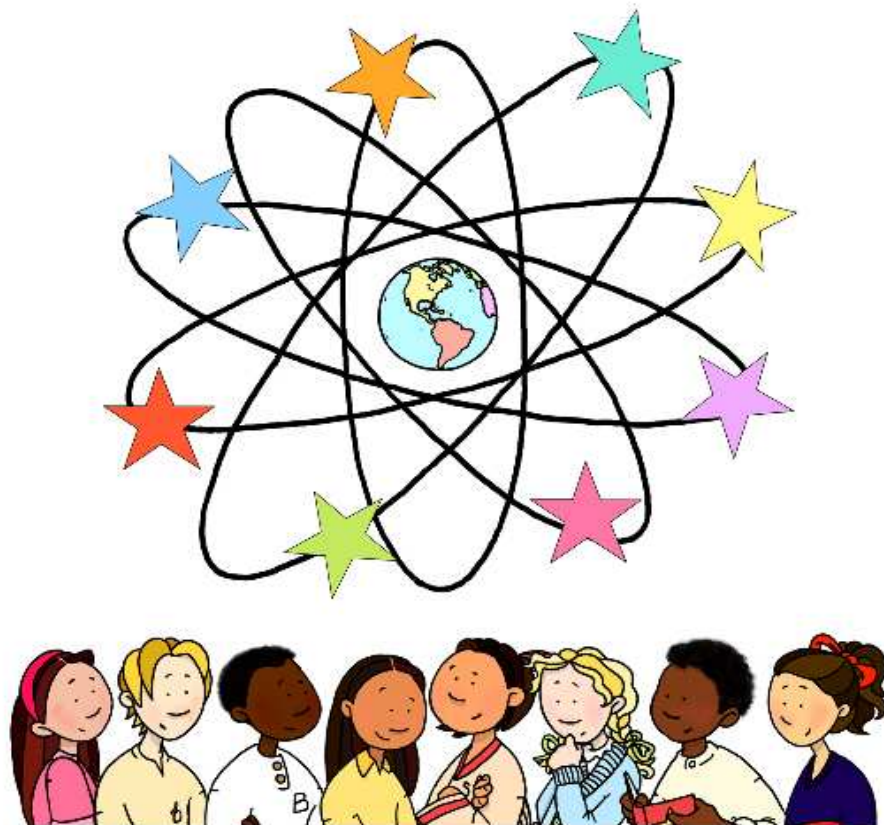# Reading & Math Explorers™ Website

(for elementary school students and teachers)

Sponsored by:

WPI K-12 Outreach Office

Janese Cerulli

Michael Ficarra

Deanna Flaherty

Reading & Math Explorers ™ Website

(for elementary school students and teachers)

An Interactive Qualifying Project Report
Submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
In partial fulfillment of the requirements for the
Degree of Bachelor of Science

Sponsoring Agency: WPI K-12 Outreach

Submitted to:
Project Sponsor: Suzanne Sontgerath
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Abstract

Paralleling nationwide trends to implement effective technology-in-education initiatives as part of the plan to increase academic proficiency and improve quality of education for America's students, this project team designed and developed an interactive Website as a technological component of Reading & Math Explorers™ for elementary school supplementary curriculum. Utilizing focus groups with elementary school teachers and WPI Office of K-12 Outreach professional staff, this project team designed a fun, child-user-friendly, interactive reading and mathematics Website for elementary school students.

Acknowledgements

We would like to thank all those individuals who helped us in our research and design work for this Interactive Qualifying Project.

Authorship

All three team members contributed to and reviewed all aspects of this project and all sections of this report and therefore we jointly accept responsibility for the project as a whole and decline the option of individual authorship.

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Introduction

In today's highly competitive global economy, educational excellence is a critical factor in the success of individuals and countries. Because of the emphasis on technology and communication in today's society, a thorough education in reading, mathematics, and science is especially crucial. It is imperative for students to receive this education, at least in part, through innovative programs with technological components.

Paralleling this concept to integrate technology in the classroom curriculum to improve the quality of education for America's students, our Interactive Qualifying Project (IQP) team created an interactive Website to foster academic excellence in reading and math in elementary school classrooms. The IQP team reviewed the current guidelines on education as well as historical perspective of access to technology and computer use in the classroom. The project team drew conclusions from this research in order to develop an exciting and stimulating Website that follows United States education guidelines.

In the United States, we are committed to providing an environment to foster educational excellence; according to the U.S. Department of Education Strategic Plan for Fiscal Years 2007-2012 the "Department of Education's mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access." The Department of Education "intends that all students have the opportunity to achieve to their full academic potential," and expects that "student achievement must continue to improve so that all students achieve proficiency in state reading/language arts and mathematics assessments by 2014." Because high quality teaching is extremely important in student achievement, the Department's focus is on helping teachers to be well-prepared, disseminating information on

effective strategies and practices, and providing technical assistance to develop quality core instruction to help educators implement programs for all students to be proficient in reading and mathematics. "The Department will measure success not only by the outcomes of its programs, but also by the nation's ability to prepare students to succeed in a global economy as productive and responsible citizens and leaders." Further, the Department of Education intends that more students at the secondary school level "must take increasingly rigorous course work, especially in mathematics and science, to be prepared for postsecondary education or the workforce following high school. Postsecondary education requires significant transformation to maintain America's leading position in scientific innovation and economic prosperity." (U.S. Department of Education, 2007)

The use of computers in the classroom has been a rising trend in the United States during the past several decades. This trend has been fueled strongly by federal technology-in-education initiatives fervently championed by U.S. presidents. In the early 1980s there was very limited use of computers in classrooms: a ratio of 125 students per computer. In the mid 1990s only about a third of schools had an internet connection for the students to use, and most commonly that connection was in the school library or study hall. (Bisland & Fraboni, 2007) By the early 2000s, President Clinton's "National Call to Action" (Clinton, 1997) initiative and President Bush's "No Child Left Behind Act of 2001" (No Child Left Behind Act of 2001, 2002) resulted in an increase in the number of computers and internet connections in schools as well as an increase in the use of those computers by students in the classroom. More specifically, there has been a dramatic improvement in technology integration for elementary school students. (Bisland & Fraboni, 2007) As explained in Bisland & Fraboni (2007), the intent of Clinton's "National Call to Action" was to enable all public schools to have internet connections available to the students

and administration and Bush's "No Child Left Behind" initiative required states to develop assessments in basic skills and included a requirement for all students to be literate in technology by the completion of eighth grade.

