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But What Do They Think It Means?
The Text/Image Relationship in Informational Communication

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Paper Presented in Partial Fulfillment of the
Master of Science Degree in Communication & Media Technologies
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August 11, 2004

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For my Grandmother, Sophie.

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ABSTRACT

To better understand how an audience processes information transmitted via image, text, or both, this study presented four different versions of the same message to four groups of RIT students. The message consisted of the following content: text only, text with images depicting evenly spaced years, text with images depicting irregularly spaced years, and text with irregularly spaced years. Subjects were instructed to look at the message for a set amount of time and then complete a questionnaire. Those who were given messages that had images and text felt less confused or misled than those who were given messages containing images only. Subjects reported that images and text both have the potential to mislead when trying to inform, but that the preferred method for acquiring information is that which employs both images and text together.

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Nicole Bartell

INTRODUCTION

Seeing is believing, or so they say. Most things that humans encounter on a daily basis are first perceived through the sense of sight. We see our food before we taste it, look at our clothes before we feel them against our skin, and view the pictures on the front page of the newspaper before we have a chance to read the article. It is not to say that sight is our one and only means of perceiving the world, but it does function with an immediacy that other senses do not. Because of this immediacy creators can capitalize on its power to capture an audience's interest and convey the intended statement or make their argument.

It is not only the immediacy of sight that makes messages with images so powerful and appealing, images not only capture interest in a way that text alone cannot but they also are often more easily remembered than text alone (Pettersen, 2001; Paivio, 1971; Paivio, Rogers, & Smythe, 1968). This phenomenon permeates forms of media, from print to the Internet to television and it is also applied to not only academic ventures but also commercial, persuasive messages.

Given this immediacy of sight coupled with the power of images and their ability to be recalled by a viewer, the influence of images in informational or persuasive pieces is substantial. With this influence that images can have over a given audience, the message creator is put in a unique position, with images he or she can create messages

that are undoubtedly more interesting to audiences than a text-only message would be. Interest aside, a message combining images and text can be easier to understand than a text only (or image only) message, the two elements serve to compliment one another and fill in for the other's weaknesses (Paivio, 1971; Holmes, 2002; Tufte, 2001). Finally, the combination of graphics and text serve to compensate for differences in the ways that members of an audience comprehend and process information (Lefferts, 1981). Additionally, differences in learning styles, cultural backgrounds, and even personal preferences can be overcome by combining text and images when creating a message.

While there is little skepticism about the positive effects that the image-text combination can have on the effectiveness of a message, there are serious ethical issues related to its misuse. Graphics and text when used together in a forthright manner can inform and persuade an audience to think or act in a desired fashion; however, when this combination is utilized to create misinforming, confusing, or incorrect messages the unsuspecting audience can be wrongly persuaded (Tufte, 2001; Weldon, Roediger, Beitel, & Johnston, 1995).

So just what is the connection between text and images in message production? How much can confusing messages be attributed to the image alone or the text alone? While it is a given that a burden of responsibility needs to be placed on the message creator, how much responsibility should be placed on the viewer to successfully decode a message and assess its merits or flaws? What are the overall implications of the image-text combination on message acquisition by the individual reader/viewer?

This particular investigation is concerned with all of these considerations on a general level, but will focus on the effect of the image-text combination in informational

graphics and its power to inform in either a straightforward or a confusing way.

Particularly, this investigation will focus on learning how the audience reports they process misinformation in the text or misinformation in the graphics, or both in a message.

RESEARCH QUESTIONS

1. When presented with an image and/or text message, which element or incantation of the message do respondents most misinterpret?
2. Does the inclusion of explanatory text or images aid in understanding a given message?
3. When a message is misleading or confusing, how do respondents report they understand the information? Do they find that text or images are more difficult to interpret?
4. Through which medium do respondents report they prefer to receive information? Does this differ from the methods they report that they prefer to utilize to create messages?

DEFINITION OF TERMS

Images- Refers to any pictorial representation of objects in reality or the graphical representation of abstract ideas. Lefferts (1981) has a useful definition of graphic charts that applies to this analysis, "...drawings that use lines and shapes to represent numbers and concepts" (p. 6). Other terms that are synonymous for the purposes of this study include graphic, picture, icon, illustration, diagram, and symbol.

Text- Refers to any portion of a message which utilizes written communication, "the main body of printed or written matter on a page... the principal part of a book

exclusive of front and back matter” (Merriam-Webster’s Dictionary, Internet). This term is used to refer to the portion of a message which is not illustrative. Other terms which may be considered synonymous for the purposes of this study include words, and printed material.

Message- Refers to both the overall communication, which includes text and images, as well as the individual messages created by the text alone and the image alone. In order to clarify ambiguity, the qualifiers “pictorial” and “textual” will be used when talking about the specific components of a given message.

RATIONALE

Within my studies in communication, I have found that I have a particular interest in visual communication. There is something about it that really captures my attention. I think that it is partly because I love photography and art, and secretly wish I had pursued a career in graphic design, but mostly it is because there is such power in visual communication and despite this power, it is notoriously hard to analyze and/or explain the effects of visual communication on an audience. The process of explaining why what one sees affects their thoughts and actions, or how a multitude of people can derive the same meaning (or widely divergent meanings) from the same image is difficult to say the least. As a student, I have discovered that there is a divide between information we derive from images and information we derive from text, and when we attempt to explain something we have experienced as an image through language, it can be hard to accurately describe an experience that has been largely visual.

In a Graphic Design History class, there was a lecture on Otto Neurath and Gerd Arntz and their ISOTYPE (International System of Typographic Picture Education) system, which was created as a supplementary visual aide in order to clarify information on an international level. The class viewed a report that Otto Neurath himself had created using the ISOTYPE system for the graphics. While looking at one particular page I noticed that the diagrams gave off the initial impression of one thing, but the dates that went along with it suggested another thing. The page was three maps of the borough of Manhattan and was showing population growth from 1767 to 1930. On the surface the maps appeared to show a population explosion, because the populated areas in the first two maps was a fraction of what it was in the final map. Upon looking at the page closer, I noticed the dates on the maps. The first diagram was of populated areas in 1767, the middle one was in 1805, and the final one was in 1930. I thought to myself that it was odd that there would be a 38 year difference between the first two maps and a 105 year difference between the second and third map. This was not at all an equal distribution of the time periods between when the information on the maps was drawn. I began wondering if there was a logical explanation for this disparity in the text of the document, since the document was written in German, I didn't have a chance to look and find out. However, it did spur my interest in this particular subject, and got me wondering about the effects of phenomena such as this on the audience and the outcome of any informational or persuasive attempt that message had made.

From an academic point of view, the area of visual communication does not have the same amount of research or relevant theories associated with it as some of the other subject areas. This study will utilize tactics from a variety of areas to produce results that

will add to the body of scholarly work in this area. Furthermore, it will test previously identified ideas such as Paivio's (1968; 1971) notion of picture superiority effect as well as Festinger's (1957; 1964) theory of cognitive dissonance as well as many other ideas.

Socially, this work will be another tool that message receivers can utilize to evaluate messages. It will broaden the visual literacy skills of audience members by attempting to explain why and how some messages are disseminated and absorbed by the audience. Hopefully, it will show the audience that they need to be critical of messages that they receive and that they should not always immediately take an image or an illustration for the truth.

REVIEW OF LITERATURE

In order to completely understand the question under investigation, it is important to have a working knowledge of previous work that has been done in the subject area. Relevant work can be broken down into six subject areas: picture superiority effect, visual literacy, persuasion and audience effects, characteristics of information design and technical writing, the interaction between text and images, and functions and mechanics of charts and diagrams. Comprehension of all of these subject areas is compulsory to recognizing the scope and power of the image-text combination in message creation and perception.

Picture Superiority Effect

In the study of visual communication, as well as many other disciplines, the importance of sight and its multiple nuances and facets is a central theme, especially to learning (Arnheim, 1971; Barry, 1997; Tufte, 2001; Wurman, 1989). There has been a great deal of work done in the area of the use of sight and visual cues and their impact on

learning and memory, with a major finding being the “Picture Superiority Effect” which states that generally, people have a better memory for pictures than they do for text (Pettersen, 2001; Paivio, 1971; Paivio, Rogers, & Smythe, 1968). On the surface, Picture Superiority Effect seems to be simple and rather straightforward; however, there has been much work in this particular area that shows its depth.

Scholars (Barry, 1997; Pettersen, 2001) have made the point that information must first be interpreted by the receiver before a message is received; the receiver of a message must observe the message and process it before it is assigned meaning. According to Anne Marie Barry (1997), “What we see, then, is not a direct recording of what’s out there, but a mental configuration that we interpret as an image—the end result of a highly exploratory and complex information—seeking system. (89)” This interpretation of visual stimulus can be different from person to person, and can result in variations on the same message being received within an audience, it is possible that misinterpretation can stem from this. Complimentary to the idea of interpretation is the notion of expectation in message retrieval, “When the learner does not see, read, or hear what she or he expects to see, or cannot find agreement between verbal and visual content, the message is likely to be misunderstood” (Pettersen, 2001, p. 122). What all of this points to is that internal forces, which are based on a wide variety of previous experiences, attitudes, and cognitive factors, play a role in our expectations as well as our interpretations of the messages that we encounter on a daily basis. As Pettersen points out, if our expectations are violated, we may misunderstand a given message. Misunderstanding can also result from ambiguous situations, as Barry points out, “Expectation can also lead to misperception in situations that seem incontrovertibly

unambiguous as well, where perception may lead us to thoroughly false conclusions as a result of “built-in” perceptual bias” (Barry, 1997, p. 54). Understanding that expectation and interpretation have such a powerful effect on message acquisition is important to understanding why message creators need to utilize messages that not only meet viewer’s expectations but are also limited to a wide variety of interpretations.

Message creators want to design messages that produce similar effects for an entire audience. Picture Superiority Effect looks at how the combination of image and text work together to accomplish that goal. As previously stated, it claims that an audience will have a better memory for an image than it would for similar text (Pettersen, 2001; Paivio, 1971; Paivio, Rogers, & Smythe, 1968). This may seem to be a straightforward concept; however, researchers have shown that there are many factors that produce the effect and at the same time can produce slightly different results (D’Agostino, O’Neill, & Paivio, 1977). Examples of these variations can include types of memory and perception that are being utilized as well as encoding methods and message creators.

Although many different factors can have an effect on Picture Superiority Effect, researchers do not hesitate from testing the initial idea that images are more easily and reliably entered into memory than their textual equivalent. In a 1984 study, Jorge Frascara (1984) studied children’s encoding methods utilizing a wall chart of different cuts of beef that included images and text. He found that long-term retention was much higher for pictures than for other encoding methods, and children who had used drawing as an input method lost very little information at all. In the application of written and visual information to learning Zanon (2002) agrees, “Using graphic images to accompany

or even partially replace written instructions can help writers solve, or at least cope with such problems. The message contained in the picture can be captured by the user with a simple glance at the picture and memorized in less time than the written text” (p. 1).

These findings show that there is little doubt that images have a potent effect on the audience when they are part of a message, but they tend to neglect the usefulness of text in understanding ambiguities that may accompany images. Certainly an image can be useful for quick reference on a familiar task as Zanon asserts, but for visuals to have the same effect in unfamiliar tasks or messages, not only are rate of presentation and repetition important variables (Paivio, 1971), but also the detailed explanation that accompanying text brings with it is constructive as well.

One of the most effective and successful uses of Picture Superiority Effect has been the combination of visuals and text. Paivio, Rogers, and Smythe (1968) point out that the use of dual coding, or the combined use of text and images, results in higher levels of recall due to the same kind of information being recorded both visually and textually in a subject’s memory. The idea of dual coding has been supported and paralleled by many other scholars, Charles Beck (1984) studied 4th grade children with both average and low reading abilities using a combination of visual and textual cues and found that the use of two different coding methodologies did produce favorable scores in the children tested. Nigel Holmes (2002) points out that scholar and inventor of ISOTYPE Otto Neurath felt the same way about dual coding, “When Otto Neurath called his International System of Typographic Picture Education (ISOTYPE) a ‘helping language’ (rather than a complete visual substitute for a written language), he was suggesting what today is taken for granted in this field: words and pictures together make

better explanations than words alone, or pictures alone” (p. 134). Dual coding is an important feature of Picture Superiority Effect in relation to the current project; in a sense the project is focusing on the strength of the individual components to see if there is a measurable effect of dual coding in the audience and whether this overrides poorly designed or ill-conceived communication.

