will face explosive population expansions in their major cities.

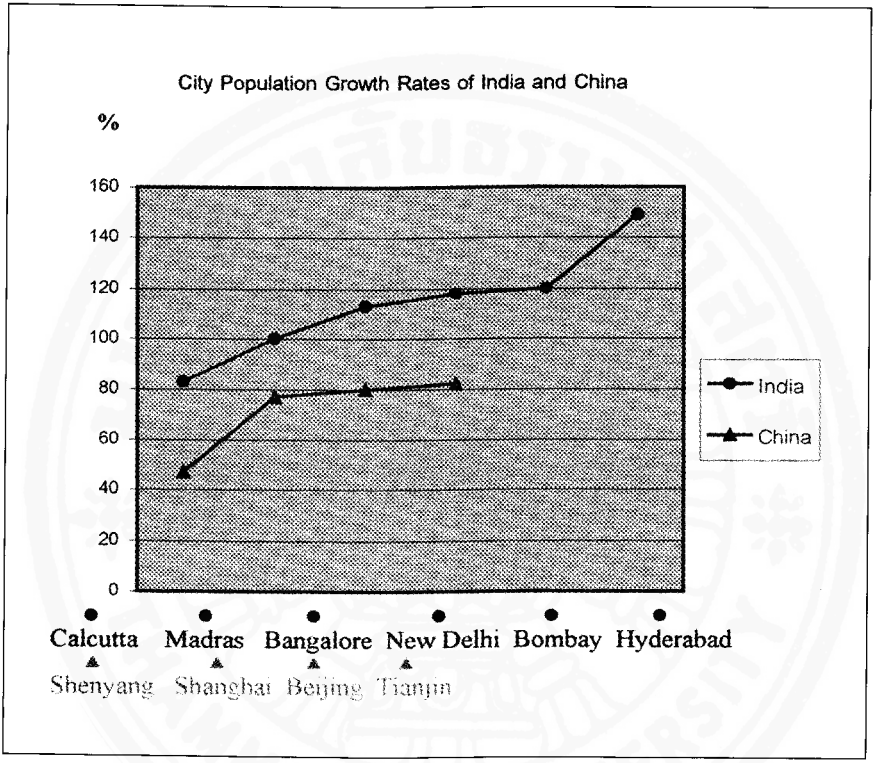
Readers can reach a similar conclusion in the case of India and China. Both countries have the lion's share of the world's population. Both are cradles of eastern civilization. Both have a number of megacities. Do they also share common urban population growth rates?

Refer to the previous figures and try to answer the following questions:

1. Even though Shanghai and Bombay had equal populations of 15.1 million people in 1995, will Shanghai be as populous as Bombay in 2025?
2. How does Beijing compare to New Delhi, both being capital cities?
3. How does Shenyang compare to Madras?
4. Overall, what is the growth rate for Chinese megacities compared to Indian megacities?

While the answers to questions 1-3 may be gleaned from an examination of Figure 1, question 4 requires further work of the reader. The line graph in Figure 4 concretely contrasts the different growth rates of Indian and Chinese megacities. The four megacities in China grow at a pace of 47 to 82 percent. The range for India's six megacities starts at 83 percent and climbs all the way up to 149 percent. Indian cities uniformly grow at much faster rates than Chinese cities do.

**Figure 4:** Line graph comparing megacity population growth rates of India and China




Having reached this conclusion, readers can predict the subsequent impact on the two countries. China seems to have more effective control over future expansion relative to India which will face a more serious situation. This inference is one hidden message of the Asian megacity graphic.

In brief, readers stand to gain a deeper understanding of facts and implications when they are able to interpret graphics at the inferential level.

### *Evaluating*

Interpreting graphics at the inferential level does not stop at being able to draw valid conclusions, formulate generalizations and making logical predictions. Readers are supposed to evaluate the information as well.

Basically, evaluating means forming judgments concerning the validity of data, personal reactions to the issue and the application of information.

An important clue to evaluating data validity is in the source of information. This is usually printed at the bottom of the graphic.

The source of the ***Existing and Future Asian Megacities*** graphic is the Asian Development Bank. The data should be accurate and reliable.

In spite of the credible source, some readers may express some reservations about the data provided. For example, Thai readers may suspect the 1995 figure for Bangkok's population. That is to say, some may not be convinced that Bangkok had 9.7 million people in 1995. These readers may argue that the official figure is much lower, perhaps at six million. Thus, the estimated 22.5 million in 2025 is far too high.

Or is it possible that the 9.7 million is never meant to represent an official figure? It is rather an estimated number of actual people who keep Bangkok a vibrant city. These are people who commute in and out of the city, work there but do not necessarily register residence in Bangkok. Many have their homes in neighboring provinces while others are migrant workers from all over the kingdom. From this perspective, 9.7 million seems reasonable and real.

Still, there remains the issue of whether the projected size of Bangkok in 2025 as a city of 22.5 million is acceptable or desirable to readers. In other words, how can readers evaluate the growth rate of Bangkok?

In light of the earlier discussion, the population growth rate of 132 percent makes Bangkok one of Asia's fastest boom towns. Bangkok is growing even faster than most megacities of India. This is bad news for Bangkok. Readers can easily predict that Bangkok will be under

tremendous pressure due to its intense growth. It is difficult to imagine how the city is going to cope with rising problems. Ways to slow down the overcrowding in Bangkok must be earnestly sought and implemented in a timely manner.

This is one way of evaluating the data presented in the Asian megacity graph. Individual readers will bring in their own background knowledge and personal biases in their evaluation of any text, which is quite normal and acceptable. After all, evaluating is the sharing of opinions and tends to be more subjective than objective. It is, however, important to offer relevant, logically sound and well-supported viewpoints.

In conclusion, graphics are helpful visual aids that enable readers to comprehend text more easily and thoroughly. When approaching a graphic, readers should identify its type, look at the title, locate labels and scan extra information in the notes, including the source, before examining specific facts. These facts are to be interpreted in relation to the title and labels. Having gathered the basic factual information, readers should examine the graphic for its broader significance. This requires a definite goal as well as an ability to analyze and synthesize data. The resulting generalization enriches readers' understanding of the surface facts and allows logical evaluation of the data presented in the graphic.

Interpreting graphics at both the factual and inferential levels requires and reinforces the ability to think. Learning to interpret graphics is a useful tool to sharpen one's thinking power for the technologically driven society of today.

# References

Allen, J. (1998). *Writing in the workplace.* Needham Heights, MA: Allyn and Bacon.

Atkinson, R. H. & Longman, D. (1999). *Reading enhancement and development* (6th ed.). Belmont, CA: Wadsworth.

Pfeiffer, W. S. & Keller, C. H. (2000). *Proposal writing: The art of friendly and winning persuasion.* Upper Saddle River, NJ: Prentice-Hall.

Sotiriou, P. E. (1996). *Integrating college study skills: Reasoning in reading, listening, and writing* (4th ed.). Belmont, CA: Wadsworth.

Wiener, H. S. & Bazerman, C. (1999). *A reader's guide.* Boston, MA: Houghton Mifflin Company.