Final Justification Paper

EDTECH 505
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**User Assumptions**

The intended audience for this unit is third grade students, ages 8-9. In third grade, a single class can represent a vast range of reading abilities—from students who are reading at a first grade level to students who are reading at a sixth grade level. As a result, graphics and visuals can often be the most beneficial way to communicate meaning to all students—not just the ones who read and comprehend text effectively. This unit was created to assist students in comprehending and being able to recall important facts about the relationship of forces and motion. Each image was created to communicate a specific idea but also to relate to the overall unit topic. Lohr (2008) explains how repetition can create a sense of unity and harmony as well as help imply relationships (p. 203). As a result, many elements of the images in this unit are repeated in several graphics to create a sense of cohesiveness and help students understand how certain concepts are related to each other.

**Graphic Description**

**Force and Motion: The Science of Movement Banner**

These two images were created as an introduction of the overall unit. I used the same stick figure and a similar color scheme as many of the other images to reinforce the unity and harmony described by Lohr (2008). The figure gradually moves towards kicking the ball, which then proceeds to bounce across the remainder of the first image onto the text of the second image. The design works because I utilized whitespace to focus attention on important aspects of the image (Lohr, 2008, p. 274) and to help show the motion of the ball. The alignment of the ball across the two images also helps portray motion.

**Unit Vocabulary**

One of the most difficult parts about teaching younger students is determining how to conquer the domain specific vocabulary. For each word, I tried to create a design that would not only appeal to younger learners, but a design that would also help communicate the meaning of each word. Lohr (2008) explains how different typefaces can convey different meanings, so I selected very specific fonts for each term. For example, I chose a heavier and bulkier typeface for the term “gravity” to create a sense of objects falling to the ground due to the force of gravity. The vertical alignment of the term also helps communicate the idea that gravity makes things fall down. The term “motion” uses a typeface that is lighter and shows more movement. “Direction” is very blocky and precise, much like directional arrows on road signs. The term “speed” uses a font that mimics flames that you might see in movies as a racecar peels out onto the road.

**Push and Pull**

This image shows the two main types of forces that are used in every aspect of motion. The image works because I used simple shapes in the design. Lohr (2008) explains, “Squares and rectangles can contain information . . . [and] focus attention” (p. 250). The most important concept for students to understand is that every motion begins from
either a push or a pull. As a result, I wanted to help students focus their attention on the terms “push” and “pull.” Using rectangular shapes helps draw attention to the terms.

Lohr (2008) also described how using cartoon shapes in instructional materials could help clarify information (p. 257). I wanted to keep the overall design basic, but at the same time, I wanted to be able to show what a pushing force or a pulling force would look like. I created very basic figures using basic rectangles, squares, and circles to show how one might “push” the word box or “pull” the word box. This works well because it adds a little more of a specific example to the overall idea of pushes and pulls. I also made the font within the rectangles italic and increased the kerning in order to show what direction the force would cause the object to move.

**Newton’s Laws of Motion**

This image was created to be an introduction to Newton’s Three Laws of Motion as well as a reminder and reinforcement throughout the unit. The image works because it is concentrated and concise. Lohr (2008) states that concentrated means key points are emphasized in both graphics and text (p. 102). The main idea I tried to convey in this image was the fact that there are three laws of motion. The three separate graphics set apart by the caution tape frames help reinforce that concept.

According to Lohr (2008), “Concise refers to reducing visual information to its most basic core level for meaning” (p. 102). While each law could have been stated in complex and technical terms, I reduced each law to a simple statement each officer is stating.

**Newton’s First Law, Second Law, and Third Law of Motion**

These three images were created to help students visualize the relationship between the three laws and the meaning of each law. For third grade students, Newton’s Laws of Motion are discussed in very simple terms. As a result, I designed each of these to communicate the simple surface meaning of each law. I used the ideas of caution tape and law officers to relate to law enforcement, helping students connect with the idea that these laws should be obeyed. In addition, each law is enclosed within a rectangular shape to help contain information (Lohr, 2008, p. 250).

