

Project Summary

Seasons Come, Seasons Go is an interactive instructional unit that teaches why the Earth has different seasons. The instruction is divided into three, self-paced lessons. Each lesson builds on content from the prior lessons. The content is presented in three modes. The first is animations, the second is text accompanying the animations, and the third is audio of the text that accompanies the animations. Quiz items are included in each lesson. The purpose of the quiz items is to check for understanding of key concepts and ideas. The quiz items take the form of multiple choice and matching items.

There are some areas that the developers do not feel they were able to adequately address because of the time constraints of the project. These items include:

1. The difference of the length of days in each of the seasons.
2. A more detailed exploration of the angle at which the Sun's rays strike the Earth during each of the four seasons.

The unit has been tested by the client (sixth grade teachers at Hooper Elementary) but has not been tested by the learners (sixth grade students at Hooper Elementary). The developers recommend that the course be evaluated by the learners and then be modified based on the experience of the target audience.

Alterations From the Original Work Plan

1. Modules were combined to make three total modules. It became evident that the six topics chosen would be better taught in three lessons with each lesson covering two of the topics.
2. Experiments were not made for all modules. A suitable experiment that would help the learner better understand the topics without possibly causing confusion could not be found for Lesson 1 (Revolution of the Earth). The experiment for Lesson 3 (Position of the Earth During the Seasons) would have been extensive and a whole project in-and-of itself.
3. Objectives. Objective 2a (Students will be able to identify the difference of the length of days in each of the seasons) was not covered in any of our modules.

Next Steps

1. Evaluation of the unit by the target audience.

2. Revision of the unit based on the finding of the target audience.
3. Expansion of the quiz items to better match the objectives for each lesson and the unit.
4. Integration with a database backend to track learner progress.
5. A more in-depth exploration of the identification of Fall and Spring based on the angle at which the Sun's rays strike the Earth.
6. Greater exploration of the orbit of the moon, with perhaps a new unit on the phases of the moon.
7. Creation of experiments for Lesson 1 (Revolution of the Earth) and Lesson 3 (Position of the Earth During the Seasons).
8. A lesson covering Objective 2a (Students will be able to identify the difference of the length of days in each of the seasons).

Acknowledgements

Sheri Leak (6th Grade Teacher at Hooper Elementary) for working with the developers on this project.

Dr. Andrew Walker (Professor at Utah State University) for extra help and encouragement.

NASA's Visible Earth for photographs of the Earth.

NASA, ESA, and the Hubble Heritage Team (STScI/AURA)-ESA/Hubble Collaboration for the background for the credits screen.

FreeFoto.com for the photographs of the Earth during each of the four seasons.

Flash CS3 Help File- for many coding tips and how-tos.

Prentice Hall Science Explorer: Astronomy (ISBN 0-13-054088-9) and Wikipedia.com for content information.

<http://www.lukamaras.com/tutorials/actionsript/moving-rotating-movie-clip.html> - for help in learning how to rotate objects via buttons.

http://highered.mcgraw-hill.com/sites/007299181x/student_view0/chapter2/seasons_interactive.html - for inspiration and ideas

Team Roles

Team members were given assignments to be the lead for individual lessons (Brent – Lesson 1: Revolution of the Earth Around the Sun, Trisha – Lesson 2: Rotation of the Earth Around Its Axis) with a collaboration on Lesson 3: Position of the Earth During the Seasons.

Additionally, team members took the lead on specific coding, design, or other parts of the project. Brent is responsible for the navigation, audio and audio functions, and basic graphics throughout the project. Trisha is responsible for the frontend, drag and drop functions, and the basic interface throughout the project.

Although there were leads for different sections of the project, all work truly was collaborative with the team members working together closely to produce the final project.

Unit Structure

The unit is separated into six separate files. This separation was created for navigation purposes and to reduce the amount of bandwidth required to use different parts of the unit. The six files are:

1. Introduction
2. Main Menu
3. Credits
4. Lesson 1 - Revolution of the Earth Around the Sun
5. Lesson 2 - Rotation of the Earth Around Its Axis
6. Lesson 3 - Position of the Earth During the Seasons

The main menu is accessible from and provides links to each of the other five files. Each of the five files has a link to the main menu and credits on each frame. Each lesson also has a link to the next lesson in the unit. The six files are structured as follows:

Introduction

Frame(s)	Content
1	Title and subtitle explaining the purpose of the unit. A brief slideshow of the seasons that includes information about the developers.

Main Menu

Frame(s)	Content
1	Buttons that link to the three lessons. The titles of the three lessons. Links to the introduction and credits.

Credits

Frame(s)	Content
1	A single frame movie clip that acknowledges helps and resources. Links to the introduction, menu, and a back button that will navigate the browser to the last page.

