Bradley Drewyor
Ed Tech 506
May 8, 2011

Justification Paper

User Assumptions

This unit on Simple Machines is intended for students in the third grade. The unit is explicitly teacher-led, due to the nature of the content and the age/abilities of the students in the class. With the teacher leading the unit, the technology requirements can be managed effectively, allowing the class to complete materials individually, in small groups, or as a whole class depending on the resources available to the classroom. As this is teacher led, the lesson materials serve as lesson plans with links to learning objects to share or distribute to students. Lesson design assumes teachers have basic computing ability, meaning they can control the mouse and navigate Web pages, print materials, and run a projector to share content with students. Additionally, lessons assume teachers have a basic understanding of the science standards for teaching about simple machines.

Students, as mentioned above, are third-grade students beginning to learn about simple machines, how they function, and how they help make work easier. Student characteristics and prerequisite skills include the following.

Third grade students
- Are Beginning to work independently
- Have a foundation of skills, but still need support
- Tend to struggle with complicated or abstract topics
- Are usually between the ages of 8-9
- Favor different learning styles, requiring differentiated learning strategies
- Struggle to work in teams, and need support and experience in this area

Prerequisite Skills
- Students must be able to measure with non-standard units of measurement.
- Students must be able to record data that is collected and communicate it in complete sentences.
- Students must have basic computer skills, including manipulating the mouse.
- Students must be able to take basic notes about their learning, in writing or by drawing pictures.

Graphics Descriptions

The easiest way to approach graphic descriptions for this project is to focus on each lesson and the graphics involved. I will approach that below.

Intro

Web Page Design: All lessons, including the Intro and Closure pages, have a consistent design intended to make lesson content for teachers clear, concise, and friendly for easier lesson delivery. Within this page, I focused on using color (border, headings) to help differentiate lessons, despite the similarity supplied in each. Additionally, I included a gear from the main intro graphic on each lesson page to give an awareness of place and sequence for the lessons.

Gear Graphic/Lesson Organizer: My gear graphic is specifically for teachers. This image used gears to show how Work and Force, the center gear, make the simple machines go. This is a visual representation of what will be taught to students, and in what sequence. I created hotspots in HTML for each of the gears/lesson titles to allow navigation to the lessons. The lesson-specific gears are re-used as a graphic on each lesson page, as well. A key to this graphic was using shape to create a visual aesthetic to continue throughout the entire unit. I identified a display shape early, which quickly allowed me to build text that fit around this central graphic. (Smaldino, Molenda, Henich, and Russell, 2005)

Glog Poster for Students/Teachers: For this graphic, I stepped back and really thought about what I wanted to get out of the graphic for students. What I really wanted to do was create a representation of the information to make it more concrete to students from the beginning, and to give them something to return to as needed throughout the unit. (Lohr, 2008) I also wanted to make sure I tied this graphic to my typography examples that allows words to convey meaning through simple use of text as graphics. Building something dynamic that teachers and kids could return to was important, as well. To that end, I decided to create the unit introduction for students using Glogster.com, which includes links to educational videos.

Lesson 1

Gear Graphic: As mentioned previously, I included the gear graphic at the top right of the page to keep some order and mapping for teacher as they move through the lessons. This is the case for all seven lesson pages.

Word Web: I wanted to provide a clear, simple, organized, hierarchal graphic to lead to a clearer understanding of the concept of work. Graphic organizers are a powerful tool for delivering information to students. They can also be used by students for other content and content areas later, once they have a positive understanding of what they are seeing. At the same time, it is extremely important to provide a solid, deliberate set of lesson plans/strategies for using the organizer, which is embodied by the lesson content that accompanies the graphic organizer. (Merkley, D.M & Jeffries, D., 2001)

Working Smarter Worksheet: This worksheet was developed to give students a way to visualize how machines (simple and complex, at this point) help make work easier. I built the graphic to include clipart images from Microsoft Word to give real life examples of machines for students to share knowledge of how they are used. I used the selection principles to create organization and hierarchy in the rows and columns of the document to make the worksheet easier to see.

Lesson 2

Inclined Plane Graphic: Just as a screw is just a fancy-shmancy inclined plane, a wedge is two inclined planes slapped together. I created a triangle to represent an inclined plane. I then simply flipped the triangle to create a second inclined plane. Finally, I copied the two inclined planes and then placed them side-by-side to create a wedge. After putting the two separate colors together, I decided to use a third-grader's knowledge of red and blue make purple to show how two inclined planes come together to make one wedge. I also then added arrows next to the inclined planes to show they would be moving together. The arrows were used to imply motion. (Lohr, 2008)

Inclined Plane Worksheet: A quick, easy blackline master for students to apply their knowledge of inclined planes. When building the page, I wanted to focus on organization the page through clear chunks and alignment. The sections are divided by a simple box, breaking up the page to keep students focused on each section as they work through them. Additionally, I included a blackline version of the typographic representation of inclined plane to allow students a visual reminder of the concept as they start in on their assignment.

Lesson 3

Wedge Diagram: It is valuable to know that a wedge is just two inclined planes, laid back to back. The purpose of this diagram is to show just that. I used color, arrows, and simple wording to show how two inclined planes combine together to create a wedge.

Wedge Worksheet: There are many wedges that we encounter around the house and in our everyday lives. This worksheet presents several clip art images to support the visual identification of different tools that act as wedges. I used aspects of chunking to break the page into different sections, with images at the top and the answer area in a box on the bottom half of the page. I chose to add a little shadow to the image boxes to create a visual definition around the image, as well.

