

Introduction

A brief review of literature shows that many people of all ages and backgrounds (e.g. students, teachers, pre-service teachers, parents) have difficulty understanding and explaining different planetary phenomena (e.g. why there are seasons or why there is night and day). Research suggests that these misconceptions could be related to the two-dimensional, static representation of the phenomena that is found in textbooks. Specific misconceptions noted include:

1. The difference in meaning between revolution and rotation.
 - a. Students frequently confuse these terms or use them interchangeably.
2. The effect of the tilt of the axis of rotation on seasons.
 - a. The tilt of the earth affects the angle at which the sun's rays strike the earth which in turn is part of the reason for different seasons.
3. The shape of the earth's orbit around the sun.
 - a. Students frequently believe that the elliptical orbit of the earth around the sun is the sole cause of the seasons.

A visual presentation of these materials in an interactive environment may overcome these misconceptions and boost student understanding, learning, and retention of the objectives.

Objectives

(adapted from the Utah State Science Core Curriculum for 6th Grade):

1. Given a blank piece of paper, learners will create and verbally explain a conceptually sound two-dimensional model or picture that shows:
 - a. The position and of the orbit of the earth relative to the sun.
 - b. The position and orbit of the moon relative to the earth.
 - c. The direction of the revolution of the earth around the sun.
 - d. The direction of the rotation of the earth around its axis.
 - e. The tilt of the earth on its axis.
 - f. The position of the earth relative to the sun during each of the four seasons.
 - g. The tilt of the earth relative to the sun in each of the four seasons for the northern hemisphere.
 - h. The angle at which light from the sun strikes the earth during each of the four seasons for the northern hemisphere.
2. Additionally the learner will verbally explain:
 - a. The difference of the length of days in each of the seasons.

Client

The client for this project is the sixth grade team of teachers at Hooper Elementary in the Weber School District. The client serves from ninety to one-hundred twenty learners, depending on the number enrolled each year.

The learners are generally white, middle-class students. Usually about 10-15% of the learners receive free or reduced lunch. About the same percentage receive special education services. The number of minority and English as a Second Language Learners is less than 5%.

The integration of technology into instruction has strong support at the school and district level. The school has two computer labs connected to a district server via a fiber-optic line.

Each classroom in the school has or will have a projector. The school is also in the process of procuring document cameras for each classroom. Classes that are registered in the student information system have an associated WSD Online (powered by Moodle, a course management system) course created. The district beta tested WSD Online last year and is preparing for widespread implementation this year.

Scope

This project will specifically address the following items:

1. The position and orbit of the earth relative to the sun.
2. The position and orbit of the moon relative to the earth.
3. The direction of the revolution of the earth around the sun.
4. The direction of the rotation of the earth around its axis.
5. The tilt of the earth on its axis.
6. The position of the earth relative to the sun during each of the four seasons for the northern hemisphere.
7. The tilt of the earth relative to the sun in each of the four seasons for the northern hemisphere.
8. The angle at which light from the sun strikes the earth during each of the four seasons for the northern hemisphere.

This project will not specifically address:

1. Phases of the moon.
2. Seasons in the southern hemisphere.
3. The specific distance of the earth from the sun.
4. The specific distance of the moon from the earth or sun.
5. The use of collected data to compare patterns relating to seasonal daylight changes.

6. The relationship between the amount of heat absorbed and the angle relative to the light source.

Target Audience

The primary users of this product are sixth grade students, approximately eleven to twelve years of age. The primary users have basic computer skills (e.g. basic word processing, internet navigation, and computer interface skills.) The project will be used in a computer lab environment that is connected to a network with a high speed internet connection, sound, and a networked printer. The computer lab also has an instructor's computer that is connected to a projector for whole group instruction. The majority of the primary users can work in a self-directed manner.

Prior to instruction on these objectives the learners have limited exposure to this subject matter. They have received basic instruction in the structure of the solar system, what an orbit is, what seasons are, and the role of the sun in the weather. They also have various bits of knowledge and misconceptions based on their observations of their surroundings.

The learners generally have a high level of interest in studying the content because it is mostly outside of the scope of what they have been taught to this point. There also seems to be an inherent interest in outer space.

Limitations

1. Learners:
 - a. Approximately twenty-percent of the primary users read below grade-level which will necessitate the integration of narration.
 - b. Since this project is being completed in the summer months, there is limited access to the primary users and thus, evaluation of the project is unattainable.

- c. The primary users have limited experience with computer-based self-instruction, which may necessitate very clear instructions as to the use of the project.
2. Time:
 - a. The project will need to be completed by the end of the semester.
 3. Resources:
 - a. Computer and software resources will be limited to the combined resources of the designers.
 - b. There is little or no budget for the completion of this project.
 - c. The creative nature of the project will be limited to the skills and abilities of the designers.

Finished Products


1. Work Plan (including introduction, objectives, client description, scope, target audience description, and listing of limitations.)
2. Prototypes (samples of the product in various phases of development)
3. Documentation describing the project
4. Development files (sound and video files)
5. Final files (completed and published project)
6. List of references used for content

Timeline

Assignment:	Assignment Lead:	Completion Date:
Interface	Trisha	23 June 2008
Graphics	Brent	23 June 2008
Storyboards	Trisha	30 June 2008
Module 1 (Position and orbit of the Earth & Moon)	Trisha	7 July 2008
Module 2 (Revolution of the Earth)	Brent	7 July 2008
Module 3 (Rotation of the Earth)	Trisha	14 July 2008
Module 4 (Tilt of the Earth on	Brent	14 July 2008

its axis)		
Module 5 (Position of the Earth relative to the sun each of the four seasons)	Trisha	21 July 2008
Module 6 (Tilt of the Earth relative to the sun & the angle light strikes the Earth in each of the four seasons)	Brent	21 July 2008
Completion of Version 1.0	Brent	23 July 2008
Testing of Version 1.0	Trisha	28 July 2008
Revisions based on Version 1.0 Testing	Brent	30 July 2008
Testing of Version 2.0	Trisha	1 August 2008
Revisions based on Version 2.0 Testing	Brent	2 August 2008
Completion & Submission of Version 3.0	Trisha	4 August 2008

Storyboards

	<p>This is the main menu. It will come after a short introduction to the unit.</p> <p>The lesson title shows when the lesson button is moused-over. We did it this way in the case that the entire unit would be completed over a period of days. Lesson numbers are easier to remember than lesson names.</p> <p>The main menu will lead to the rest of the unit.</p>
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	<p>This is our instruction interface.</p> <p>Animations and images will appear in the large box. Written instruction will appear in the bottom box while it is being heard audibly.</p> <p>The upper inset in the top box is showing the current season in the northern hemisphere.</p> <p>The bottom inset in the top box shows the current angle at which the sun's light is hitting the earth</p>
	<p>This is our experiment interface.</p> <p>It is very similar to the instruction interface except that the students will be able to control certain variables (depending on which lesson they are on). In this particular lesson, students will be able to control the tilt of the earth and see how the tilt affects the seasons in the northern hemisphere, as well as see how the rays of the sun will hit the earth.</p> <p>The experiment interface also includes a help button that will give students ideas on what to be looking for as the variables change.</p>

	<p>This is our quiz interface.</p> <p>The Instruction, Experiment, Next Lesson, and Return to Menu buttons will be grayed out to ensure students take the quiz before moving on and to ensure that they are taking the quiz from memory.</p>
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