All Lessons

Frame(s)	Content
All	<p>Buttons for Navigation:</p> <ol style="list-style-type: none"> 1. Instruction- navigates to the start of the lesson 2. Take a Quiz- navigates to the quiz for the lesson 3. Return to Menu- navigates to the unit menu 4. Credits- navigates to the unit credits 5. Exit - closes the browser window or current tab <p>Buttons for Audio:</p> <ol style="list-style-type: none"> 1. Play/Pause Button (changes state between play and pause)- plays and pauses audio 2. Stop Button- stops audio that is playing 3. Narrate All Checkbox -if checked all narrations will automatically play <p>Content Audio:</p> <ol style="list-style-type: none"> 1. All frames will have narration matching the text on the frame

Lesson 1: Revolution of the Earth Around the Sun

Frame(s)	Movie Clip	Instructional Text
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1	Helpful hints	Gives some helpful hints for navigating through the learning module
2	States the lesson objectives	Welcomes the learner and provides instructions
3	Shows a point revolving around another point	States the definition of revolution and describes the shape of the Earth's orbit
4	Shows that shape of the Earth's orbit can appear to change depending on the perspective of the viewer	Explains perspective and how it affects the appearance of the Earth's orbit
5	Shows the moon revolving around the Earth as the Earth revolves around the Sun.	Explains the moon's orbit around the Earth.
6	Shows the Earth revolving around the Sun.	States that the Earth revolves around a point in the solar system called the Sun.
7	Displays the Earth revolving around the Sun.	Explains that it takes approximately one year for the Earth to revolve around the Sun.
8	Shows the direction of Earth's orbit around the Sun.	Explains that the Earth revolves around the Sun in a counter-clockwise direction.
9	Congratulations message	Tells user that they've finished the Instruction portion and can move on to the Quiz section.
10	Embedded question	Quiz question about the revolution of the Earth around the Sun.
11	Restatement of lesson objectives	Lets the user know what they should have learned about in the lesson.

Lesson 2: Rotation of the Earth Around Its Axis

Frame(s)	Movie Clip	Instructional Text
1	States the lesson objectives	Welcomes the learner and provides instructions
2	Shows the Earth, a police siren, and helicopter as examples of rotating items. Users click on the items to see them rotate.	States the definition of rotation and how the Earth revolves around an axis.
3	Shows the direction in which the Earth rotates.	Explains the direction in which the Earth rotates from two different views: top and side.
4	The Earth tilts to 23.5° when clicked on by the user.	Explains that the Earth has a 23.5° from vertical.
5	Shows that the Earth revolves around the Sun.	States that the Earth's tilt remains relatively the same as it revolves around the Sun.
6	Show a location on the Earth rotating and an inset shows what is occurring on Earth from that location.	Explains that a full rotation of the Earth is one day.
7	Congratulations message	Tells user that they've finished the Instruction portion and can move on to the Experiment and Quiz section.
8	The Earth is tilted at 0°. Tilt can be changed by the user.	Explains how to use the buttons to change the tilt of the Earth as desired.

9	Shows the Earth at the tilt set by the user.	Discusses how the tilt affects the weather on the Earth.
10	Four movie clips showing different Earth tilt options.	Quiz question about the consistency of the Earth's tilt as it revolves around the Sun.
11	Restatement of lesson objectives.	Lets the user know what they should have learned about in the lesson.

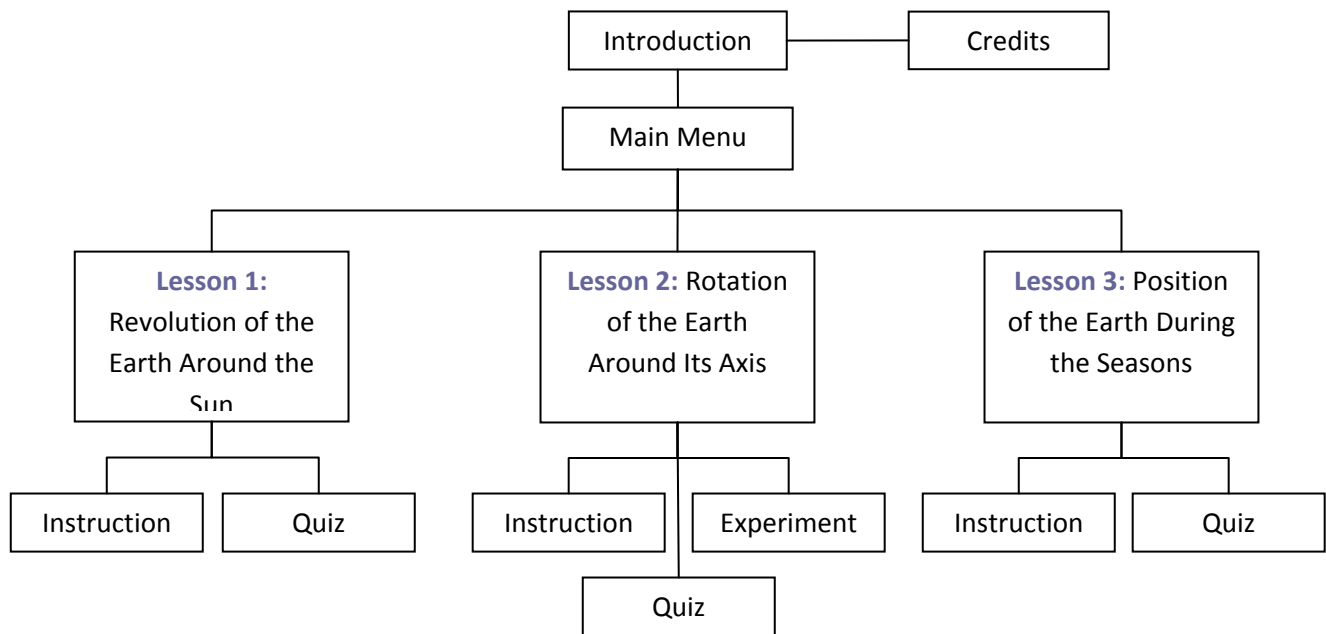
[Lesson 3: Position of the Earth During the Seasons](#)