The federal requirement for students to be literate in technology by eighth grade and the initiatives for the use of interactive computer-aided curriculum in the classroom is challenging for many teachers because of the need to understand how to use computers and technology effectively to enrich the learning process, including the complexity of choosing software and Websites that are useful and safe to use in the classroom. In addition to recent increased requirements for teachers to participate in professional development sessions focused on their academic subject areas, the new technology-in-education initiatives have increased the need for teachers to be technologically sophisticated and thus have added requirements for teachers to participate in training sessions pertaining to computers and internet use as well as best practices. (U.S. Department of Education Office of Educational Technology, 2004)

Currently, the development of a Website for curriculum in reading and mathematics is part of a project with the Worcester Polytechnic Institute (WPI) office of K-12 Outreach. The ultimate goal of this project team is to design an interactive Website for elementary school students and teachers; the purpose of this Website is to provide a technological component of the Reading and Math Explorers™ curriculum supplement.

Reading and Math Explorers™ is a curriculum supplement for Kindergarten through grade 4 (grades K-4). It is an eight-unit hardcopy tool for elementary school teachers to use with their classroom curriculum. The National Council of Teachers of English (NCTE) and National Council of Teachers of Mathematics (NCTM) standards were used as the backbone for the

creation of Reading and Math Explorers™. Each of the eight units of the curriculum supplement is developed around a diverse set of historical and contemporary characters. Every unit is comprised of a character's biography, including "inspirational achievements and interests," and related activities in reading/language arts and mathematics. The characters are "leaders and innovators" and "are depicted as children, empowering students to recognize in themselves the potential for achievement." (Ortiz & Boettcher, 2005) Some of the characters and related activities are: Lillian Gilbreth (engineer) and Sequoyah (educator) on mathematics activities on algebra concepts patterns and functions and Antonia Novello (doctor) and George Washington Carver (scientist) on mathematics activities on data analysis.

In order to develop the interactive Website for the Reading and Math Explorers™ curriculum for this project, the team researched guidelines for the design of successful children's Websites and integrated learning systems (ILSs) and consequently identified the following features to be important: simple and easy to follow instructions for the teachers and students, activities that appeal to a child's natural curiosity and are accessible to students of various grade levels, activities that test skills being taught in the classroom curriculum, use of characters to create a sense of familiarity, a navigation structure and layout that is uncomplicated, and use of pictures and designs as visual stimuli. The Website should be created for use by multiple levels of learning abilities within a grade in order to include students with different learning styles and students with learning disabilities. (Blowers & Bryan, 2004; Children's Technology Review, 1998; Kulik, 2003)

In addition to working toward developing the Website, we (the project team) focused on researching ways to help elementary students successfully learn a structured curriculum through

a fun and user-friendly Web interface. As a team, we designed this Web interface to be

conducive to different learning styles and backgrounds and appropriate for the age and academic

level of the students. The outcome of the project is the Website design as well as the Website

development for one character, with a framework for easily adding characters and content. The

project team relied upon input and feedback from a focus group of teachers and students who use

the Website.

Background (Literature Review)

Reading and Math Explorers™ is a hardcopy curriculum supplement, developed through the Worcester Polytechnic Institute Office of K-12 Outreach, for use by elementary school teachers with their classroom curriculum in reading and language arts and mathematics in grades K-4. The activities in this curriculum supplement are based on the accomplishments and hobbies of a diverse set of historical and contemporary characters who are depicted as children. One of the characters, Lillian Gilbreth, is an engineer; other characters are role models in areas such as teaching, science, engineering, and medicine.

For this Interactive Qualifying Project (IQP), our project team designed an interactive learning Website to provide a technological component of Reading and Math Explorers™. This Website is child-user-friendly, helps to develop proficiency in elementary school reading and mathematics, encourages an interest in science and engineering, and promotes the development of technology literacy.

Historical Review of Computer Use in Education

Computer and internet access for students in U.S. public schools has increased since 1994. The National Center for Education Statistics (NCES) shows the following trends. In 1994 only 3 percent of public schools had internet access in instructional rooms, versus the 94 percent that had access in 2005. The student to instructional computer ratio also has improved over the years. When the data was first captured in 1998, the ratio was 12.1 to 1 in comparison to the 3.8 to 1 ratio in 2005. (Wells & Lewis, 2006)

Because access to computers and the internet has improved in schools, many teachers and school systems today are supporting the integration of computers in the classroom. Computers in the classroom are used for activities such as researching information, writing papers, and playing educational games.

Speak Up 2007 for Students, Teachers, Parents & School Leaders reported survey results on the topic of emerging technologies. ("The Speak Up data is collected through online surveys and verified through a series of focus groups and interviews with representative groups of students, educators and parents.") "Increasingly teachers are becoming interested in use of games to increase student engagement (65%), address different learning styles (65%), focus on student-centered learning (47%), and to develop problem solving and critical thinking skills (40%)." (Project Tomorrow, 2008)

In 2007, the National School Boards Foundation reported the results of its study on computer use. The Board acknowledged the positive impact of computers and internet use on student learning, stating: "Based on what parents and children told us, this survey confirms that we are becoming a 'cybernation.'" Two of the survey's key findings are: "The main reason families buy computers and connect their children to the Internet at home is for education," and, "The Internet does not disrupt children's everyday habits and typical, healthy activities. In fact, children who use the Internet appear to spend less time watching television; more time reading newspapers, magazines and books; more time playing outdoors; and more time doing arts and crafts than they did before they started using the Internet from home." (National School Boards Foundation)

Focused Grade Level: Rationale for Choosing Specific Elementary School Grade Level

After researching national curriculum standards, Massachusetts Department of Education (DOE) Standards, and the Reading and Math Explorers ™ curriculum, our project team decided to focus the initial development phase of the Reading and Math Explorers ™ Website on the grades 2-4 level, and to propose the inclusion and expanded grade range and additional curriculum units in the long term plan for the development of the Website.