Picture Superiority Effect doesn't happen all by itself; there are important factors that must be present for Picture Superiority Effect to happen at all. The most important factor in the presentation of any communicative message, whether visual, textual, auditory or otherwise, is the arousal of the audience's attention. “Attention plays an important role in memory. By exerting control over the information that reaches the short-term memory, it determines what information ultimately becomes stored in our explicit or declarative memory” (Pettersen, 2001, p. 116). As Pettersen states, attention is the first step for information to make its way into the audiences' memory. Message creators must first get their audience's attention and hold their interest long enough for the message to be perceived and processed. One method to provoke attention of the audience and hold its interest is to make an image vivid. As Paivio (1971) asserts, “The more vivid the image, the more effective it should be as a memory representation” (p. 347). Message creators' main goal is to make their messages memorable and persuasive; they attempt to do this by having qualities that Foss (1993) would describe as, “a novel technical aspect” that grabs and holds a viewer's attention and allows for assessment and assignment of meaning (Foss, 1993). This “novel technical aspect” can be the vividness of an image, its complexity, method of presentation, or even the novelty of the task that

the receiver must attend to. Any of these facets (among many others) help to guide the audience's attention to the message to be communicated and hold it there.

As already discussed, it is important not only to arouse attention but to hold it, because the audience must perceive the message before it can assign the message meaning the message creator must not only convey the message, but he or she must also understand the reasons an audience will want or need to perceive the message. Control of attention can be complex or simple, dependent upon the situation that the audience is in. "There are several ways in which attention can be controlled; an audience may be drawn to a particular piece of communication automatically, because they are instructed to, or because they are required to due to the specific task at hand" (Pettersen, 2001. p. 117). These three types of attention control can greatly affect the success of a message. If a message creator has an understanding of these different types of attention, he or she could conceivably create a message that combines these types of attention control and hold attention long enough for the message to be conveyed. Once the audience's attention has been captured, the audience must then gather and process that information, and it is graphics that can help perform those functions (Lefferts, 1981). Although understanding these principles are important factors in message creation and persuasion, the process is not as simple as understanding these ideas and utilizing them. All messages are contending with the active selectivity of the individual, Arnheim (1971) states that active selectivity is, in its most basic sense, tuned into changes in the environment. What this means to the creator of a message is that while an individual may be tuned in to their particular message for any given amount of time, there is a possibility that anything could distract them from the message and an attempt at persuasion or the transfer of knowledge

could be lost. Arnheim points out that appealing more directly to an individual will generally help perception and attention,

Experiments have indicated that when observers are shown a figure with the instruction to commit it to memory as faithfully as possible ‘because your memory will be tested,’ they make an effort to preserve the characteristics of the figure. Under such circumstances they will recollect, for example, that a circle had a small gap, which otherwise might have dropped out in memory or not been actively perceived in the first place.

(p. 81)

The addition of consequences, such as a test, for not paying attention is a good way to keep the attention of an audience focused on the communicated message. However, it hardly seems practical to attempt to impose consequences for not paying attention to every message. While advertisers and other message creators attempt to do so, often the audience does not see the consequence in the same way as the creator and the effect is lost, attention is not held, and the message is not received.

The other major factor in the production and effect of Picture Superiority Effect is audience intelligence, specifically, aptitude for understanding visuals and visual messages. As will be discussed in a later section, visual intelligence and visual/media literacy are important factors to have when assessing any message; however, having instinctual perceptual and visual brainpower is a separate facet of intelligence. Howard Gardner (1993) and his theory of Multiple Intelligences presents the idea that people have different kinds of intelligences that exist at different levels in all people, “...the intelligences work together to solve problems, to yield various kinds of cultural

endstates—vocations, avocations, and the like” (Gardner, 1993, p. 9). Different intelligences come into use for different tasks, in the instance where an individual needs to decode a visual message he or she would employ his or her visual/spatial intelligence. Gardner defines spatial intelligence as “the ability to form a mental model of a spatial world and to be able to maneuver and operate using that model” (Gardner, 1993, p. 9). An excellent example of an everyday use of visual/spatial intelligence is using directions with pictures to assemble something or perform a task. This requires the user to understand the directions and transfer that understanding into the “real world.”

Closely related to intelligence is perception. Arnheim (1971) makes the case for perception being a higher level mental process than some believe, and closely relates it to thinking. Messages must be perceived before they can be processed or acted upon. As Enrick (1972) states, “Information must be visualized in compact, comprehensible perspective, thereby facilitating arrival at proper conclusions...” (p. 168). Barry (1997) supports the idea of compact, comprehensible perspective with her observation that “we also extend any continuing pattern along the direction previously established” (p. 52). Successful perception is a result of a well-designed message as well as that message making sense in the particular context within which it is encountered. While attention to design and context undoubtedly aide in perception, scholars point out that perception is as finite and fickle as anything else, different circumstances and different people will have different perceptual reactions to the same message (Tufte, 2001; Weldon, Roediger, Beitel, & Johnston, 1995). Intelligence and perception are base level requirements for Picture Superiority Effect, while attention is important after these first two requirements have been fulfilled. If anything is to be learned about any of these preceding concepts, it

is that the meaning can change from situation to situation and from person to person. Their effect is hard to predict, and because of this ability to change, make message composition truly difficult.

Visual Literacy

While certainly dependent upon intelligence and perception, visual intelligence and visual/media literacy are distinct concepts. Intelligence and perception are instinctual cognitive processes, while visual literacy skills are something that are learned and developed over time with the aid of education. An individual must understand the visuals that he or she is presented with in order to understand media (Messaris, 1998). This understanding of media, let alone its individual visual components, is important to the receiving and decoding process of communication itself. Tufte (2001) points out that any means of communication can be used to deceive, not just visual communication or charts and graphs. Images can be deceptive, images can be misunderstood, and often it takes some manner of education to understand the differences and their impact on information processing. "When the mind operates in the manner of the scientist, it looks for the one correct image hiding among the phenomena of experience. Education has to bridge the gap between the bewildering complexity of primary observation and the relative simplicity of that relevant image" (Arnheim, 1971, p. 305). Carefully crafted communication in any form can lead the audience in a particular direction, whether truthful or not, based on its persuasive qualities.

Most people regard information processing as a specific job undertaken by people who wear glasses on chain and sit in vast open offices tinged with the greenish cast of fluorescent light fixtures, caught in the glow of the

cathode ray as they stare into computer screens. In other words, information processing is something done by someone else, someone who can type. In an information age, we must all come to regard ourselves as information processors. Every time we listen to a news report, talk to a coworker, read a magazine, look out over a crowd of faces at a convention we are perceiving and processing information. (Wurman, 1989, p. 316)

Wurman shows that the process of information acquisition is ubiquitous, we do not have a choice of whether or not to receive information, it inevitably happens as we go about our daily business. Because of the all-encompassing nature of information and communication, it is important to be able to understand it and to discern the straightforward from the clandestine. This in turn creates the need for media literacy skills.

Anne Marie Barry (1997) in her book *Visual Intelligence: Perception, Image and Manipulation in Visual Communication* focuses on the complexities of visual communication, and argues for a well developed sense of visual intelligence. She identifies the two components of visual literacy as 1) the awareness of the cognitive processes behind visual messages and 2) the creation of significant visuals for communication with others. While both of these components require reasoning skills, she separates visual literacy from visual intelligence, combining her definition of visual literacy into an advanced description that includes critical thinking, visual reasoning, verbal reasoning, and abstract thought.

Visual intelligence, however, may be described as a quality of mind developed to the point of critical perceptual awareness in visual

communication. It implies not only the skilled use of visual reasoning to read and to communicate, but also a holistic integration of skilled verbal and visual reasoning, from an understanding of how the elements that compose meaning in images can be manipulated to distort reality, to the utilization of the visual in abstract thought. (Barry, 1997, p. 6)

Understandably, visual intelligence is complex; however, it is necessary in order to make sense of the information rich society in which we live. Due to all the information that is available, it is important to be able to catch inconsistencies and adjust incorrect perceptions,

Thus, although it may seem to us that our minds are in control and making consciously judicious decisions, and we would like to think that we always judge things in a relatively unbiased fashion or that emotion is only an “additive” to rational thought, exactly the reverse may be true. Even though we can and often do correct misperceptions cognitively if we become aware of inconsistencies, we must actively *choose* to do so.

Otherwise, we just cruise along perceptually without critical examination.

(Barry, 1997, p. 25)

It is the awareness of these inconsistencies and ability to critically examine the world around us that gives people the ability to be visually intelligent. However, we are not instinctually endowed with this power of visual logic; it is something that must be honed and practiced. “Optimistically, it can be argued that, by acquiring visual literacy, people enrich their repertoires of cognitive skills and gain access to powerful new tools of

creative thought” (Messaris, 1998, p. 70). Understanding of visual literacy allows for the extension of thought and self expression, and gives people another tool for evaluating and interacting with the world around them.

Understanding visual literacy enables viewers not only to assign meaning to visual messages, it also enables them to draw connections and conclusions regarding visual messages as a whole. Archetypes and symbols are essential players in visual communication, and a sound understanding of their characteristics and uses is essential to being visually intelligent. Archetypal symbols are those which share a similar, epic meaning in the collective subconscious of a society. Fontana (1993) asserts that archetypes are shaped by both the collective psyche as well as individual experience. This accounts for their changing meaning over time as well as their modified appearance. The existence of shared symbols for a culture is important to message making; utilizing widely recognizable symbols allows creators to tailor messages in a specific way which allows them to reach an audience with specificity, economy, and rapidity.

Persuasion and Audience Effects

Basic communication models illustrate two participants in the communication of any message, the sender and the receiver. It is the receiver that is commonly focused upon to correctly decode the message and then be influenced by it, therefore requiring the receiver to have (in the case of visual communication) visual literacy skills. However, it is paramount that the creators have visual literacy skills as well so that they may properly create influential messages. Audiences have developed visual reasoning skills, as a result of persuasive efforts on the behalf of message creators. While not all persuasive efforts are made with the intent to deceive the audience, the goal of persuasion is often to

redirect the audience's attitudes or beliefs. Postman (1992) demonstrates the power of the visual:

The new imagery, with photography at its forefront, did not merely function as a supplement to language but tended to replace it as our dominant means for construing, understanding, and testing reality. By the end of the nineteenth century, advertisers and newspapermen had discovered that a picture was worth not only a thousand words, but in terms of sales, many thousands of dollars. (p. 68)

Even in informational messages, the goal is to show the audience how to do something in a particular way or to think about something in a particular fashion. While it may seem that the two are quite separate, there are elements of persuasion in informational communication just as in nearly every form of communication.

In the creation of a message there is (or should be) as much attention to one's audience as to the message itself (Riordan & Pauley, 1999). Tufte (2001) argues that all too often the audience is underestimated; however, it seems that media ploys and persuasive tactics reach the audience, as evidenced by the endless sales of fitness equipment that promises to effortlessly give the user a flat stomach and toned body in just minutes a week. Media certainly attempt to exert control over the audience, whether or not they have underestimated the audiences decoding skills. "By controlling the viewer's positioning vis-à-vis the characters, objects, or events in an image, including the image sequences of film or television, the image's producer can elicit responses that have been conditioned by the viewer's experience of equivalent interrelationships with real-life people, things, and actions" (Messaris, 1998, p. 75). Advertising message creators

understand life experiences of people and utilize them to play into desires and needs. In visual messages the use of beautiful imagery or people to attract attention is heavily utilized.

In some academic circles advertising as a form of visual persuasion has a negative connotation. However, in technical communication the use of visuals has a different purpose. For example, Zanon (2002) asserts that people who work in technical fields are often more visually oriented and that the use of graphics is a better way of reaching them than with textual descriptions which, “they need to reprocess in their mind in order to make them visual and be able to actually use the information received” (p. 2). While the use of visuals is alluring (persuasive) to these people, it is also helpful and evidence of careful attention to the needs of the audience on the part of the message producer. Furthermore, the careful construction of visuals can solve looming problems. This is exemplified in such applications as the use of icons in the Olympics. In this situation a heterogeneous group of people all need to understand the same information, and since it is impractical to have signs in many different languages, graphics are utilized. Applications such as this support Neurath’s belief that a pictogram should represent only its physical appearance and not its other characteristics (Holmes, 2002). In adhering to this idea, pictograms become used by a more diverse audience, require less explanatory text, and apply to a greater range of situations.