Each of these images represents the use of CARP in design. Lohr (2008) explains, “Contrast is the action that helps learners see the main point” (p. 207). In each image, the stark contrast of black type on the yellow caution tape helps direct attention to the text describing the main idea of each law. Including all three of the laws in each image also created contrast. The law that I wanted to focus on was made larger and in full color, in contrast to the other two laws that were gray scale and smaller. This helps create contrast and show the relationship between the three laws while still helping students focus on one specific law at a time.

All of the three laws within the rectangles are aligned with one another to help create a sense of balance. In addition, the smaller elements in each law graphic are also aligned with one another. This helps create the idea that the elements and text are related (Lohr, 2008, p. 201). In addition, within the third law image, the arrows, balloons, and speech
bubbles are aligned in a balanced and symmetrical way. This helps “save the learner’s mind from having to do unnecessary work” (Lohr, 2008, p. 175).

Lohr (2008) explains, “Repetition can create a sense of harmony and unity. When you repeat similar colors in a display, or similar typefaces, you imply relationships” (p. 203). The caution tape, the officers, font selection, and color scheme were repeated in all three law images and the Newton’s Laws of Motion image.

Proximity refers to the spacing of elements within an image. Lohr (2008) discusses how elements close together seem related but elements far apart seem unrelated (p. 203). By placing each speech bubble close to specific officers, it creates a relationship between the text in the speech bubble and the position of the officer. As each officer was designed to be in a position that demonstrates an aspect of the law, the proximity of the two helps reinforce meaning.

**Simple Machines**

This image was designed to give students an idea of the six main types of simple machines. The image works because it is clean, neat, simple, and organized in a way that portrays each of the smaller images is included in the main category of “simple machines.” Lohr (2008) explains that using vertical and horizontal alignment can help improve hierarchical organization (p. 128). Having the objects below the title indicates a primary and secondary relationship, and having each object aligned with one another horizontally implies equal value within the primary category of simple machines. In addition, the idea that there are six main types of simple machines is declarative knowledge students need to learn. Smith and Ragan (2005) explain that the use of images is a great associational technique for processing this type of knowledge (p. 160).

**Levers**

This image was created as an example to students of a collage-type image they will be creating as part of the lesson on simple machines. The overall image uses a lot of white space to help emphasize the important concepts. Lohr (2008) cites Hartley in stating that consistent use of space can help readers access more personally relevant pieces of information (p. 274). By using minimal text and separating the text with whitespace, students will be more able to focus on the important concept that levers can be used in tools we work with and things we play with.

The image also works because I arranged the elements in the image in a left to right, top to bottom way. Lohr (2008) explains, “The human mind makes a continual effort to impose order and create meaning. The more you accelerate the process, the more you help the learner’s mind” (p. 175). By organizing the elements in a readable way, it helps eliminate some of the unnecessary work on the part of the learners.

**Design Process**

Jackson (2008) explained that graphic design requires an audience (p. 64). In order to design effective visuals, the intended audience, their characteristics, and their needs needed to be identified. I began my unit and the design process for my images based on the identification of my audience—my third grade students. From there, I identified
an instructional need based on the Utah State curriculum for third grade science. As the concepts of force and motion are addressed in the core, I decided to base my unit on those ideas.

In creating my images and overall unit plan I constantly considered the selection and organization of each image. I wanted to be certain the objectives were clear and the information presented was accurate and easily accessed by third grade students. Stokes (2002) cautioned, “The use of visuals in education, although consistently shown to aid in learning, must be carefully planned. The use of visuals that steer the learner to the exciting or entertaining aspects of presentation rather than encouraging thoughtful analysis of the underlying meaning may interfere with the intent of the lesson” (p. 16).

The ACE model was highly beneficial in my process to create useful visuals. In many cases, the design was changed based on the evaluation and the process began again. “Newton’s First Law,” “Newton’s Second Law,” and “Newton’s Third Law” were the images that underwent the most extensive changes, with several redesigns to improve the effectiveness of the images and ensure they did not detract from learning.