We chose this grade level because the goal of the project was to develop a Website for students to use independently with little or no help from the teachers. Students at the grades 3-4 level are expected to be able to execute the same tasks as those at the PreK-2 level, but with a maturing ability to "contribute knowledge to class discussion in order to develop ideas for a class project and generate interview questions to be used as part of the class project." (The Commonwealth of Massachusetts Department of Education, 2001) The Massachusetts Technology Literacy Standards for grades K-2, "allow the teacher flexibility in deciding when students are ready to use technology. For this reason, the competencies listed for K-2 are described as exploratory concepts and skills." Students in grades 3-4 are expected to, "demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity." For example, the students are expected to log onto a computer and use a navigation bar without the help of a teacher or other adult. (Massachusetts Department of Elementary and Secondary Education, 2008) Although the DOE standards classify second grade into a different group of grade levels, we chose to incorporate grade 2 because of the apparent overlap in the National and Massachusetts standards between the PreK-2 and 3-4 grade levels.

Today's interactive learning Websites possess characteristics similar to the Integrated Learning Systems first described in the late 1980s. Integrated Learning Systems, "specify instructional objectives and tie these objectives to individual lessons, provide for integration of lessons into the standard curriculum, span several grade levels in one or more curriculum areas, run on a networked system of computers or terminals, and collect and record results of student performance." (Kulik, 2003) Today's interactive learning Websites possess traits such as sound, colored graphics, and various inputs through which the user can submit their answers for the online activities; compared with earlier interactive Websites where information was presented on black and white text screens with unsophisticated visuals and using tutorials in frame format.

Many educators view Integrated Learning Systems favorably for the perceived positive impact on children's learning, but some still view the impact as negative. Often, the effective (or ineffective) design of a Website is the primary reason that a particular Website is perceived to have a positive (or negative) effect on children. (Kulik, 2003)

The success of Web-based learning as an integrated part of the curriculum often is dependent upon teachers' level of expertise and comfort with technology and its implications in education. "It is evident, then, that our teachers need to be prepared to effectively use these powerful on-line resources to prepare our children to thrive in a digital society." (Abbey, 2000) "In 2005, nationwide, 83 percent of public schools with Internet access indicated that their school or school district had offered professional development to teachers in their school on how to integrate the use of the Internet into the curriculum in the 12 months prior to the fall survey." (Wells & Lewis, 2006)

Research shows that there are many different definitions of Web design and different theories on what design criteria make an effective Website. A commonality throughout this research indicates that an effective Website has five primary components. Powell summarizes these components as, "content, visuals, technology, delivery, and purpose." Some major themes throughout modern Web design are detailed as being, " designer needs versus user needs; the balance of form and function; the quality of execution; and the interplay between convention and innovation." (Powell, 2002)

Effective design of interactive Web-based learning environments requires that Web designers think from the perspective of the user. An effective site, "1) Explores and stimulates learners' motivation; 2) Fosters and encourages participation and interaction among the students; and 3) Contains a great amount of personal and humanistic elements." (Abbey, 2000)

The Positive and Negative Features of Similar Websites

An ideal Website is one that includes easy-to-follow instructions, is focused on reinforcing the skill being taught in the classroom, and is usable by students at various levels of learning abilities within the specified grade range. It should also give indicators when something is incorrect and allow the student to attempt to correct their mistake, therefore encouraging the students to learn the material rather than simply guessing at the answers. The Website should be aesthetically pleasing so the students are able to complete the given activities without getting distracted. The Website should be able to be fully functional regardless of the operating system that the students are using. (Blowers & Bryan, 2004)

The research phase of the IQP included a review and analysis of other existing children's Websites and identified positive and negative aspects of these sites. These Websites (Table 1)

were recommended by members of the focus group. Using the qualities of an ideal Website, we identified four Websites, from the complete list of recommended sites in Table 1, to analyze further. These Websites were Starfall, Scholastic, FunBrain, and MathMovesU.

Table 1: Websites Recommended by the Focus Group

Website	Web link
PBS Kids	http://pbskids.org/
Reading Website Starfall	http://www.starfall.com/
Fraction Modeling Website	http://www.visualfractions.com/
Scholastic Website	http://www2.scholastic.com/browse/learn.jsp
Funbrain Education	http://www.funbrain.com/
Liberty Kids	http://www.libertyskids.com/index.html
Apples for the Teachers	http://www.apples4theteacher.com/
Everyday Math	https://www.wrightgroup.com/everydaymath/index.html?cat=37
Houghton Mifflin Website	http://www.eduplace.com/
Spelling Website	http://www.spellingcity.com/
Raytheon Math Moves U	http://www.mathmovesu.com