It is understood that most (arguably all) communicative efforts have the ability to facilitate or encourage some sort of change in the audience (Festinger, 1957). This is especially true with information design and technical writing; forms of communication frequently utilize graphics as well as text for explanative and persuasive messages

(Lefferts, 1981). Much in the same way that dual coding effects memory, images and text in concert have the ability to create powerful persuasive messages. Message creators often use graphics as well as text to polarize an audience. “To see is to reason. Thus, the use of visual forms of communication has great potential for influencing what a person thinks. Graphic presentation is always much more than a way to present just facts or information. Rather, it is a way to influence thought, and, as such, graphics can be a powerful mode of persuasion” (Barry, 1997, p. 7). This ties into the “seeing is believing” cliché. People often cannot or will not invest enough mental power in a given message to fully conceptualize it. With the use of graphics in those messages, an audience can see specifically what the message makers are trying to do. This allows for less of a range of interpretation within the audience while speeding the transmission of information and also persuading the audience. Petterson (2001) agrees with the persuasive power of visuals, stating that there is a *Picture Facilitating Effect*, the use of visual aids in presentations is more persuasive than presentations without images.

In contrast, not all scholars believe that the graphic is the supremely persuasive element in a message. Type has the ability to point an audience in a particular direction, to influence an audience so that they think about the communication as the author wants them to. “Type has a more specific meaning than an image has; therefore, type can blind an image to a specific meaning. When type directs the viewer toward a specific meaning, individual freedom to form an interpretation is diminished” (Meggs, 1989, p. 41). Due to this specificity, the audience does, as Meggs asserts, lose its freedom of interpretation. It is coerced by the text to think of the visual accompaniment in only the way that the text explains. This can be the result of misconceived efforts on the part of the message

makers, or it can lead to misperception and misunderstanding on the part of the audience. While the same can be true for visuals, unbiased type is potentially much more difficult to produce than unbiased charts, although it is certainly possible.

Whether utilizing visuals or text or both in a message, it is important to pay attention to cause and effect, for both the image and the type as well as the audience.

We might even say that the grammar of a language is an organ of perception and accounts for the variances in world view that we find among different peoples. But we have been slow to acknowledge that every extension of speech— from painting to hieroglyphics to the alphabet to the printing press to television—also generates unique ways of apprehending the world, amplifying or obscuring different features of reality. Each medium, like language itself, classifies the world for us, sequences it, frames it, enlarges it, reduces it, argues a case for what the world is like. (Postman, 1988, p.33)

The audience is central to persuasion, and there is potential for anyone to be persuaded by the various forms of communication that he or she comes into contact with at any time. Due to this possibility it is important for those responsible for the messages to understand the audience and how it can be influenced by that message. Images and text are powerful tools of persuasion, and need to be used with understanding and care. Imprudent use of this combination will result in messages that are difficult to interpret.

Characteristics of Information Design and Technical Writing

It is indeed a daunting task to create messages that are easily interpreted. In the case of information design and technical writing, that task is often amplified by the need for an extremely clear and concise product. Many writers and designers utilize the combination of type and images to clarify their messages; however, this combination is not clear cut. There are numerous ways in which to use the combination. People in different disciplines and vocations all have a need to communicate their ideas effectively to others and likewise to have others present understandable information to them. Lefferts (1981) makes this point as well, and argues that "...the communicator—is often called on to buttress his message with informative and persuasive charts, graphs, and tables" (preface, p. v). Everyone has the capacity to become a technical writer or an information designer in some way to fulfill a particular need in his or her life, and it is because people without special training often take on these roles that the need for high-quality communication skills has arisen. Recognizing that not every message creator has been trained in information design or technical writing is important; however, for the remainder of this section, professional designers and authors will be the main focus of the discussion.

The principal function of texts and graphics in information design and technical writing (or informational communication) is to clarify complex ideas and directions. Both disciplines deal with the transmission of information and ideas. Information design deals with studying how information is perceived and processed by the audience and how they use that information to formulate and implement a strategy for conveying the necessary information to that audience. The same can be said for technical writing (Whitehouse,

2001). As evidenced by the volume of informational communication that we come into contact with, there are many people, situations, and ideas that utilize this form of communication. “The range of Information Design projects is prolific. In print, there are of course the most familiar examples like charts and graphs, and a whole range of graphic components that diagram and explain actions and processes—like how to tango or perform brain surgery” (Whitehouse, p. 216). Indeed there are multiple and varied uses for technical writing and information design; however, not all examples of them are effective. Tufte (2001) states that, “The best designs... are *intriguing and curiosity-provoking*, drawing the viewer into the wonder of the data, sometimes by narrative power, sometimes by immense detail, and sometimes by elegant presentation of simple but interesting data” (p. 121). In a way that very few other incantations of communication can, informational communication presents its audience with a clear answer to a question; Tufte shows that good design will lead the audience to those conclusions and beyond.

In the case of instructional manuals, the audience often engages in a learning exercise. In this case the question is of how to perform a specific task or solve a particular problem. The use of a technical manual provides the answer to that question and facilitates its real life remedy. Zanon (2002) asserts that when people learn visually from a manual (or otherwise) the learning process they undergo is similar to the learning process in a hands-on exercise. This is a very potent method for teaching and learning, especially for visual-spatial learners, as it often creates concrete memories of the task, which the user will be able to duplicate in the future without the aid of the manual.

Now that an understanding of informational communication, its characteristics and its effects have been established, it is important to understand what interaction of

design and information itself designers and authors use to create effective messages.

First, a communicator must select what information to communicate in order to meet the requirements of the project or problem at hand. Tufte (1990) states that “Information consists of *differences that make a difference*” (p. 65). Information is presented so that people can understand a problem and find a solution to it, or simply for people to learn about new or foreign concepts. The effective presentation of this material is important to the success of a particular task or the fulfillment of a particular need.

Information design relies on a small amount of important concepts. Edward Tufte (2001) boils the elements of graphic excellence down to three items: substance, statistics, and design. If all of these elements come together with quality and balance, the design will, as Tufte asserts, be superior. However attaining excellence within the substance, statistics, and design involves strict attention to myriad other rules and elements to consider. In *Visual Explanations*, Tufte makes four rules that one should consider in an information design situation,

1. Place data in appropriate context for assessing cause and effect.
 2. Make quantitative comparisons.
 3. Consider alternative explanations as contrary cases.
 4. Assessment of possible errors in the numbers reported in graphics.
- (p.29-34)

Use of these rules as a guideline when creating informational communication is a way to insure that one meets the criteria for excellence, and are in general good ways of thinking about the problem, data, and possible design solutions. While it is important to have clarity and focus in a design, it is also important not to underestimate the audience or oversimplify a message. Audiences want to be able to explore new ideas and information on their own, and good designs should draw them in. “So much for the conventional,

facile, and false equation: simpleness of data and design = clarity of reading. Simpleness is another aesthetic preference, not an information design strategy, not a guide to clarity. What we seek instead is a rich texture of data, a comparative context, an understanding of complexity revealed with an economy of means” (Tufte, 1991, p. 51). Tufte advocates for clarity and honesty over simplicity. Unbiased information design should present information and allow the audience to draw their own conclusions. Good persuasive attempts will show the audience that the desired outcome is the right choice with well chosen and honest information, allowing the audience to believe that their decision was made independently.

Although we often think of information design and technical writing as combining images and text effortlessly, there are distinct challenges with bringing these two different presentation styles together.

When graphic designers bring word and image together to create visual-verbal messages, two problems must be resolved. First, visual organization is a problem, for two totally unlike systems of communication—language signs and pictorial images—must be merged into a cohesive whole.... The second problem involves message making: How can these two unlike communication systems come together to reinforce and extend one another? (Meggs, 1989, p. 41)

Audiences are conditioned to often receive and process information in a linear fashion, such as in a newspaper article or a list of directions. The presentation of data using a linear method (text) as well as a non-linear method (images) can present problems.

Postman (1992) discusses the use of images in the presentation of information, “Here was

information that rejected the necessity of interconnectedness, proceeded without context, argued for instancy against historical continuity, and offered fascination in place of complexity and coherence” (p. 69). It takes a trained individual as well as a significant amount of research and consideration to understand just how to present material so an audience can benefit from both words and pictures.

Furthermore, designers and writers need to contend with the larger problems that surround informational messages. Often, a person will utilize instructions to solve a dynamic problem, something that moves and changes. However, designers often do not have the luxury of easily or economically creating dynamic images. Additionally, problems such as this can lead audiences to false conclusions.

The usual illustrations in textbooks and on the blackboard help to make a problem visible, but they also freeze it at one phase of the range to which the proposition refers. Therefore, they tempt the student to mistake accidental circumstances for essential ones. The solution is not to leave out illustrations but either to produce mobile models, for instance, by means of film animation, or, at least, to use immobile illustrations in such a way that the student realizes which of their dimensions are variables.

(Arnheim, 1971, p. 182)

Arnheim provides a solution to the problem in advocating for static images which more accurately represent the way something happens in reality. This adds to the utility of a design as well as its durability.

Information design and technical writing are forms of communication with important roles in the creation and dissemination of facts and processes. They can be

applied to many different situations and satisfy many different needs. Usage of well-designed graphics makes design goals more feasible and often facilitates better understanding of the presented data. However, there are significant differences between image and text, and consequently there are many considerations for a designer or author to explore before beginning to create the message in order for a successful outcome.

The Interaction Between Image and Text

As evidenced by the work of many scholars, effective communication, especially effective graphic communication is a challenge. Tufte (1990) argues that graphic communication involves the process of translating three-dimensional information into a two-dimensional surface, and that all communication between image makers and receivers takes place in this two-dimensional surface. This translation is something that adds a layer of mental processing to the audiences' task, requiring them to re-translate the information back into the three-dimensional world to apply it. As a remedy for the issues associated with creating effective informational communication, scholars agree that the combination of images and text is a way to enable the creation of effective messages (Paivio, 1971; Holmes, 2002; Tufte, 2001). The two elements should work together to clarify ambiguities, answer questions, and provide explanations. Often it is the graphic that is looked upon to fulfill these needs, "Information displays should serve the analytic purpose at hand; if the substantive matter is a possible cause-effect relationship, then graphs should organize data so as to illuminate such a link. Not a complicated idea, but a profound one" (Tufte, 1997, p. 49). While images unquestionably have the ability to clarify and "illuminate" text or extensive amounts of data, the reverse can be argued for text. Often the illustration itself would be confusing at best if left on its own, open too

widely for interpretation. In order to avoid the ambiguities that may arise with just one presentational element, the usage of both are employed. “Visual-verbal synergy is the cooperative action of words and pictures used together to create a meaning that is greater than the individual signification of the parts” (Meggs, 1989, p. 64). This brings back the theme of dual-coding found in work done on Picture Superiority Effect, which allows for communicated messages to be successful, despite a variety of adversities, under a multitude of different conditions. However, the image-text interaction is not as straightforward as communicators would like it to be, Messaris (1998) argues that the rules that govern verbal language are much different than those that pertain to visual language.

In traditional print media, it is expected to separate type from image, however, in information design and (to a lesser degree) technical writing, visuals and text are often intertwined such that there is no clear separation of field between verbal and visual content (Meggs, 1989). This unique aspect allows for the information to be perceived differently than it would in traditional forms, although the receiver often does separate text from image (except in cases where image and text become one) to process the information. Consequently, some scholars believe that text and image *should* be separated,

Most important, one wants the reader to distinguish it from words. The shapes used in graphic presentation are different from the shapes of letters. And, while graphic charts must be labeled with words, these should be kept to a minimum in order to preserve the effectiveness of the graphic presentation. In addition, the more the graphic is distinguished from the

“field” (that is, the paper and words) within which it appears, the more the reader’s perception is increased. (Lefferts, 1981, p. 7-8)

It seems that scholars are divided about the most effective way to present images and text, possibly due to the multitude of applications for the combination, personal preference of the message maker, and differences in learning style of audience members. Despite differences of opinion, it is clear that the grouping of images and text to create messages is something that people agree on.

In light of the difference of opinion that occurs regarding separation of elements, it is evident that the design environment in which we find ourselves is actively changing and has been since the advent of the information age. Many people feel that language “loads the image,” and confines a reader to thinking about that image in a particular way (Holmes, 2002; Lefferts, 1981; Meggs, 1989), while it is clear that others believe that images have the power and influence to hold their own against type (Postman, 1992). However, in the interest of effective communication, it is abundantly clear that there is a need for both delivery methods,

A set of numbers, without any reference or verification, can dramatically change our values, behavior, and emotions. We rarely question the figures quoted by the news because we assume them to be correct and valid, or at least important. But many times, these statistics are misinformation, disinformation, or just plain non-information. (p. 175)

Images can back up text, and text can explain images. As information receivers, we rely on both to validate information provided by one and to also root out possible errors and understand how to present effective and accurate communication.