Frame(s)	Movie Clip	Instructional Text
1	States the lesson objectives	Welcomes the learner and provides instructions
2	Drag and drop interaction	Connects prior knowledge of a clock to the position of the Earth during each of the four seasons.
3	Shows the Earth's orbit split into quadrants for each of the seasons.	Explains that each season is $\frac{1}{4}$ of the revolution of the Earth.
4	When season labels are clicked on, the user is shown how the sunlight hits the Earth during each season.	Explains that the tilt of the Earth affects how the rays of the Sun hit the Earth and thus, causes the seasons.
5	Congratulations message	Tells user that they've finished the Instruction portion and can move on to the Quiz section.
6	Drag and drop embedded question that requires the user to label where each season	Quiz question

occurs in the revolution.

7	Drag and drop embedded question that requires the user to match how the rays of the Sun hit the Earth to its corresponding seasons	Quiz question
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Flow Chart



Naming Conventions

The following naming conventions were used throughout the project:

- Camel case was used in the naming of symbols and instances.
- Movie Clips – *mcNameOfClip* (i.e. mcEarth)
- Buttons – *btnButtonName* (i.e. btnNextLesson)
- Dynamic Text – *dtTextName* (i.e. dtInstructional)

- Instances – *instInstanceOfWhat* (i.e. *instMcEarth*)

Important Variables

The following variables were used throughout the project:

- Navigation Variables (*varInstFrame*, *varExpFrame*, *varQuizFrame*) – The navigation variables kept track of where instruction, experiments, and quizzes began. They allowed for button navigation.
- Alpha Variables (*activeAlpha*, *inactiveAlpha*) – The alpha variables controlled the transparency of the buttons in the instructional modules. When buttons were not to be used, their transparency was set to *inactiveAlpha*.
- URL Variables (*varReqURL*, *varLessonURL*)- The *varReqURL* was used to streaming the audio files. The *varLessonURL* was used for navigation between lessons, as well as navigation to the introduction, menu, and credits.
- Movie Clip Variables (*varMC*, *varMCFrame*)- The *varMC* indicates the primary movie clip on the frame. The *varMCFrame* indicates the starting frame of that movie clip for that frame. These are used in the function for clicking the next button. They were also used in a function for play again. This function has been disabled by the developers at the time of publication, but was used to repeat the content on the frame from the beginning.
- Sound Variables (*varSoundPlaying*, *varPausePosition*)- The *varSoundPlaying* was used to track the play state of the currently loaded audio file. The *varPausePosition* was used to resume play of the currently loaded audio file after pressing the pause button and then pressing the play button.

Critical Code Segments

ActionScript code is explained via comments in the actions layer of the .fla files.

Known Bugs

The Exit button works in Internet Explorer, but is known not to work in Firefox. It might also not work in Opera and Safari.

The drag and drop items will behave erratically in the following situation:

- If an answer has been dropped on the correct drop target and another, incorrect answer is dropped on the same target the feedback text and the audio for the correct answer will play. (The audio only plays if the play button is pressed or narrate all is selected.) It appears this problem is related to the order of the items on the layer. Attempts to address this problem were made using the childIndex setting of a container. However, the developers were unable to satisfactorily resolve this issue without creating further issues.

Audio

Narration was recorded by Brent Ludlow using Audacity and has been saved in an MP3 format. Audacity can open and edit MP3 files so the saving of the original project files served little purpose.