The Starfall Website is a good example of a Website that is easily adaptable for multiple grade levels. Not only does the level of difficulty change between the levels, but also the way in which the instructions are presented changes. The instructions change to correspond with the comprehension abilities of the user, in this case the student. At the lower levels the user simply points and clicks on pictures on the screen without instruction/prompting to do so. When the user clicks on the pictures, there is audio that teaches the activity to the user. At the higher level, there are instructions in the form of pictures and text for the user to review before beginning the activity. (Starfall Education, 2007) The following figures (Figures 1, 2, 3) show the Website's adaptability for multiple grade levels.
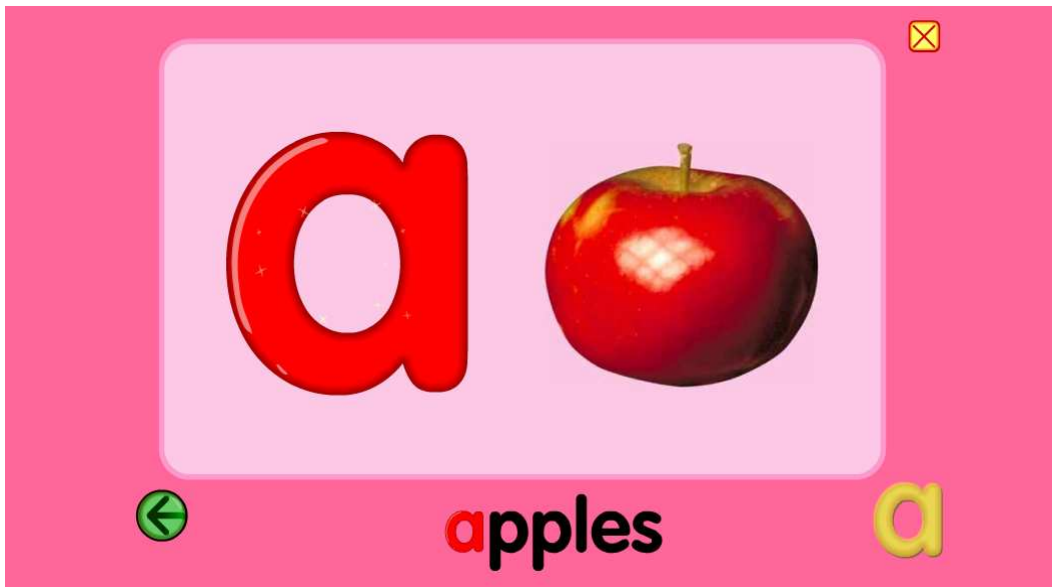
Figure 1: Beginning level, getting ready to read, of Starfall.com

Figure 2: Intermediate level, beginning to read, of Starfall.com

Figure 3 Advanced level, reading, of Starfall.com

The Scholastic Website is a very good example of a Website that targets all grade levels and subject areas. The Website is split up in two parts: it is first separated into groupings of grade levels; it is then separated by the individual subject areas. There are several activities available in each subject for each group of grade levels. This site is a good example of a combination of both static printout activities and interactive online activities. The site also presents easy-to-follow instructions in both written and spoken form, sometimes even simultaneously. For the activities that do not have detailed instructions, a help button is provided for the user. (Scholastic, 2009)

Figure 4: Printable activities of various levels from Scholastic.com

Figure 5: Beginning level printable activities from Scholastic.com

The FunBrain Website is an example of Website that is good in concept but not well executed. Instructions for the math activities are text heavy and not easy to follow. Although the user has the ability to select a level, the instructions remain the same regardless of the level. The visuals for most of the activities are distracting and difficult for the average learner and therefore potentially extremely difficult for users with learning disabilities. (FunBrain, 2009)

The MathMovesU Website is another example of a good concept gone wrong. The instructions for the game are text heavy and difficult to follow. The objectives of the games are not obvious nor are they clearly stated to the user. The activities require the user to have a prior knowledge of information that is unrealistic for the specified grade level. One good aspect of this Website is the ability for the user to create a character without discriminating limitations such as skin or hair color. (Raytheon, 2009)

Aspects of Computer Programming Details for Interactive Learning Websites

The material in this section is presented with the assumption that the reader has a basic understanding of the World Wide Web (WWW), Web pages, and client-server technology.

Open source is defined by the philosophy "that software should be freely distributed, and so should the source code that makes it work." (Hunley, 2006) These technologies include the Apache HTTP (hypertext transfer protocol) Web Server, Ruby, mod_ruby, eRuby, erubis, haml, sass, MySQL, and several other common Web technologies. A fairly standard framework, consisting of an extensive back-end technology known as the server-side and a user-facing front-end known as the client-side, comprises the Website and technologies that drive it. "Server-side programs have jobs that require access to information that isn't on the user's machine." "Client-

side programs are used to handle tasks that don't require access to data on the server." (DiNucci, Guidice, & Stiles, 1998)

Server-side and client-side operations are the two key operations concerned with the displaying or sending of a Web page; and, the difference between server-side and client-side operations is a critical concept in effectively designing Website architecture.

An example of server-side and client-side is shown by Google™ apps (not actually used in the RME IQP). Google™ apps, a package of online software offerings, offers both server-side and client-side examples. Relatively new to the commercial market, Google™ apps uses the Internet to deliver, to consumers (clients), computing capability including e-mail, instant messaging, calendar, word processing, and spreadsheets offering and is delivered over the Internet to consumers (clients). The software that makes Google™ apps work resides on the server-side on Google™ computers. On the client-side, the consumer is able to use the software to access data on their own computing devices (e.g., PCs and mobile phones), then work on their own devices, and sync data between server-side and client-side. The combination of server-side and client-side allows users to work either online or on local/personal computing devices. For Google™ apps, Google™ creates and tests new features and improvements as well as stores client data (e.g., email messages) on Google™ computers on the server-side, and then constantly makes these features available in client-side online services such as handling email on mobile phones. (Lohr & Helft, 2007)

As described by Hunley, "A Web server is simply any device (not just computers) on a network, running a program in the background. This program is constantly monitoring for any HTTP

requests for services coming into the device. If it receives a request, it sends the information requested." (Hunley, 2006)

The back-end system is used to generate the activities that the user is able to see and with which the user is able to interact. Open source databases and scripting languages including MySQL and Ruby are widely used around the world because they are simple to implement and have extensive documentation and because the open source community freely distributes both MySQL and Ruby. Scripting languages generally "are more specialized than full-fledged programming languages. Their range of capabilities usually is focused on the particular environment in which they will be used." (DiNucci, et al., 1998)

The front-end serves as a navigation system allowing the user to identify and access the portions of the site which are of interest to them, and serves as an additional layer to add an aspect of interaction and specific design features to the activities. MooTools is a JavaScript framework that allows for additional user interaction. "JavaScript, for example, is designed for use on the Web and so includes commands for things like checking for particular plug-ins and handling browser tasks." (DiNucci, et al., 1998) Adobe Flash Player is used to play audio when the Website allows the user to choose certain sections of the site to be read aloud. These aspects provide the user with a quicker and more enjoyable experience than if the site solely relied on non-interactive content delivered by the Web server alone.