A feature that is more important than the level of demarcation between type and image is how the data are represented. When unbiased and honest communication is a goal of the author, accurate depiction of the data or information at hand is paramount. “A graphic does not distort if the visual representation of the data is [sic] consistent with the numerical representation. What then is the ‘visual representation’ of the data? As physically measured on the surface of the graphic? Or the *perceived* visual effect? How do we know that the visual image represents the underlying numbers?” (Tufte, 2001, p. 55). In addition to the accurate representation of the data, Tufte (1990) points out that utilizing a visual-verbal approach is “an appropriate and proper compliment to human capabilities” and that “the more relevant information within the eyespan, the better” (p. 50). Type and image combined solve a plethora of problems, and as has been proven are a good supplement to human learning processes. Although they have very different rules of usage, and distinct sets of positive and negative elements, their strengths often compliment the other’s flaws, and consequently the final product is better than the individual parts. This information is more easily understood by receivers.

Characteristics of Charts and Diagrams

The importance of quality charts and diagrams is apparent when the body of work that has been created informing audiences about mechanics of good diagrams, pitfalls of bad diagrams, and audience effects is taken into account. Scholars have sectionalized, analyzed, and classified illustrations into many different kinds of visuals that are used for different purposes to display varying kinds of data. For the purposes of this study, discussion of diagrams and illustrations will pertain primarily to the mechanics, misrepresentation, and uses of visual aids in the form of data maps.

In order to discuss the impact of this subject area on the current study, it is necessary to understand that there are many specific uses for graphics in the realm of communication. Additionally there are different general uses for different classifications of graphics. On a macro level, all graphics in information design should be used as visual aids, and as such, visual aids have four specific purposes: 1) to summarize data, 2) to give readers an opportunity to explore data, 3) to provide a different entry point into the discussion, 4) to engage reader expectations (Riordan & Pauley, 1999). With the exception of the first purpose, all of the listed objectives are targeted toward fostering understanding of the message at the audiences' end, placing the focus of the communication on the audience rather than the information itself. Likewise, Riordan and Pauley (1999) focus their interpretation of the uses of illustrations on the audience, 1) to help explain points in the text, 2) to help readers remember a topic, 3) to avoid lengthy discussions, 4) to "give the reader permission" to believe his or her perception of the textual material. While this does focus on the audience, it also provides clues to the characteristics of the illustration. For example, number three, "to avoid lengthy discussions" alludes to the fact that a reader can in some circumstances glean more information and understanding from a diagram or illustration than a long, drawn out, and wordy description of the same thing.

One aspect of chart creation that most people agree is a main ingredient to an effective product is having good mechanics. Close attention to all components including margins, typography, scale, and color play a major role in the effectiveness of the final message (Enrick, 1972). Assuredly, there is no shortage of people willing to provide advice about what qualities and ideas to keep in mind when creating charts and diagrams.

Lefferts (1981) states that there are four main components of good graphics: unity, balance, contrast, and meaning. Additionally, he states that there are nine objectives to keep in mind when creating these graphics: 1) clarity, 2) simplification, 3) emphasis, 4) summarization, 5) reinforcement, 6) interest, 7) impact, 8) credibility, 9) coherence (Lefferts, 1981). Lefferts' ideas force the creator to pay attention to detail and revisit a design over and over to make sure that it meets all of the objectives and represents all four of the main components of good graphics. This disciplining creators to having enormous attention to detail is an excellent quality to have when creating complex messages. Perhaps the most well known scholar in the world of information design is Edward Tufte, in his book *The Visual Display of Quantitative Communication*, Tufte discusses design strategies such as the use of small multiples and "data ink." Additionally, Tufte (2001) asks that designers "Above all else, show the data." Similar to other scholars, Tufte wants close attention to be paid to the overall outcome, and for quality to show in all aspects of a chart or diagram to more clearly present information.

In addition to mechanical considerations such as typography and margins, content of the product should be given careful consideration as well. Copy should clearly express the ideas that are to be communicated. Illustrations or photographs that accompany the copy should do the same thing. Enrick (1972) reflects this idea of completeness, and warns that when one element is cryptic or overly symbolized, the audience will have to work harder to extract meaning from the piece. Therefore, he stresses that "It is thus a good rule that a chart should be self explanatory, given the diagram itself, its title, subtitle, and brief explanatory text under the visual section" (Enrick, 1972, p. 6). Overall attention to quality of all of the contributing pieces of communication provides an

indispensable layer of quality to the overall message and works to assure that the audience will get the intended message.

The reason that so much attention is given to quality ingredients in information design and technical writing is that it is very easy for information to be misrepresented or wrongly perceived. Sometimes it is not the fault of the design, but of the information. Tufte (1990) gives an example of a graph that incorrectly showed the price of diamonds over a long period of time, what the information providers didn't take into account (or perhaps refused to take into account) was that the value of money changes over time. Tufte used this example to show that information is easily confused when complex ideas are being illustrated; however, he also shows that an audience would be intelligent enough to suspect that the graph may not have been adjusted to reflect changes in the economy. It is for this reason that Tufte (2001) warns the audience that sometimes outside information and research is needed to uncover lies in graphics. People should not just take something for its face value just because it was presented to them in a publication. On the mechanics end of graph design, it is important to give close attention to proportion and labeling to avoid misrepresentation. One should not show something that is 150% larger than something else as 600% larger just for dramatic effect (Tufte, 2001). While it is true that audiences often are highly intelligent, and do see these "lies," there are qualities of graphics that can unintentionally misinform an audience. For example, Monmonier (1991) shows how data maps can give the illusion of homogeneity with an example that segments a town into equal squares and codes by average televisions per household. A poorly constructed data map could show that adjacent areas appear to be similar when they are not, or exclude important variances from the displayed

data. While the designer can not accommodate every contingency or outlier, that special care has to be taken with the construction of data graphics to not misinform the audience.

As much as graphics have the capacity to confuse or misinform an audience, they have a greater power to facilitate understanding. “The most exclusive data maps, such as the cancer atlas and the count of the galaxies, place millions of bits of information on a single page before our eyes. No other method for the statistical display of information is so powerful” (Tufte, 2001, p. 26). Data maps have the power to put information in a single diagram that would take many pages of text or many rows and columns of numbers to display otherwise. As Tufte (1990, 2001) would say, they create an economy of perception, allowing the viewer to understand similarly presented data over many different images. Not only does this save time for the creator and the audience, it engages the audience to explore the data in a way that it would not be able to in another form. Tufte notes the similarities between data maps and real life, “Despite their quantifying scales and grids, maps resemble miniature pictorial representations of the physical world. To depict relations between *any* measured quantities, however, requires replacing the map’s natural spatial scales with abstract scales of measurement not based on geographic analogy” (Tufte, 1997, p. 14) This parallel that exists between data maps and real life can help an audience member understand the way that the information relates to his or her specific region. However there is a need for generalization in data maps.

A good map tells a multitude of little white lies: it suppresses truth to help the user see what needs to be seen. Reality is three-dimensional, rich in detail, and far too factual to allow a complete yet uncluttered two-dimensional graphic scale model. Indeed, a map that did not generalize

would be useless. But the value of a map depends on how well its generalized geometry and generalized content reflect a chosen aspect of reality. (Monmonier, 1991, p. 25)

Indeed, generalization can easily lead to confusing graphics. Monmonier (1991) also points out that a way to overcome presenting misinformation is to collect data over a longer period of time and therefore even out the effect of chance occurrences. If anything, there are many different ways to go about collecting data and presenting it. All that any designer can strive for is to create a product that is a faithful representation of data that was accurately collected and allow the audience to analyze and draw conclusions from that information.

METHOD

In order to answer the research questions, an experiment was conducted utilizing varying combinations of text and visual images to gauge the audience's response to messages with differing visual displays. Sample sets were drawn from a convenience population of RIT students. The target number for the groups was four groups of 25 students. Each sample group received the same text, one group received a text-only version of the instrument, the second received an image-only version of the instrument, and the remaining two groups received instrumentation with images and text, with different dates accompanying the data maps. All four groups will answer the same questionnaire so that their reactions can be compared and contrasted.

This model was drawn from several studies that have tested the impact of images and text on a given audience. There are two main classifications of studies upon which the present study has been based. Much of the work that has been done focusing on

testing Picture Superiority Effect has followed the form of presenting subjects with series of images and words (in varying forms) to test free recall of the subjects. Despite the popularity of this methodology for testing Picture Superiority effect, conclusions of the studies have ranged in response from supporting the effectiveness of image and text in memory recall to denying that the combination has any effect on recall of knowledge (D'Agostino; O'Neill; & Paivio, 1977; Weldon; Roediger; Beitel; & Johnston, 1995; Amrhein & McDaniel, 2002). While these studies have yielded a variety of results, the popularity of this form of assessment shows that it is not only an accepted form of methodology, but also capable of producing results from which valuable conclusions can be drawn. The portion of this study that parallels these studies is the variances in the message which the different groups have received, which is analogous to the elements of the other studies in which the researchers presented their subjects with varied forms of the same message.

The other grouping of studies from which the current methodology was drawn focuses on presentation and audience perception of a given message. A study performed by Knobloch, Hastall, Zillman, and Callison (2003) tested audience's reactions to different versions of an informational Internet newsmagazine, which presented the same text with different pictures or no picture at all. The results of the study showed that articles with accompanying images were chosen to be read more often than articles without images. In a similar study, researchers created a fake news report about a disease transmitted by ticks and included versions of the article with images of ticks, images of ticks as well as images of ticks as well as child victims, or no visuals at all (Gibson & Zillman, 2000). The researchers concluded that the articles that included images of ticks

as well as children prompted the highest assessment of risk of all three versions of the article. A final study utilized videotaped versions of the same presentation that featured the same content, but varied the inclusion of visuals and also colored and non-colored visuals (Morrison & Vogel, 1998). The researchers concluded that the participants who were presented with versions that included visuals were more often persuaded by the videos and were also influenced to spend more time and money with the seminars that were advertised in the videotapes. The present study most closely follows these studies by presenting the audience with different versions of the same message and gauging their reactions as well as the degree to which they may understand a given message. This study closely follows the model set forth by Knobloch et al (2003) and Gibson & Zillman (2000), as it seeks to create a news-like article and present the audience with varied versions of the same message.

Visual material for the instrument has been taken from Otto Neurath's *Gesellschaft und Wirtschaft. Bildstatistisches*, a portfolio which is in the RIT Archives. The particular image selected is a series of data maps which show population growth in the borough of Manhattan over a period of time. Only the particular image from *Gesellschaft und Wirtschaft. Bildstatistisches* will be utilized in order to eliminate any unwanted effects caused by the title or surrounding text. The text for the instrument was retrieved from Encarta (September 12, 2003) and was synthesized by the researcher; it attempts to be specific to the images without referring to any of the three images individually.

The questionnaire was constructed with 10 questions relating to the article as well as the students reactions and opinions about images and text, and presentation methods.

Each element on the questionnaire is derived from a research question, to learn the audiences' reactions as well as their opinions. The rationale for each question is as follows:

1. *The settlement of the New York City area occurred steadily over a long period of time.* This element appears first because it directly corresponds with learning the audiences' reaction to the confusing information dimension of the study. This question asks the audience to consider, based on the image/text that they just looked at, if the information they just received leads them to believe one thing or another about the settlement of the New York City area. In cases where the years on the data maps have been manipulated, the answer to this question will be given particular attention.
2. *Throughout New York City's history, many things have occurred that effected the rate at which its population grew and its infrastructure developed.* While this question essentially has the same function as question number one, the responses to this question will be derived more directly from the text portion of the instrument. In the instance where the audience received only the data maps, the audience will have to consider this based on the data maps only.
3. *I think that this message was straightforward, and that I received the information it was attempting to convey.* This question asks the audience directly if they think that this was a confusing or misleading message. Were they confused or thrown off by possibly vague or conflicting information, or did they make sense of the materials which they were presented with?

4. *I think that there were parts of this message that were misleading.* This is a straightforward question to the respondent about their impressions of the article. The sub-question 4a. *If Yes, which part of the message did you find misleading?* Asks the audience to elaborate and specifically identify what part of the instrumentation they felt misled by.
5. *The inclusion of graphics is/would be helpful in understanding this material.*
6. *The inclusion of an article with background information is/would be helpful in understanding this material.* Questions 5 and 6 look to see how the audience as a whole will respond to the different parts of the message. In the instances where groups will receive only text or image, it will be interesting to see if there is a noticeable difference in their responses to the responses of the groups which received both image and text.
7. *When I feel that part of an image and text message is wrong, vague, or misleading I tend to:*
- ☐ *Trust the image more than the text.*
 - ☐ *Trust the text more than the image.*
 - ☐ *Attempt to make my own conclusions about the message.*
 - ☐ *Completely discount the whole message.*

This question asks the respondent how they react to confusing information in general.