Another part of my design process was to use some of the suggestions Lohr (2008) gave for developing visual concepts (p.77). By looking up the terms "force" and "motion" in the dictionary, I was able to start brainstorming some things related to the topic. From there, I tried the synectics approach to brainstorming--using analogies and metaphors to explore new ideas (Lohr, 2008, p. 77). This process led me to compare Newton's Laws of Motion to law enforcement, and the “Newton’s Laws of Motion” image was created. The concept of Newton’s Law Enforcement Officers was then repeated in each of the individual law images, using repetition to imply a relationship between the four images.

Clark and Lyons (2011) explained that good instructional materials focus on important lesson content (p. 46). By using various Principles, Actions, and Tools (PAT), I was able to help focus my images on key concepts and relate complex ideas to things the intended learners have prior knowledge about.

For example, Lohr (2008) stated, “Depth refers to scale, dimension, and texture. Depth plays a critical role in making information stand out” (p. 270). In the “Push and Pull” image, I used drop shadows to help the boxes the figures are moving stand out. Since the terms in the boxes represent the most important concept in the image, adding the drop shadows helps direct learner attention to the main point of the image. “Newton’s Third Law” also uses drop shadows to help certain elements stand out, such as the arrows indicating the motion of the each object.

Land, Hannafin, and Oliver (2012) explained, “When learning is anchored in everyday contexts, learners are more likely to understand how concepts are applied and why they are useful” (p.12). In my “Levers” image, I used objects that are readily familiar to students in order to demonstrate that simple machines are used in every day life, how they can benefit us, and why it is important to understand how they work.

Typography can also be a focal point in an image. I used a variety of serif and sans serif typefaces throughout my images to help maintain readability. Not only was my selection of font based on readability, but I also considered where I wanted attention to be
directed. For example, I used a large sans serif font in the “Force and Motion: The Science of Movement banner” to draw attention to the terms “force,” “motion,” “science,” and “movement.” In addition, type can add meaning to concepts. With the “Unit Vocabulary” image, I used typefaces that enhanced the meaning of each word.

My images use space to clarify text, create a sense of balance, and help direct attention to chunks of information (Lohr, 2008, p. 272-273). For example, the “Levers” image uses whitespace to help create balance between the different elements within the graphic. Each of the Newton’s Laws graphics uses whitespace to help differentiate between key statements about each law. In the “Simple Machines” graphic, whitespace helps chunk information by separating each of the boxes with the simple machines in them.

I also created images that are concentrated, concise, and concrete. They emphasize key points, help learners easily visualize concepts, and are reduced to the basic concepts that need to be communicated. For example, the “Levers” image is concentrated because it emphasizes the key points in both the graphics and the text. It is concise because there is an effective use of whitespace and simple examples of levers we use to work and play.

“Newton’s Second Law” was reduced to a very simplified version of Newton’s Second Law of Motion in an effort to be more concise. The “Simple Machines” image was also cut down to just the basic concept of the six main types of simple machines.

Lohr (2008) also explained that more recent research suggests that three to five chunks of information are the maximum for working memory (p. 125). As a result, my “Simple Machines” image has just the six types of simple machines, rather than adding additional facts about each type within the image.

I also used the principles of CARP in my designs: contrast, alignment, repetition, and proximity. In “Newton’s First Law,” “Newton’s Second Law,” and “Newton’s Third Law” I used contrast by placing all three laws in each image to show their relationship to one another, but with two of the three smaller and in gray scale to emphasize one law at a time.

In each of my images, the shapes I used were selected in an effort to enhance the communication of key concepts. For example, in the “Push and Pull” image, the shape of the rectangular boxes the figures are pushing help draw attention to the terms inside. The “Newton’s Laws” images also use rectangles and squares to contain information and focus attention. The “Simple Machines” image uses an overall rectangular shape to show the hierarchal relationship of the simple machines. In “Newton’s Third Law” simple arrows are used to imply motion.
Sources