The Website structure was designed using XHTML (extensible hypertext markup language) which is a strict standard defined by the World Wide Web Consortium (W3C) and is the most compatible with the wide variety of browsers the user might be using to render each page.

Website design also uses other technologies, including Cascading Style Sheets (CSS) to make the site aesthetically appealing.

Methodology

Project Background and Problem Statement

The Reading and Math Explorers™ Website Project was a collaboration between an undergraduate project team of Worcester Polytechnic Institute (WPI), the WPI Office of K-12 Outreach, and a focus group of elementary school teachers.

The project objectives were determined and the problem statement was developed in Fall 2009 by the project team. (Appendix A) Our faculty advisor and project sponsor from the WPI Office of K-12 Outreach reviewed the project objectives and problem statement.

The ultimate goal of this project was to design an interactive Website integrated with the Reading and Math Explorers™ curriculum supplement for elementary school students and their teachers. The purpose of this Website was to provide a technological component of Reading and Math Explorers™ which is based on a set of eight historical and contemporary characters (people); the curriculum was in development through the WPI Office of K-12 Outreach.

This goal was reached by accomplishing the following objectives: 1) conduct research about the problem, 2) identify and analyze potential concepts, 3) gather focus group input, 4) select proposed solution, 5) create prototype, 6) share our results, 7) redesign, and 8) test final design.

These objectives were achieved using the following techniques: a literature review was performed, focus group meetings were conducted with elementary school educators, feedback was gathered from the focus group, and focus group feedback was analyzed to determine specifics for Website design.

Research about the Problem

After finalizing the project objectives and problem statement, the project team began its research to become familiar with Reading and Math Explorers™ (RME). During the research phase of this project, we gathered information from project advisors and project sponsors, reviewed pertinent literature, and held focus group meetings with elementary school teachers. The project research materials included 1) the RME curriculum, 2) Federal Guidelines for Education, 3) articles on ways to help elementary school students successfully learn a structured curriculum through an interactive Website, and 4) books and articles on methods for effectively designing Websites. After reviewing the entire RME curriculum, members of the K-12 Office of Outreach and project team attended a June 2009 meeting for the purpose of gathering feedback from elementary school teachers who had used the RME curriculum. These teachers provided feedback, both verbally and in hard copy, on their experience using the RME curriculum as a supplement in their classrooms during the school year 2008-2009. Our team read and analyzed the written feedback from the elementary school teachers.

Our team researched the federal guidelines for education, specifically examining the U.S. Department of Education Strategic Plan for the fiscal years of 2007-2012 as well as the U.S. Department of Education Technology Plan which outlines the technology-in-education initiatives. We also examined the Commonwealth of Massachusetts Department of Education and Northborough Public Schools standards for elementary school students. We focused on the standards pertaining to reading and mathematics and also on computer and technology use in the classroom.

Based on the information gathered, we began to focus on grade levels 3-4 for the activities on the Reading and Math Explorers™ Website. After discussing this grade level focus with our advisors, we were asked to re-focus our site for grade levels 2-4. This request was made because the focus group, enlisted by the WPI K-12 Outreach Office, consisted mainly of 1st and 2nd grade teachers. This request required our team to conduct further research in order to confidently implement the request.

The project team researched ways to help elementary school students successfully learn a structured curriculum through a fun and user-friendly Web interface and then designed this Web interface to be conducive to different learning styles and appropriate for the age and academic level of the students.

Our team reviewed Websites that were suggested by the June 2009 meeting participants. From this list of Websites, our project team scrutinized four Websites that were popular with the teachers. The four Websites were Starfall, Scholastic, FunBrain, and MathMovesU.

In order to identify criteria for creating effective Websites, we reviewed scholarly research on Web design and met in working sessions with WPI Computer Science Professor Gary Pollice. The project team examined a list, from the project team advisors, of possible Website components: character biographies, reading and math games, fun facts, links to other Websites, and specialized pages just for teachers.

Identify and Analyze Potential Concepts

Our review of pertinent literature and our information gathering from meetings with teachers provided the background for this research report and the foundation for development of the

Website. The project team developed the Website from input and feedback from a focus group of teachers who use the Website.

As a result of our research, we identified guidelines for designing the RME Website based on the components of the Reading and Math Explorers™ curriculum.

We relied heavily on Professor Pollice's guidance and Powell's *Web Design: The Complete Reference* as the most comprehensive printed source of information regarding the details of Web design. Based on our meetings with Professor Pollice and our research, we gained an appreciation and understanding of the themes and components of effective Website design. In this phase of our project we focused on: user needs (versus designer needs), purpose, content, visuals, and programming/technology.

As a result of identifying our Website's target audience as elementary school students in grades 2-4 and their teachers, we determined the features/functions of the Website should include: 1) visually attractive/interesting pages and activities, 2) easy-to-follow/simple instructions, 3) voice or sound talking to the user, 4) pictures/images rather than lots of words, 5) a straightforward navigation system. We decided that we would develop Lillian Gilbreth as our first character because of our common interest in engineering.

Based on our literature review, research, and analysis of other Websites, we determined the best combination of features for our Website (Table 2) and modeled the RME site after Starfall.com and Scholastic because those sites are easily adaptable to a range of ages/grade levels, cover multiple subject areas, and contain easy-to-follow instructions.