This response will be interesting when compared to responses from the other portions of the questionnaire. It will also be interesting to see if there is a visible influence from the instrumentation that a particular group receives.

8. *I think that (Images/Text) have/has more potential to mislead an audience when attempting to inform them.* This question has many of the same goals as question 7, although it asks the respondent which of the two (text or image) they think can

mislead an audience. This belief may be visible when looking at the other responses the individual has selected.

9. *When learning new things or performing new tasks, I prefer to be presented with information or directions that:*

- ☐ *Feature images only.*
- ☐ *Feature text only.*
- ☐ *Feature images and explanatory text.*
- ☐ *Feature some other communicative tactic. (Please specify) _____*

While this question does not ask the audience to refer specifically to the article or image, it may indicate a preference toward one or the other that may explain earlier responses.

10. *If I had to choose one method for conveying information or instructions about a particular topic or task, I would choose:*

- ☐ *Pictures and illustrations*
- ☐ *Written directions or information*
- ☐ *Some other method. (Please specify) _____*

This question asks the audience to choose a specific method; results from this question will show a preference toward a specific method. It will be particularly interesting to see if respondents will elect some other method for presenting information, such as hands on instruction, or a method that combines text and image.

Also on the questionnaire will be demographic questions about the respondents gender, year level in school, particular college (Liberal Arts, Business, Engineering, etc.), as well as the year in which they were born. This information will not be used to personally

identify any respondent, but may be used for classification purposes should any unexpected trends emerge in the data.

Prior to administering the questionnaire, the image and article combination as well as pilot questionnaire were presented to a small group of people with backgrounds in photography, digital imaging, and graphic design to gauge responses and test out the instrumentation. From this testing, adjustments to the article content as well as some of the questionnaire items were made. The panel also served as a test group for determining the length that each group would have to look at the experiment materials and fill out the questionnaire.

After obtaining the approval of the Institute Review Board, the experiment was administered to 106 Rochester Institute of Technology students in Mass Communication, Human Communication, and Visual Communication classes as well as students living in Ellingson and Gleason Residence Halls. Experiment administrators were instructed to give the data map/ article portion to respondents and allow them a certain allotted time (three minutes for articles, one minute or less for image-only instruments). Respondents were then given the questionnaires. It was expected that this portion of the experiment would take less than five minutes to complete. The participants were not allowed to look at the data map/ article after they had been given the questionnaire in order to measure their perception of the instrument without allowing the respondent to revisit the instrument after reading the questions.

The responses to the questionnaire were collected, analyzed, and compared to explore the similarities and differences between the different text/ image combinations in order to answer the research questions. All responses were entered into an Excel

workbook, one spreadsheet for each of the four different forms of the article/image.

Separating the responses in this way allows the impression of one particular group to be displayed and at the same time allows the researcher to see similarities and differences between the different groups. After all the responses were entered, the individual groups were first analyzed to learn about particular responses from single groups, gauging their overall response to the particular material that they had received. After the individual analyses were performed, the results were compared to one another for an overall impression of the responses. At this point any major similarities or differences between the same groups were noted.

RESULTS

The instrumentation was given to a total of 106 students at RIT between November 3 and 18, 2003. Students in Visual Communication, Mass Communication, and Human Communication classes were each given different versions of the survey; students in more than one class were instructed to take part in the study only once. The fourth group was made up of students living in the residence halls on the RIT campus. Students within each college of RIT as well as NTID took part in the study, of which 54 of the respondents were male and 52 of the respondents were female. The following results show the students responses as a whole and also the responses given by the individual groups. Responses were not isolated to a specific respondent nor were they separated by gender.

Table 1

Group 1: Original Years

Question	R1	R2	R3	R4
<hr/>				
1. Steady settlement of the area...	15	10	N/A	N/A
2. Many effects on growth...	23	2	N/A	N/A
3. Effectively received message...	18	7	N/A	N/A
4. Parts of message were misleading	9	16	N/A	N/A
4a. Which parts were misleading...	4	1	4	N/A
5. Graphics would be helpful...	17	8	N/A	N/A
6. Article would be helpful...	21	4	N/A	N/A
7. Dealing with misleading info...	5	6	9	5
8. Image/Text are more misleading	13	13	N/A	N/A
9. Preferences when learning...	0	1	23	1
10. Preferences when teaching...	14	6	5	N/A

Table 1 shows the overall results of group 1, which received the article as well as the datamaps with the original years. Overall this group responded to the material in a diverse fashion, for many of the questions the group chose between all the available answers without showing a distinct preference to any single answer, except for in the instances of question 2; *“Throughout New York City’s history, many things have*

occurred that have had an effect on the rate with which its population grew and it's infrastructure developed" and question 9; *"When learning new things or performing new tasks, I prefer to be presented with information or directions that: Feature images only, feature text only, feature images and explanatory text, some other method."* In the instance of question 2, the group nearly unanimously decided that yes, there have been a plethora of events that have effected the city's population growth and infrastructure development. In the instance of question 9, the group nearly unanimously decided that their preferred method for learning new things or performing new tasks would include a combination of images as well as text. The group was split in half when asked to choose if images or text are more misleading, question 8. Similarly, the responses to question 7 show a nearly even distribution in responses to the question *"When I feel that part of an image and text message is wrong, vague, or misleading I tend to: Trust the image more than the text, Trust the text more than the image, Attempt to make my own conclusions about the message, completely discount the entire message"* with slightly more respondents choosing "Attempt to make my own conclusions about the message" over the other choices.

Table 2

Group 2: Manipulated Years

Question	R1	R2	R3	R4
<hr/>				
1. Steady settlement of the area...	11	15	N/A	N/A
2. Many effects on growth...	24	2	N/A	N/A
3. Effectively received message...	21	5	N/A	N/A
4. Parts of message were misleading	7	19	N/A	N/A
4a. Which parts were misleading...	3	2	2	N/A
5. Graphics would be helpful...	18	7	N/A	N/A
6. Article would be helpful...	17	9	N/A	N/A
7. Dealing with misleading info...	7	4	14	1
8. Image/Text are more misleading	15	10	N/A	N/A
9. Preferences when learning...	1	0	25	0
10. Preferences when teaching...	17	5	4	N/A

Table 2 shows the overall results for group 2, which received the article as well as the data maps with altered years. Overall this group responded generally in the same fashion as group 1, with the exception of a few items. In comparison to group 1, group 2's response to question 1; *"The settlement of the New York City area occurred steadily and over a long period of time"* was flipped. While both sets hovered around an even

split between yes and “no”, group 2 leaned more toward no while group 1 leaned more toward “yes”. In response to question 6; *“The inclusion of an article with background information is/would be helpful in understanding this material”* group 2 did not agree as much with this statement as group 1 had, pointing to a possible difference in the way that the altered information was processed by the respondents. Questions 7 *“When I feel that part of an image and text message is wrong, vague, or misleading I tend to: Trust the image more than the text, Trust the text more than the image, Attempt to make my own conclusions about the message, completely discount the entire message”* and 8 *“I think that (Images/Text) have/has more potential to mislead an audience when attempting to inform them”* produced differing results as well, this group more decidedly leaned toward making their own conclusions about misleading messages and also were not as split when asked if they thought images or text were more misleading. While these two groups which both received the image and text message had many similar responses, they also had some key distinctions. Both the similarities and differences between their responses will provide valuable data for discussion.

Table 3

Group 3: Article-Only

Question	R1	R2	R3	R4
<hr/>				
1. Steady settlement of the area...	16	9	N/A	N/A
2. Many effects on growth...	22	3	N/A	N/A
3. Effectively received message...	17	8	N/A	N/A
4. Parts of message were misleading	7	18	N/A	N/A
4a. Which parts were misleading...	0	6	0	N/A
5. Graphics would be helpful...	16	9	N/A	N/A
6. Article would be helpful...	14	10	N/A	N/A
7. Dealing with misleading info...	6	5	13	1
8. Image/Text are more misleading	10	15	N/A	N/A
9. Preferences when learning...	2	1	21	1
10. Preferences when teaching...	12	8	5	N/A

Table 3 shows the responses for group 3, which received the text article only and did not see any data maps or dates which corresponded with those maps. In comparison with the groups which had text as well as images to evaluate, the text-only group responded in an interesting fashion, some of their results corresponded with the responses given by Groups 1 and 2 and some of the responses went off in a different direction than

the other groups. Responses to question 1; *“The settlement of the New York City are occurred steadily and over a long period of time”* was similar in numbers to the responses that were collected from the group which received the article and maps with the original years. Questions 3 and 5 also yielded results that were close to the responses seen in Group 1. For question 4; *“I think that there were parts of this message that were misleading”* the article only group responded in similar fashion to Group 2, which had the maps with manipulated years. When looking at responses to question 4a, *“If Yes, which part of the message did you find misleading?”* it is not surprising to see that all of the respondents in this group who found the message misleading selected the text, because there were no other components to this message. Finally, responses to question 8; *“I think that (Images/Text) have/has more potential to mislead an audience when attempting to inform them”* are similar to the responses of the previous two groups with the overall response rates nearly split between images and text, it is interesting to note that the majority for this group leans toward text while the majority for Group 2 leaned toward Images.

Table 4

Group 4: Image-Only

Question	R1	R2	R3	R4
<hr/>				
1. Steady settlement of the area...	11	19	N/A	N/A
2. Many effects on growth...	26	4	N/A	N/A
3. Effectively received message...	14	16	N/A	N/A
4. Parts of message were misleading	18	12	N/A	N/A
4a. Which parts were misleading...	7	4	7	N/A
5. Graphics would be helpful...	27	3	N/A	N/A
6. Article would be helpful...	25	5	N/A	N/A
7. Dealing with misleading info...	6	3	18	3
8. Image/Text are more misleading	19	11	N/A	N/A
9. Preferences when learning...	17	7	0	6
10. Preferences when teaching...	12	8	5	N/A

Table 4 shows the responses for group 4, which received the data maps only and did not receive the article with explanatory/ background information. When comparing the overall responses of Group 4 to the responses of Groups 1, 2, and 3; there are many interesting responses to note. While there are similarities in the responses of this group when compared to the other groups there are also notable differences. Question 3, which

asks; *"I think that this message was straightforward, and that I received the information it was attempting to convey"* elicited responses from this group whose overall response pattern was much closer to being split between yes and no than the other groups, additionally, the majority of responses for this question is just barely on the No side, which even at 53.3% of the respondents in this group, is a much larger percentage of No's than the other groups brought out. Responses to questions 4 and 4a, which ask about misleading portions of the message and ask the group to identify which parts of the message they found misleading also has interesting results. Again, Group 4 was the only group in which a majority of the respondents answered question 4 "Yes," and when looking at the responses to the elaboration question, the people who chose yes were split evenly between choosing the image and both image and text as the misleading element, a smaller percentage chose the text as the misleading portion. Finally, in response to question 8; *"I think that (Images/Text) have/has more potential to mislead an audience when attempting to inform them"* the image only group also hovered close to being evenly split between Images and Text, the majority of the group did lean toward Images however, which is interestingly opposite from the text only group and aligned with the responses of the two groups which received both image and text instrumentation.

Table 5

Group 5: All Respondents

Question	R1	R2	R3	R4
<hr/>				
1. Steady settlement of the area...	53	53	N/A	N/A
2. Many effects on growth...	95	11	N/A	N/A
3. Effectively received message...	70	36	N/A	N/A
4. Parts of message were misleading	41	65	N/A	N/A
4a. Which parts were misleading...	14	13	13	N/A
5. Graphics would be helpful...	78	27	N/A	N/A
6. Article would be helpful...	77	28	N/A	N/A
7. Dealing with misleading info...	24	18	54	10
8. Image/Text are more misleading	57	49	N/A	N/A
9. Preferences when learning...	3	3	98	2
10. Preferences when teaching...	60	26	20	N/A

Table 5 shows the overall results of all four groups of respondents when put together. This table reveals overall trends in the way that the questions were answered regardless of what version of instrumentation the individual respondent received. In many cases, the overall response for many of the questions reveals clear trends which show that

the respondents as an amalgamated group were decided on a response or split between one or more response. For question 1; *“The settlement of the New York City are occurred steadily and over a long period of time”* the overall results show that the group was evenly split between yes and no. The individual groups with a majority of respondents choosing “yes” were groups 1 (Original Years) and 3 (Article Only). The remaining groups, 2 and 4, both had a majority of respondents choose “no” for question 1.