Lesson 4

Spiral BLM: It is important for students to understand that a screw is simply a very sophisticated inclined plane wrapped around a central pole. Once students cut out the spiral, I would have them hold the outside end to the top of a chair or desk. They will then be able to see how the spiral forms a long, curved ramp, or inclined plane. Finally, I would wrap the spiral around a central pole (a pencil, pen, dowel rod, etc.), showing the shape of a screw. My image itself contains both the spiral and a possible central pole for students to cut out, as well.

Lesson 5

Lever and Fulcrum Web Link: I found a great example of a lever and fulcrum, complete with labels, to allow teachers to show a graphic representation of a lever before embarking on the lesson activities. This link is from UC Irvine Distance Learning Center and can be found here.

Seesaw Worksheet: The purpose of this BLM is to act as a record sheet for the seesaw activity completed by students to demonstrate how levers function. The text in each box provides a point-of-use reference to remind students what they were doing in their experiments. Also in the worksheet is a three-dimensional object representing the fulcrum to give students a focal point for creating their levers and the weights in the image.

Lesson 6

Message Pulley System Directions: The intended target is both possibly for students and their teachers; however, I have created my graphic with the students in mind more than the teacher. Given the materials, I wanted a graphic that would support the construction of the system, even if they chose not to read the directions (or can't read them). In this way, I am creating one image for both audiences. This graphic focused on the ideas of contrast (boxes, shading, sections), alignment (again, boxes and sections), repetition (similarity of boxes, shading), and proximity (text and images for the directions). I believe teachers and students would be able to build the message pulley system following the provided directions and information.

Message Pulley System: Again, another simple BLM worksheet for students to use to support the simple machine experiment completed during the lesson. Familiar typeface, spacing, alignment, and boxes support quick and easy completion of the activity for the students. Nothing fancy; it just serves its purpose.

Lesson 7

Wheels at Home Worksheet: Students are challenged to identify the wheels and axles in each of the images, plus draw their own examples of common simple machines that incorporate wheels and axles in their daily lives. Following the familiar worksheet format will make this worksheet less intimidating.

Closure

PBS Complex Machines Game: Less of an image and more of just a Web-based game, this link directs students to a simple machines and complex machines game, challenging students to use what they have learned to visually create a machine that uses the functions of the different simple machines to complete a game task. Learning by experimentation is a powerful tool, and this game does just that. There is ample evidence to support the value of applying knowledge to promote learning.

Edheads Simple Machines Post Test: Edheads provides a very nice, simple, image-based post test on simple machines here. There is not much to explain other than this is an optional post test teachers can provide to students to see how well they comprehended and can apply their learning from the simple machines unit.

Design Process

Having spent many years in educational publishing, I have some experience in tyring to identify well-designed lessons, but my experience in the BSU Ed Tech program has shown me time and again that I have a great deal to learn in terms of designing instruction myself. I have a firm grasp on what is generally known as the systems approach to instructional design as described by Brown and Green (2006). In a systems approach to instructional design, the separate design steps are seen as just that—separate steps that can be completed sequentially over a period of time.

A major model designed by Dick and Carey suggests the use of a system of development, examination, and refining of instruction based on a goal of making improvements to the instructional materials (Dick, Carey, and Carey, 2001). This is the model that I am most familiar with in my professional life, as we tend to receive manuscript from researchers who go through a very systematic approach of identifying a key deficit or learning target, determining what the key characteristics are for learners needing an instructional intervention, developing instruction to address the deficit, piloting the instructional materials, and evaluating the success of those materials and revising as necessary. Designing instruction in this way fits very will within the instructional design process known as ADDIE—analyze, design, develop, implement, and evaluate (Brown and Green, 2006).

As I said before, this is what I see as the most common approach to instructional design in my field; however, as instruction moves to incorporate more electronic media for content delivery, the idea of rapid prototyping has greater appeal and application in the development process. The electronic delivery of content allows for increased opportunity to make sure content is in front of the intended target learners more frequently and earlier in the process than with print-based materials. This represents a slight deviation from the idea of a pure systems approach to instructional design and moves to a more postmodern approach that represents a more combined, parallel development process as opposed to very separate, unique steps. Throughout this course, I took the opportunity provided to me to create content, test, revise, and finalize images and lesson material to ensure that the best in design theory that I have learned over time came to bear in this project.

References

Brown, A., & Green, T. (2006). *The essentials of instructional design: Connecting fundamental principles with process and practice.* Upper Saddle River, NJ: Pearson Education, Inc.

Dick, W., Care, L., & Carey, J. O. (2001). *The systematic design of instruction* (5th ed.). New York, NY: Addison-Wesley/Longman.

Lohr, L. (2008). *Creating graphics for learning and performance: lessons in visual literacy* (2nd ed.). Upper Saddle River, N.J.: Pearson/Merrill/Prentice Hall.

Merkley, D.M. & Jeffries, D. (2001) *Guidelines for implementing a graphic organizer.* The Reading Teacher, 54 (4), 350-357.

Merrill, D. (2002) *First principles of instruction.* Educational Technology Research and Development, 50 (3), 43-59.

Smaldino, S.E., Molenda, M., Heinich, R., & Russell, J. D. (2005). *Instructional media and the new technologies of instruction,* New York: Macmillan.