Based on potential best combination of features for our Website, the Website should:
have simple instructions
have activities which reinforce skills taught in the classroom
be usable by students at various levels of learning within the specified grade range
give indicators when something is incorrect and then allow students to attempt to correct their mistake (thus encouraging students to learn the material rather than simply guessing at answers)
be aesthetically pleasing so students are able to complete activities without distractions
be fully functional regardless of the operating system

After creating this general set of Website features and functions, we began to brainstorm about the physical detail of the Website.

Upon recognizing the need for an inviting home page with a simple navigation system, we created a mockup (using Microsoft Publisher) of a proposed homepage which included a navigation bar on the left hand side and "About RME" as the main item on the page. (Figure 6) In this initial design, we intended the homepage to be a curriculum overview used primarily by the teachers and parents. (In our final design, we used the homepage as a welcome page.)

Figure 6: Screen Shot of Initial Proposed RME Homepage

Consequently, the project team designed a questionnaire as a tool for the focus group to provide

feedback for evaluating the concepts of the RME Website. (Appendix C)

Gathering Focus Group Input

In fall 2009, the undergraduate team and faculty advisors from the WPI K-12 Outreach Staff met with seven teachers representing five school districts. (Appendix D lists teachers and districts.) Using a focus group format for the collection of information, the intent and outcome of the meeting was to gather information from a potential group of users (teachers) about the skills and needs of the Website's potential users (including students as well as teachers).

The project team and faculty advisors held Focus Group Meeting #1 in October 2009 to gather feedback on the initial Website design. The project team presented the mockup for the initial proposed design of the Website. (Figures 6 and 7) Then, in order to gather focus group feedback on the initial Website design, the project team distributed Website Evaluation Questionnaire 1 to the focus group at the meeting.

Lillian Gilbreth

Lillian Gilbreth

Engineer (Algebra Patterns and Functions)

Lillian Gilbreth:
A Brief Biography

Lillian grew up in a large family and often was responsible for taking care of the household. Born in California in 1878, Lillian was the oldest of nine children. She learned to take care of her brothers and sisters and helped her parents. School was very important to Lillian. She loved reading and music and always dreamed about going to college. Lillian's father did not believe that women should go to college, but Lillian convinced him that she should. She attended the University of California and received a master's degree in literature.

After college, Lillian met and later married Frank Gilbreth. Frank was very interested in studying how people and work could be better organized. He and Lillian started a business together working on these ideas. Frank never went to college, but Lillian continued with her education. She studied psychology at Brown University and earned her doctorate. Besides being so busy with her education and career, Lillian also was a mom. She and Frank had a dozen children!

Life at the Gilbreth house was exciting and fun. Imagine the busy mornings getting ready for school! Lillian studied the basic tasks that the children had to perform in order to find out if there were ways for them to accomplish the tasks faster or more efficiently. There were charts for brushing teeth, taking baths, combing hair, doing homework, and making beds. The children also collected data by writing down their daily weight and recording the amount of water and electricity that they used.

The family held family meetings each week and they discussed activities, chores, and the household budget. The children could submit a sealed bid for special chores, such as painting a fence or doing a gardening project. The children also took on special jobs like keeping inventory of grocery shopping needs and buying birthday presents. The household ran smoothly and efficiently.

Lillian never stopped learning. She always loved reading and developed a love of math too. She became the first woman engineering professor at Purdue University in 1935. She worked with many different companies, helping them to organize the way work was done. Her hard work, both on the job and at home, never stopped. She worked until she was in her eighties and was known as "a genius in the art of living."

Figure 7: Screen Shot of Initial Proposed Lillian's Biography Page

The project team used the October 2009 focus group discussion and the results of Website

Evaluation Questionnaire 1 to gather information about the focus group participants' reactions

and opinions of the initial proposed Website design. The following table (Table 3) summarizes

the discussion, reactions, and opinions. The related detail is in Appendix E.

Table 3: Summary of Focus Group Discussion & Website Evaluation Questionnaire

Website Design	Focus Group Reactions and Opinions
Login system	Positive reactions to a "teacher login" to provide access to additional features (e.g., additional resources, activity selection, and hardcopy curriculum). Positive reactions to a "student/classroom login". Positive reactions to option to visit Website as a "guest" (with no login).
Audio	Explained that audio is a tremendous help for emergent readers, ESL children, and special needs children. Explained that audio helps all children with the vocabulary.
Visuals	Emphasized the importance of visuals. Cautioned that too many visuals can become distracting and overwhelming. Suggested that some real-life photographs of Lillian be included on the Website to encourage children to do background research on Lillian. Agreed with the project team's suggestion to have visual cues (such as green for correct and red for incorrect) within the activities.
Website layout	Suggested that Website layout be sequenced such that the users: first, select the character then, select the type of activity (reading or math) then, select the activity from a list.
Teacher control	Positive reactions to the concept of having a teacher control feature, allowing teachers to select the specific activities that the students will be able to access.
Ease of use	Emphasized importance of Website being easy for students to use. Emphasized importance of activities being age/learning level appropriate. Embraced the projects team's idea of including a hyperlink to glossary and audio of correct pronunciation and definition of the glossary words.