Responses to question 2 *“Throughout New York City’s history, many things have occurred that had an effect on the rate with which its population grew and its infrastructure developed”* were much different than question 1. All groups chose “yes” in an overwhelming majority to this question, with only 10.4% of all respondents choosing “no.” With question 3 *“I think this message was straightforward, and that I received the information it was attempting to convey”* a new response pattern emerges, with the group leaning less toward a definitive response yet with a distinct majority choosing the affirmative for this question. Question 4 follows a similar pattern to 3, the question asks *“I think there were parts of this message that were misleading”* while the majority of answers to question 3 were positive, the majority for question 4 are negative. Question 4a asks the respondents of question 4 who chose “yes” to identify which part of the message they found misleading. Responses to this question are fairly evenly distributed between all 3 response options (Image/ Text/ Both). Questions 5 and 6, which ask the respondents if the inclusion of graphics and/or text is or would be helpful in understanding the given message follow nearly identical response patterns, with over 70% of the group choosing “yes” for each question. In response to question 7; *“When I feel that part of an image and text message is wrong, vague, or misleading I tend to: Trust the image more than the text,*

Trust the text more than the image, Attempt to make my own conclusions about the message, completely discount the entire message” the group as a whole was mostly split between choosing either image or text, which about 40% of the respondents did, and choosing to make their own conclusions about the message, which what about half of the group chose to do. Interestingly, only about 10% of the group would have elected to completely discount the entire message. Question 8 asked the respondents to identify if they believed that images or text have more power to mislead an audience when attempting to inform them, the group was very close to being evenly split between the choices with 53.8% choosing Image and 46.2% choosing Text, there was one respondent who chose both, despite this not being a response choice. For question 9; *“When learning new things or performing new tasks, I prefer to be presented with information or directions that: Feature images only, Feature text only, Feature images and explanatory text, Feature some other communicative tactic (please specify)”* the responses were the most one-sided of any of the responses, with 92.5% or 98 respondents choosing images and explanatory text. In light of this response, when the group was asked what method they would choose for conveying information in question 10, 56% chose images, 24.5% chose text, and only 18.9% chose other, among the responses in the “other” category were image & text, video, and oral presentation. These results support common knowledge and findings that people have different learning styles and communication channels.

Appendix F shows a percentage breakdown of the individual groups as well as the combined group by question. From this table it is possible to see trends in the way that the groups answered particular questions, in particular, how a given group responded in

comparison to the rest of the groups for a given question or questions. This table also reveals similarities and differences between the ways that certain groups responded to questions.

Responses to question 1 show that the group which received the instrumentation with the article and image with the original years and the group which received the article only both had a majority of respondents who chose yes, while the other two groups (article with manipulated years and image only) had a majority of respondents who chose no. The overall results of this question show that when considered together, the combined group showed that neither choice yielded a result in either direction. It is interesting to note in the breakdown of the groups that the two groups which received both images and text had opposing results, and that the same happened for the groups which received only the text or the image.

While responses to question 1 are more evenly distributed, responses to question 2 show that the individual groups did agree on responses in some instances. In response to question 2, 89.6% of all respondents agreed that there were a variety of factors which played a role in the development of the New York City area. This is not a surprising outcome, as the question itself asks for more of a common sense response than a response based on the instrumentation, and that the article which was read by 3 out of the 4 groups mentioned this almost exactly. It is interesting that the group which did not receive the article was also the group whose positive response rate to this question was the lowest. While the differences between the image only group and the other groups is not enough to prove a definite influence by the instrumentation, there is a possibility that the text in the other groups did have a bit of influence.

Questions 3 and 4 ask the respondents if they thought the information was straightforward or misleading. Responses to these questions are constant, for question 3, all groups but the image only group had a majority of respondents who thought that the message was straightforward. Again, for question 4, all of the groups but the image only group had a majority of respondents who did not think that the instrumentation was misleading. This stability in responses shows that the respondents were answering the questions in a constant fashion, which lends itself to the fact that the respondents were giving their candid opinions about the instrumentation, and that in most cases; respondents were receiving the same message from the article/image.

Less than 40% of respondents found the article or image they were given to be misleading. This response to question 4 is (as previously stated) supported by responses to question 3. Question 4a asks those who answered “yes” in question 4 to choose which part of the article they found to be misleading. When looking at the groups responses at the same time, it is hard to see any trends in the way that all the groups answered this question. Of the members of the individual groups which answered this question, it appears that each individual group went in a different direction with their answers to the question. The group which received the text and image with original years was split mostly between choosing the image and both, with only a few people selecting text. The group which received the article and image with manipulated years chose image with the most frequency, but the remainder of respondents were split between the text being misleading and both elements being misleading. Unsurprisingly, 100% of the respondents in the article only group who found the material to be misleading selected the text as the misleading element. The respondents from the image only group who found the material

to be misleading were split between image and both, much like the group which received the maps with original years.

Questions 5 and 6 ask the participants if the inclusion of graphics and/or text (respectively) were or would be helpful in understanding this material. For both questions all groups answered that yes, the inclusion of explanatory images and text are or would be helpful for understanding this material. The group responses which are most noteworthy for both of these questions are the responses of the image only group and the article only group. For both questions, the image only group was one of the groups which most strongly favored the use of explanatory images and or text. This is supported by their response to question 4, which when compared to the other groups, reveals that this group was most confused or misled by the instrumentation they received. In contrast, the article only group lies at the other end of the spectrum. In response to question 4, the only group who felt the material was *less* misleading was the group which received the article and images with manipulated years. When looking at the article only groups' response to questions 5 and 6, this trend is repeated. Although a majority of these respondents believed that the addition of images and/or the presence of text aided in understanding the material, the percentage of respondents from this group choosing "yes" in comparison with the other groups reveals that the article only group had the lowest positive response rate of all groups surveyed.

In response to question 7, all of the groups had a majority of respondents who reported that when a part of a message is wrong, vague, or misleading they tend to draw their own conclusions from the message. In this case, about half of all participants reported that they would do this, and the other half chose to either believe the image or

text alone, or completely discount the entire message. When looking at the responses of the groups in comparison with the other groups, the response rates are mostly constant when considering the percentage of group members selecting a given choice. The group which received the article and images with original years had responses which were most evenly distributed when compared to the responses of the other groups.

Question 8 asked the participants if they think that either images or text have more potential to mislead an audience when attempting to persuade them. While results across all groups show that a slight majority of respondents believed that images have more potential to mislead an audience, the amount of individuals who chose text is also significant. The inability of the group as a whole to choose a definitive answer to this question is significant. When looking at the responses of the groups, the article only group was the only group in which a majority of people chose text as the element with more potential to mislead. This provides the possibility that the instrumentation did play a role in the way that some of the respondents answered this question.

The final two questions ask the respondents what communicative tactics they prefer when learning new tasks or conveying information or instructions to others. Question 9 allowed the respondents to choose from images alone, text alone, images and text together, or some other format. All of the groups chose images and text in an overwhelming majority and the other responses in nearly insignificant amounts. When comparing individual group responses to this question, the participants who did not choose image and text in combination were unpredictable. Question 10 yielded a much different response than question 9 did. In response to this question, where the participants were not given the express choice of image and text together, 56.6% of the respondents

elected images as the method that they would choose, while 24.5% chose text and 18.9% chose other. The individual breakdowns by group follow the same pattern, with differences so minor that they do not warrant discussion.

Performing chi-square tests on the results showed that the only questions in which the results had significant distributions were questions 3, 4, and 4a which all asked the respondents if they felt they understood the message and whether or not they felt that the message was misleading. According to the chi-square results, it is possible that similar responses may be found if these questions were asked of a larger population of respondents. The chi-square results for the remainder of the questions showed that the distribution of the answers was not statistically significant, and may not resemble the responses from a larger population if queried.

The results show that there were many different ways that the respondents answered the questionnaire, as a result there are many points of discussion and interpretation of the responses. The following section will discuss the results as they have been collected, and will compare them to expected results and the results found in other studies.

DISCUSSION

A major objective of the study was to find out how audience members react to confusing, wrong, or vague information due to inaccurate representation of data. In order to do this, instrumentation was devised that attempted to present study participants with many different versions of the same message, with the expectation that variances in the sample message would produce different effects in the meanings that the audience members assigned to the message. Working from the expectation that some of the study

participants would find the message confusing or misleading and that other participants would be forced to think about confusing or misleading messages, the study also sought to find out how the participants reported they deal with misleading information, what type of information (visual, verbal, or both) they believe has more potential to misinform, and also preferred information delivery channels when learning or teaching new tasks.

Tufte (2001) makes the point that perception is unpredictable, and because of this it is difficult to create messages whose meaning is constant across all members of a given audience. Knowing that it would be nearly impossible to create a message (in any form) which would have the desired effect (understanding or misunderstanding) on a given respondent, the different forms of the message were created. The two forms which featured images and text, with differing years on the data maps were created to see if differences in the information relating to the image portion of the message would produce different responses. Similarly, the text only and image only versions were created to measure the participants' responses to just one element of the message. Results from question 1, which is among the most basic of questions on the survey, show that the groups were split between agreeing and disagreeing that the settlement of the New York City area occurred steadily and over a long period of time. The two groups that agreed with the statement, the group which had the text and images with original years and the group which received the article only had majorities of respondents who agreed that the settlement was gradual. This follows the expected outcomes when these versions of the instrument were created, while the version text and images with original years features maps with inconsistently spaced time periods, the audience seems to have not fallen into the trap of just looking at the maps themselves and took into account the labels on the

maps. Support for this finding is seen in the way that the group which received the same text and images with different years answered the same question. This group had a majority of respondents who reported that the settlement of the area was not steady. This may be attributed to the fact that the labels for the data maps for this group were created so that the participants would be led to believe (by the images) that there was a massive population explosion in the time period between the second and third image. Looking at the overall responses of all participants to question 1, it is seen that an equal amount of people responded to the question affirmatively and negatively. This result shows that despite all of the differences across all four variations of the message, the audience was not swayed one way or another, and points to the fact that the instrumentation was in fact fair and balanced.

This study was designed to present the participants with many variations of the same message using different communication codes to see if there were differences in the respondents' reports on the clarity or ambiguity of the message. After collecting the reactions of 106 students to the article or image or combination of the two, it can be stated that in most of the scenarios tested, a majority of respondents reported that they did not think that the message they received was misrepresentative.

The only scenario in which a majority of the respondents found the message to be misleading was the image only group. This finding supports the ideas of scholars such as Tufte (2001) and Barry (1997) who continually make the point that the perception of visual messages is much more complicated and open to much more interpretation than textual messages or messages which combine both image and text. When this group was asked to identify which part of the message they found to be most misleading, the

respondents believed in equal amounts that the image and both the image and text were the most misleading portions of the message. While it is uncertain if the respondents chose “both” or “text” because of the absence of explanatory text or because of the small amount of text in the instrumentation, it is certain (evidenced by the other trials) that the existence of text made a clear difference in the way that the members of the other groups answered the same questions. This is seen in the way that the groups who received instrumentation featuring images and text as well as the text only groups answered questions 3 and 4 on the questionnaire. While the image only group had a majority of respondents who answered that they did not find the message straightforward and that part of the message was misleading, the other groups had majorities who reported the opposite.

This finding supports the work of scholars such as Paivio (1971), Holmes (2002), and Tufte (2001) who agree that the combination of images and text aide the message recipients in deriving meaning from a given message. The fact that of all the groups tested, the image only group was the only group in which more respondents reported that the given message was not straightforward and was misleading, and the other groups results were opposite from the image only group. This set of results show that a message in which images are the dominant method of conveying information allows for a more broad range of interpretation and confusion than a message which employs different forms of the same information.

The fact that the article only group did not find the message to be as vague or misleading as the image only group is a finding that defied expectations. While the study did not specifically address the way that respondents report the acquisition of text only

messages, possible reasons that this group reported understanding the message with higher frequency levels than the image only group is that conventional information acquisition methods (such as reading the newspaper, instructions, or other forms of directions) are often text only, and people in general are forced to learn using these methods only. Through conventional teaching methods and modes of information delivery, audiences become accustomed to having information given to them in ways that allow for little interpretation; however, with images the possibility for different interpretations of the same message is much greater, as has been shown in previous research.

In addition to collecting the respondents reactions to the straightforwardness or misleading aspects of the instrumentation, the study sought to learn if the respondents thought that the inclusion of graphics and/or explanatory text was or would have been helpful in understanding the message. Previous research shows that the image and text combination does aide in information comprehension (Paivio; 1971, Holmes; 2002, Tufte; 2001), and the responses of the group tested in this study show that nearly 75% of the group tested think that the inclusion of explanatory graphics and text was or would have been helpful for the understanding of the material they were presented with. The group which reported that it felt most misled (the image only group) was also the group which had the highest percentage of people report that the inclusion of graphics was helpful in understanding the message and the second highest percentage of people who reported that the inclusion of an article with background information would have been helpful. This makes sense taking into account that this was the group in which 60% of respondents felt that there were parts of this message which were misleading. It was

expected that the other groups would have responded at the same level as this group or that the responses would have been closer to being evenly split between yes and no. However, after noting that most of the respondents in these groups felt that they understood the message they were given, their lukewarm responses can be accepted as personal opinion of the respondent.

There has been much work done to find out how audiences respond to different kinds of information, and there has also been a lot written about misleading information, how and why it is misleading, and what message creators can do to make their messages as straightforward as possible. Arnheim (1971) discusses active selectivity, that the mind is constantly looking for changes and anomalies in ones environment, by seeking out these aberrations, instead of dismissing things that are inconsistent or do not make sense a message receiver's attention is drawn to such an inconsistency. Similarly, Festinger's theory of Cognitive Dissonance provides the idea that when an audience member is drawn to information that does not make sense or challenges a preconceived notion, that individual will strive to change his or her ideas or ways of thinking so that the inconsistencies are diminished or erased. In the case of this study, half of the respondents reported that when they are faced with inconsistent information they attempt to draw their own conclusions from the presented material. Of the respondents who did not choose this option, 22.6% stated that they would believe the image, 17% would believe the text, and 9.4% would completely discount the message altogether. While it is not possible to state the extent that the instrumentation played in the way that the respondents answered this particular question, the possibility that it did play a role for some respondents and not for others is a factor which must be considered.

Question 8 on the questionnaire asked the respondents to report if they thought that images or text had more potential to mislead an audience when attempting to inform them. Overall results showed that the respondents as a whole could not say that images or text had more power to mislead. While reasoning behind the choice that a particular participant may have selected can be attributed to a combination of personal ideas on the subject as well as the particular instrument that the individual may have received, this does show that like Tufte (2001) stated, perception is erratic and this makes it very hard to predict exactly how a message will be interpreted. Considering the individual groups in comparison with one another, the article only group was the only group in which the respondents selected text in majority, while the rest of the groups selected image. As previously stated, with 53.8% of the respondents choosing image, 46.2% choosing text, and 3.8% (one respondent) choosing both, it is fair to say that the population as a whole does not have a clear opinion on the subject, and it is more than possible that opinions on the misleading nature of an element of communication can vary from situation to situation dependent on circumstances.

The final two questions on the survey asked the respondents to identify which method(s) they would prefer to have when receiving information and when they need to present information to others. In response to the question about receiving information, 92.5% of all respondents identified a combination of images and text as the preferred format for receiving information or learning a new task. This further supports the work of others on the power of the image and text combination to properly and consistently convey a particular message. When asked what method they would prefer when presenting information to others (and were not given the express option of choosing

images and text), 56.6% of the respondents chose images alone, 24.5% of the respondents selected text alone, and the remaining 18.9% selected other. Many of the participants who chose “other” selected images and text, but also mentioned was live/oral presentation and video. The fact that the group chose images and text with such overwhelming majority (for question 9) and images (for question 10) supports the work that has been done showing the power of Picture Superiority Effect in aiding comprehension and memory of topics and tasks.

While the current study does not directly follow a specific study which was previously performed, it did stem from a variety of studies that were created to measure similar reactions in audiences. Work that has been done to investigate Picture Superiority Effect shows that images aide memory in the recall of facts and other information, the results of the current study show that the groups in which images and text made up the message produced a lower percentage of respondents who felt that the message was misleading, especially when compared to the percentage of respondents who got the image only message and did report that they thought it was misleading. The media and audience reaction studies from which the current methodology is stemmed from showed that when images were used in messages the audience had higher response rates to vivid images or pictures than versions of the same message which did not have images. Support for this finding can be seen in the reactions of the article only group as compared to the groups which received the image and article together, the article only group had a lower percentage of respondents who felt the overall message was straightforward, and also was the only group who felt that text has more potential to mislead than images.

This study showed that 1/3 of all respondents felt that the message they were presented with was misleading. While there were many responses to which element of the message was misleading, it is clear that respondents who were given the image and text together felt misled at a much lower rate than the image only group. The group failed to choose between images and text when asked which they thought had more potential to mislead or confuse an audience, but agreed overwhelmingly that they prefer to receive information with both text and images. This group reported that when they are faced with wrong, vague, or misleading information, half of the group tried to make their own decisions, and many of the remainder of the group tended to believe either the image or the text only rather than completely discounting the entire message.

CONCLUSION

This study presented four different versions of the same message to four groups of Rochester Institute of Technology students. The students viewed a message which contained an article, an article with images with evenly spaced years, an article with images with irregularly spaced years, or just an image with irregularly spaced years and a title. Participants in the study were allowed to look at the message for a set amount of time and then were given a questionnaire to fill out. The questionnaire had 10 questions created to answer the pre-determined research questions, which sought to find how the audience identified and processed information and misleading information. It was found that respondents who were given messages that had images and text felt less confused or misled than respondents who were given messages containing images only. It was also found that the audience felt that images and text both have potential to mislead when

trying to inform, and that the preferred method for acquiring information that which emplos images and text together.

Research question 1 asked “when presented with an image and/or text message, which element or incantation of the message do respondents find most misinterpreted?” It was found that the image-only version of the message produced the highest percentage of respondents who felt misled by the message. The image alone was insufficient for many respondents in this group to feel that they accurately received the message that was being communicated. Research question 2 asked “does the inclusion of explanatory text or images aide in understanding a given message?” In response to this question, it was found that all groups but the image-only group had majorities of respondents who thought the message was straightforward and not misleading. All groups reported that the inclusion of explanatory text and or images did or would have helped in understanding the message that was communicated. Research question 3 asked “when a message is misleading/confusing, how do respondents report they understand the information?” AND “do they find that text or images are more difficult to interpret?” It was found that about half of the respondents attempted to make their own conclusions about a message with the info that they were given, and that a decision on which has more power to be misleading is something that depends largely on the individual audience member and is hard to generalize. Research question 4 asks “through which medium do respondents report they prefer to receive information?” AND “does this differ from the methods they report they prefer to utilize to create messages?” It was found that the participants in this study prefer to receive information that includes images as well as text. When creating

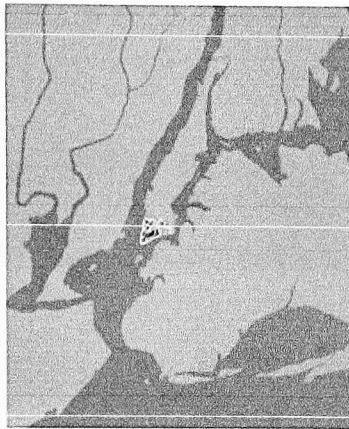
messages; they prefer to use images, however, they were not given an overt choice of images as well as text to choose from.

Limitations to this study include the convenience sample which the study was drawn from. Because respondents to this study are all students at the Rochester Institute of Technology and are almost all college-age, the results of this study cannot be applied to a more diverse population. The size of the sample also prohibits the results of the study from being applied to the general population. Another limitation to this study is that the instrumentation was created to fit the needs and goals of these particular research questions and has not been tested out with other groups or with different content. Because the questions in the instrumentation require the respondent to self report his/her reactions to the message, there is a level of uncertainty over the validity of all responses.

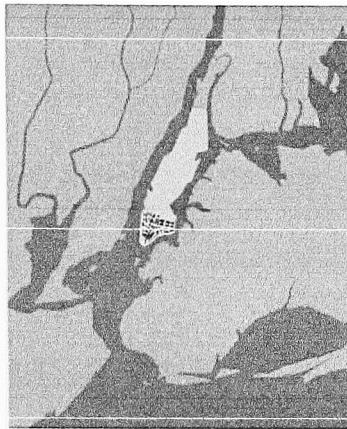
Possibilities for further research stemming from the current study include performing the study as it is on a larger and more diverse sample audience. Individual research questions could also be expanded upon and studied much more in depth. For instance, studying how an audience member identifies and deals with misleading information would yield pertinent information to this study. Further research can be preformed to learn about possible connections between learning styles of a respondent and their preferences for sending and receiving information. Finally, this study could be performed utilizing a different message, method for conveying the message, or questionnaire/interview to see what reactions are to the message.

Appendix A: Instrumentation; Article with Original Years

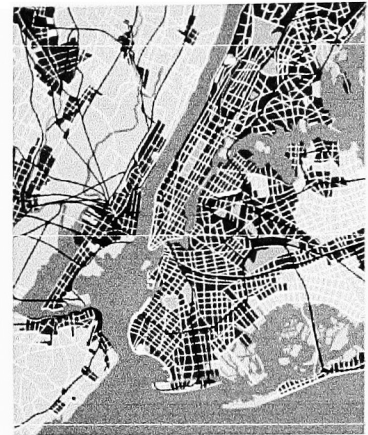
New York City



1767



1805



1930

The settlement of what is now known as the New York City area was influenced by many factors. When the Dutch purchased the island of Manhattan from Native Americans in 1626, the island was a sparsely populated trade outpost with little to no infrastructure. The introduction of European settlers to the area was the beginning of many changes for the areas inhabitants as well as the land itself.

Shortly after the future New York City area had become a Dutch property, Charles the II of England gave the area which included Manhattan to his brother the Duke of York. Under British rule, New York became a center for commerce and culture. At this time infrastructure was developing as well, most people relied on horses and carriages as their main source of transportation. The city remained under British control until the end of the Revolutionary war when it became the first capital of the nation as well as the first capital of the state of New York.

The early years of the United States were a great period of growth for the New York City area as well as the nation as a whole. Immigrants arrived in great numbers, and New York City was for many their final destination in the new world. At the same time, transportation networks were growing by leaps and bounds. Completion of such projects as the Croton Aqueduct and the Brooklyn Bridge brought vital elements to the city as well as connected the city to surrounding areas. This trend continued through the Civil War and the years of reconstruction of the South, during this time the city grew at a rapid pace. Mass transit also made its debut during this time period, as inhabitants went from horse drawn street cars to elevated trains and electric trolleys and eventually the debut of the subways.

When The Port of New York Authority was established, it was the first of its kind in the Western Hemisphere and the first interstate agency created under a clause of the Constitution permitting compacts between states. The Port Authority assumed control of all mass transit in the New York City area including bridges, tunnels, and subways. The name was later changed to The Port Authority of New York and New Jersey in to identify more accurately the bistate status of the agency.

Just when it seemed that nothing would stop the development of New York City, the Great Depression struck the United States. The stock market crash devastated the nation's economy and many Americans found themselves jobless. During the Depression Era the country, New York City included, experienced a period of negative immigration, where more people were leaving the country than were coming to it.

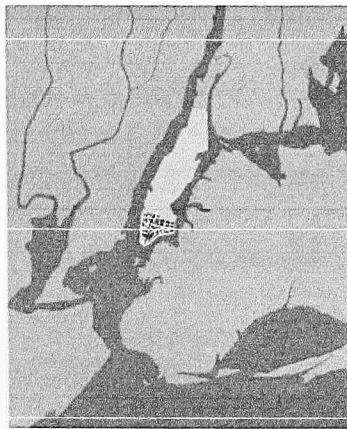
In the later years of the 20th century New York City continued to change and develop in many ways. There are many unpredictable and unique things about the city, two of which are the history of its inhabitants and the development of its infrastructure.

Appendix B: Instrumentation; Article with Manipulated Years

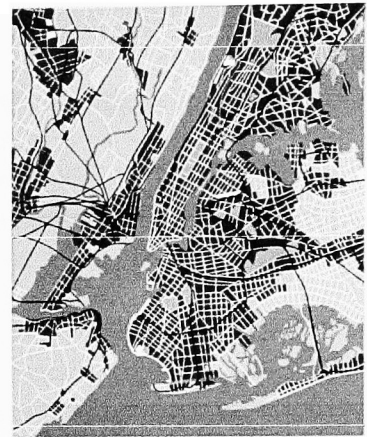
New York City



1730



1830



1930

The settlement of what is now known as the New York City area was influenced by many factors. When the Dutch purchased the island of Manhattan from Native Americans in 1626, the island was a sparsely populated trade outpost with little to no infrastructure. The introduction of European settlers to the area was the beginning of many changes for the areas inhabitants as well as the land itself.