We created a concept map of the Website to provide the framework for the proposed Website's structure. (Figure 8) The concept map shows how the individual Web pages of the Website are connected. The lines on the concept map indicate the links between the Web pages.
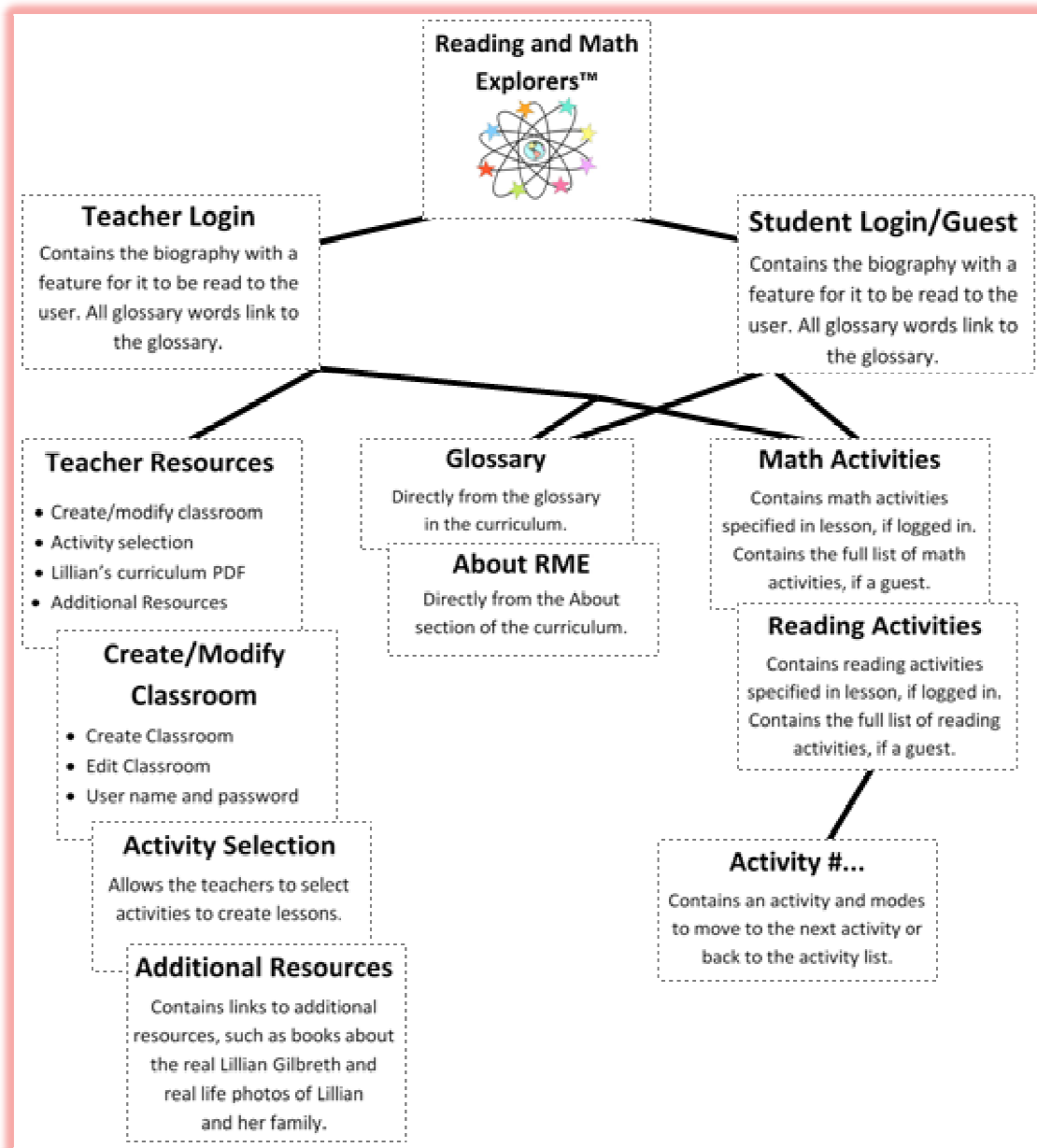
Figure 8: Concept Map of RME Website

We based our guidelines for designing specific aspects of the Website on our analysis of: the components of the RME core curriculum, federal and state education and technology standards, input from K-4 educators, several existing websites, and pertinent literature on the use of educational software.

We identified the following characteristics to be fundamental to the design of our Website: a simple and straightforward navigation bar on each character's page; a home page showing all of the available characters, with the ability to click on each character to go to the character's page; an audio button, for the user to have the text read to them; colors consistent with that of the individual character; visual recognition when an activity or part of an activity has been completed correctly or incorrectly, e.g., red is incorrect and green is correct.

From the RME core curriculum, we identified the details of the hardcopy RME curriculum to include in Phase 1 of the RME Website development of Lillian's character. (These details are in Appendix F.) Based on these details from the hardcopy RME curriculum, we determined that the following activities (Table 4) should be included on Lillian's part of the Website:

Activity	Description/Purpose	Grade Level
Biography Questions	As an introduction to future lessons on Lillian, students will learn about Lillian's life and achievements. Students will demonstrate comprehension of information presented in a biography.	K-4
Sequencing (Pictures)	Students will be able to sequence important events in the life of Lillian Gilbreth.	K-1
Sort It	Students will be able to match words to the correct word families and use words to complete sentences.	1-2
Create New Words	Students will create new words from the letters in Lillian's name.	3-4
Vocabulary Sentences	Students will demonstrate understanding of selected vocabulary words. Students will fill in the missing words from the story.	2-4
Hundred Chart	Students will become familiar with a hundred chart and recognize the patterns shown in the columns.	K-1
Too Many Socks and Mittens	Students will explore relationships between numbers and sets. They also will recognize, describe, and extend patterns.	2-4
In/Out Machine	Given an equation, students will be able to determine the product.	1-4
Final Sounds	Students will be able to identify end word sounds.	K-2

The project team decided to design the Web pages with a combination of aesthetic appeal and simplicity of functional design. Our decision was a result of understanding that children need a visual stimulant to keep their interest in a simple and straightforward environment so as to minimize distractions.

We decided not to use animation of characters on the Website because 1) animation creates distraction for many students and 2) the use of animation would have required the drawing of a new set of artwork.

Based on the focus group's strong recommendation, we designed the proposed Website to include sound in order to make the Website useable by all users.

Creation of Prototype

The project team used the concept map, design criteria, and content detail to develop the layout for each Web page and the links between the pages. Our project team wrote the pages using our own Web development skills relying on tools and templates for coding Web pages. The main technologies used to create the Website were HTTP, haml, sass, and JavaScript. As such, the RME Website follows a fairly standard framework, consisting of both server-side and client-side technologies. These technologies were chosen because they are fairly straightforward for developers with a limited background in programming.