Shortly after the future New York City area had become a Dutch property, Charles the II of England gave the area which included Manhattan to his brother the Duke of York. Under British rule, New York became a center for commerce and culture. At this time infrastructure was developing as well, most people relied on horses and carriages as their main source of transportation. The city remained under British control until the end of the Revolutionary war when it became the first capital of the nation as well as the first capital of the state of New York.

The early years of the United States were a great period of growth for the New York City area as well as the nation as a whole. Immigrants arrived in great numbers, and New York City was for many their final destination in the new world. At the same time, transportation networks were growing by leaps and bounds. Completion of such projects as the Croton Aqueduct and the Brooklyn Bridge brought vital elements to the city as well as connected the city to surrounding areas. This trend continued through the Civil War and the years of reconstruction of the South, during this time the city grew at a rapid pace. Mass transit also made its debut during this time period, as inhabitants went from horse drawn street cars to elevated trains and electric trolleys and eventually the debut of the subways.

When The Port of New York Authority was established, it was the first of its kind in the Western Hemisphere and the first interstate agency created under a clause of the Constitution permitting compacts between states. The Port Authority assumed control of all mass transit in the New York City area including bridges, tunnels, and subways. The name was later changed to The Port Authority of New York and New Jersey in to identify more accurately the bistate status of the agency.

Just when it seemed that nothing would stop the development of New York City, the Great Depression struck the United States. The stock market crash devastated the nation's economy and many Americans found themselves jobless. During the Depression Era the country, New York City included, experienced a period of negative immigration, where more people were leaving the country than were coming to it.

In the later years of the 20th century New York City continued to change and develop in many ways. There are many unpredictable and unique things about the city, two of which are the history of its inhabitants and the development of its infrastructure.

Appendix C: Instrumentation; Article Text Only

New York City

The settlement of what is now known as the New York City area was influenced by many factors. When the Dutch purchased the island of Manhattan from Native Americans in 1626, the island was a sparsely populated trade outpost with little to no infrastructure. The introduction of European settlers to the area was the beginning of many changes for the areas inhabitants as well as the land itself.

Shortly after the future New York City area had become a Dutch property, Charles the II of England gave the area which included Manhattan to his brother the Duke of York. Under British rule, New York became a center for commerce and culture. At this time infrastructure was developing as well, most people relied on horses and carriages as their main source of transportation. The city remained under British control until the end of the Revolutionary war when it became the first capital of the nation as well as the first capital of the state of New York.

The early years of the United States were a great period of growth for the New York City area as well as the nation as a whole. Immigrants arrived in great numbers, and New York City was for many their final destination in the new world. At the same time, transportation networks were growing by leaps and bounds. Completion of such projects as the Croton Aqueduct and the Brooklyn Bridge brought vital elements to the city as well as connected the city to surrounding areas. This trend continued through the Civil War and the years of reconstruction of the South, during this time the city grew at a rapid pace. Mass transit also made its debut during this time period, as inhabitants went from horse drawn street cars to elevated trains and electric trolleys and eventually the debut of the subways.

When The Port of New York Authority was established, it was the first of its kind in the Western Hemisphere and the first interstate agency created under a clause of the Constitution permitting compacts between states. The Port Authority assumed control of all mass transit in the New York City area including bridges, tunnels, and subways. The name was later changed to The Port Authority of New York and New Jersey in to identify more accurately the bistate status of the agency.

Just when it seemed that nothing would stop the development of New York City, the Great Depression struck the United States. The stock market crash devastated the nation's economy and many Americans found themselves jobless. During the Depression Era the country, New York City included, experienced a period of negative immigration, where more people were leaving the country than were coming to it.

In the later years of the 20th century New York City continued to change and develop in many ways. There are many unpredictable and unique things about the city, two of which are the history of its inhabitants and the development of its infrastructure.

Appendix D: Instrumentation; Image Only

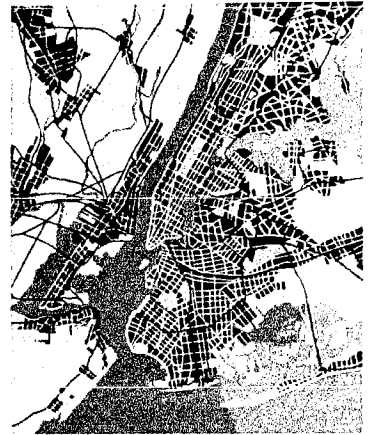
New York City



1767



1805



1930

Appendix E: Instrumentation; Questionnaire (*Demographic questions omitted*)

For the following questions, please select the answer that most closely fits your impression of the material you just looked at. There is no right or wrong answer, just your impressions.

1. The settlement of the New York City area occurred steadily over a long period of time.

☐ Yes ☐ No

2. Throughout New York City's history, many things have occurred that had an effect on the rate with which its population grew and its infrastructure developed.

☐ Yes ☐ No

3. I think that this message was straightforward, and that I received the information it was attempting to convey.

☐ Yes ☐ No

4. I think that there were parts of this message that were misleading.

☐ Yes ☐ No

4a. If Yes, which part of the message did you find misleading? (If no, proceed to question 5).

☐ Image ☐ Text ☐ Both

5. The inclusion of graphics is/would be helpful in understanding this material.

☐ Yes ☐ No

6. The inclusion of an article with background information is/would be helpful in understanding this material.

☐ Yes ☐ No

7. When I feel that part of an image and text message is wrong, vague, or misleading I tend to:

- ☐ Trust the image more than the text.
- ☐ Trust the text more than the image.
- ☐ Attempt to make my own conclusions about the message.
- ☐ Completely discount the whole message.

8. I think that _____ have/has more potential to mislead an audience when attempting to inform them.

- ☐ Images
- ☐ Text

9. When learning new things or performing new tasks, I prefer to be presented with information or directions that:

- ☐ Feature images only.
- ☐ Feature text only.
- ☐ Feature images and explanatory text.
- ☐ Feature some other communicative tactic. (Please

specify) _____

10. If I had to choose one method for conveying information or instructions about a particular topic or task, I would choose:

- ☐ Pictures and illustrations
- ☐ Written directions or information
- ☐ Some other method. (Please

specify) _____

Appendix F: Results

1. The settlement of the New York City area occurred steadily over a long period of time.

<i>Original Years</i>	15 (60%) Yes	10 (40%) No
<i>Manipulated Years</i>	11 (42.3%) Yes	15 (57.7%) No
<i>Article Only</i>	16 (64%) Yes	9 (36%) No
<i>Image Only</i>	11 (36.7%) Yes	19 (63.3%) No
<i>All Responses</i>	53 (50%) Yes	53 (50%) No

2. Throughout New York City's history, many things have occurred that had an effect on the rate with which its population grew and its infrastructure developed.

<i>Original Years</i>	23 (96%) Yes	2 (4%) No
<i>Manipulated Years</i>	24 (92.3%) Yes	2 (7.7%) No
<i>Article Only</i>	22 (88%) Yes	3 (12%) No
<i>Image Only</i>	26 (86.6%) Yes	4 (13.3%) No
<i>All Responses</i>	95 (89.6%) Yes	11 (10.4%) No

3. I think that this message was straightforward, and that I received the information it was attempting to convey.

<i>Original Years</i>	18 (72%) Yes	7 (28%) No
<i>Manipulated Years</i>	21 (80.8%) Yes	5 (19.2%) No
<i>Article Only</i>	17 (68%) Yes	8 (32%) No
<i>Image Only</i>	14 (46.6%) Yes	16 (53.3%) No
<i>All Responses</i>	70 (66%) Yes	36 (34%) No

4. I think that there were parts of this message that were misleading.

<i>Original Years</i>	9 (36%) Yes	16 (64%) No
<i>Manipulated Years</i>	7 (26.9%) Yes	19 (73.1%) No
<i>Article Only</i>	7 (28%) Yes	18 (72%) No
<i>Image Only</i>	18 (60%) Yes	12 (40%) No
<i>All Responses</i>	41 (38.7%) Yes	65 (61.3%) No

4a. If Yes, which part of the message did you find misleading?

<i>Original Years</i>	4 (44.4%) Image	1 (11.2%) Text	4 (44.4%) Both
<i>Manipulated Years</i>	3 (42.8%) Image	2 (28.6%) Text	2 (28.6%) Both
<i>Article Only</i>	0 Image	6 (100%) Text	0 Both
<i>Image Only</i>	7 (38.9%) Image	4 (22.2%) Text	7 (38.9%) Both
<i>All Responses</i>	14 (35%) Image	13 (32.5%) Text	13 (32.5%) Both

5. The inclusion of graphics is/would be helpful in understanding this material.

<i>Original Years</i>	17 (68%) Yes	8 (32%) No	
<i>Manipulated Years</i>	18 (72%) Yes	7 (28%) No	1 no answer
<i>Article Only</i>	16 (64%) Yes	9 (36%) No	
<i>Image Only</i>	27 (90%) Yes	3 (10%) No	
<i>All Responses</i>	78 (73.6%) Yes	27 (25.5%) No	1 (0.9%) No Answer

6. The inclusion of an article with background information is/would be helpful in understanding this material.

Original Years	21 (84%) Yes	4 (16%) No	
Manipulated Years	17 (65.4%) Yes	9 (34.6%) No	
Article Only	14 (58.3%) Yes	10 (41.7%) No	1 no answer
Image Only	25 (83.3%) Yes	5 (16.7%) No	
All Responses	77 (72.6%) Yes	28 (26.4%) No	1 (0.9%) No Answer

7. When I feel that part of an image and text message is wrong, vague, or misleading I tend to

Original Years	5 (20%) Image	6 (24%) Text	9 (36%) Own	5 (20%) Discount
Manipulated Years	7 (26.9%) Image	4 (15.4%) Text	14 (53.8%) Own	1 (3.8%) Discount
Article Only	6 (24%) Image	5 (20%) Text	13 (52%) Own	1 (4%) Discount
Image Only	6 (20%) Image	3 (10%) Text	18 (60%) Own	3 (10%) Discount
All Responses	24 (22.6%) Image	18 (17%) Text	54 (51%) Own	10 (9.4%) Discount

8. I think that _____ have/has more potential to mislead an audience when attempting to inform them

Original Years	13 (50%) Image	13 (50%) Text	1 (3.8%) answer "both"
Manipulated Years	15 (57.7%) Image	10 (38.5%) Text	
Article Only	10 (40%) Image	15 (60%) Text	
Image Only	19 (63.3%) Images	11 (36.7%) Text	
All Responses	57 (53.8%) Image	49 (46.2%) Text	

9. When learning new things or performing new tasks, I prefer to be presented with information or directions that:

Original Years	0	1 (4%) Text	23 (92%) I&T	1 (4%) Other
Manipulated Years	1 (3.8%) Image	0 Text	25 (96.2%) I&T	0 Other
Article Only	2 (8%) Image	1 (4%) Text	21 (84%) I&T	1 (4%) Other
Image Only	0 Image	1 (3.3%) Text	29 (96.7%) I&T	0 Other
All Responses	3 (2.8%) Image	3 (2.8%) Text	98 (92.5%) I&T	2 (1.9%) Other

10. If I had to choose one method for conveying information or instructions about a particular topic or task, I would choose:

Original Years	14 (56%) Image	6 (24%) Text	5 (20%) Other
Manipulated Years	17 (65.4%) Image	5 (19.2%) Text	4 (15.4%) Other
Article Only	12 (48%) Image	8 (32%) Text	5 (20%) Other
Image Only	17 (56.7%) Image	7 (23.3%) Text	6 (20%) Other
All Responses	60 (56.6%) Image	26 (24.5%) Text	20 (18.9%) Other

Appendix G: IRB Approval Form

Form C
IRB Decision Form

TO: Nicole Bartell
FROM: RIT Institutional Review Board
DATE: October 30, 2003
RE: **Decision of the Institutional Review Board**

Project Title: *But What Does it Really Mean? The Text/Image Relationship in Informational Communication.*

The Institutional Review Board (IRB) has taken the following action on your project named above.

☒ Approved as Type I.

Now that your project is approved, you may proceed as you described in the Form A. **Note that this approval is only for a maximum of 12 months; you may conduct research on human subjects only between the date of this letter and October 30, 2004.** You must promptly report to the IRB any proposed modifications, unanticipated risks, or actual injury to human subjects. The IRB will send you a Form F approximately two months before the end of your 12-month human research project. If your project will extend more than 12 months, your project must receive continuing review by the IRB – please contact me for information that must be presented to the IRB for continuing approval to conduct human subjects research at RIT.

Marjorie K. Zack
Institutional Review Board Administrator
(On behalf of Richard Doolittle, IRB Chair)
cc: IRB Members

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