We created a framework similar to that in our outline (Figure 8, on page 28) in our first steps of programming the Website. We then began adding content, such as the biography, about information, activities, and audio to the pages. We then created a login system and added the necessary pages that went along with it.

Sharing of Our Results

The project team and faculty advisors held Focus Group Meeting #2 in January 2010 with eight teachers representing five school districts. Most of these teachers had attended the focus group meeting in the fall and were familiar with the initial design of the Website as well as the ideas that we proposed to implement on our final design.

In order to gather feedback on the revised version of the Website design, the project team presented the Website and distributed the Website Evaluation Questionnaire 2 (Appendix G) to

the focus group participants. The project team presented additional changes that they anticipated to implement prior to project completion, and asked the teachers to note any minor recommendations that would be necessary to make the Website more useable. These recommended changes were to 1) make the functioning character stand out more on the home page; 2) have a notification of success for the user when they complete an activity; 3) make the right/wrong, green/red, comparison consistent throughout the site; 4) use a font and spacing that is large enough, especially for young users. The project team used the January focus group discussion and the results of the Website Evaluation Questionnaire 2 to determine what final alterations should be made. Full responses are in Appendix H.

Redesign

Our final Website design included several modifications to the previous designs: 1) In order to make Lillian stand out on the Homepage, Lillian and her star are larger than the other characters, and Lillian and her star are in color while the other characters are grey. (We recognize that this is not an ideal solution because when other characters are implemented, the large size will not fit all characters on the page without overlapping.) 2) The final design includes a "good job notification" to indicate that an activity has been completed. 3) The design uses a color confirmation for all of the activities. 4) The font size and spacing on the final pages are larger than in the previous designs. 5) The final design has a "next" button that appears at the end of each activity to take you to the next activity.

Testing of Final Design

 The project team conducted testing of the final design of the Website with a group of 15 people of various technology backgrounds. We developed and distributed a Website Testing

Questionnaire (Appendix I) comprising: 1) questions about the type of computer environment they currently use, 2) their technology background and experience, 3) instructions for completing a set of activities on the Website, and for documenting all steps they took in doing so and 4) instructions for documenting any problems/errors/bugs they encountered on the Website, and 5) request for their comments and suggestions about the Website. The full results of this testing are in Appendix J.

Because we conducted this testing before the completion of our Website, we were able to address (as noted in the following paragraph) the feedback from the test group.

Most of the bugs/problems and many of the suggestions were resolved and implemented before the end of our project. Specifically, we were able to resolve the issue of compatibility of the audio player and different internet browsers and a major bug with the login system that prevented users from remaining logged in for more than a few seconds. We chose a diverse group of individuals to be testers of the Website because we recognize that the users of our Website will not necessarily have a strong, if any, technology background and will not necessarily have any prior background knowledge of the goals targeted through the RME curriculum. We chose our test group to be representative of the users of our RME Website.

Summary

The outcome of the project was the overall Website design as well as the Website development for one of eight characters, with a framework for easily adding characters and content. The project is the foundation for a multi-character Website that is easy to maintain by the WPI Office of K-12 Outreach and future Interactive Qualifying Project teams.

Results

There are several major results from this Interactive Qualifying Project. The primary results include: this IQP report, the completion of the overall design of the Reading and Math Explorers™ Website (Appendix K), and completion of Phase 1 of implementing the Website. This Phase 1 is a fully functioning Website (rmexplorers.org) with one curriculum unit with one character (Lillian Gilbreth, an engineer).

The RME Website design provides the framework so that all aspects, including all the characters and the curriculum units, of the RME curriculum ultimately will be accessible through this Website. The RME IQP team designed the Website based on the concept map shown in Figure 8 and the guidelines outlined in Table 5. (The guidelines were developed as a result of extensive literary research and information gathered from a focus group of teachers who are the target audience for using the Website.)

RME Website Design Guidelines	
Purpose	Develop content and layout to help elementary school students successfully learn a structured curriculum through a Web interface
User needs	(Website designers should)Design from the perspective of a child user of the Website rather than the Website designer's perspective
Features/Functions	• Fun, child-user-friendly, conducive to different learning styles • Appropriate for the age, developmental, and academic level of users • Presentation of activities in a welcoming manner • Visually attractive/interesting pages and activities • Simple, easy to follow instructions • Pictures / Images (versus lots of words) • Visuals not distracting (Focus group teacher feedback indicated that visuals are important, but too many tend to be distracting) • Simple, straightforward navigation system • Simplicity / adaptability to many ages and levels of users (similar to Starfall.com and Scholastic Websites, which were suggested by the focus group members) • Easy for a student to use the Website with little or no teacher instruction (Based on teacher input that several students work on a shared computer or individual computers while the rest of the class does other designated activities) • Activities that reinforce skills taught in the classroom, specifically RME hardcopy curriculum • Audio with a voice talking/reading to the user because audio helps children with any difficult vocabulary. (Focus group expressed a great interest for audio because these teachers had experienced audio to be a very useful tool with emergent readers, ESL children, and special needs children) • Combined teaching method involving audio and visual components and interactive learning (Research indicates that not all people learn the same way, many people learn best through a combination of learning methods, and computer games are an effective way of teaching, especially for grade level 1-4 users) • Visual indicators showing correct responses; and visual indicators showing incorrect responses (Activities should give indicators when something is incorrect and allow a student to attempt to correct mistakes, thus encouraging students to learn the material rather than simply guessing)
Programming/ Technology	Use programming languages and tools which are compatible with all standard operating systems and easy to maintain by the WPI K-12 Outreach Office and future IQP teams.

In Phase 1 of implementing the Website, the Website is fully functional for one curriculum unit; that is, Lillian Gilbreth, an engineer, is the only character presented on the Website.

The background work for the Website included the review of many Websites to ensure appropriate "look and feel" characteristics of typical Websites, including general Websites as well as sites targeted at children's learning. This has resulted in a very comfortable and familiar Web experience for visitors to the site.

On the Website's Homepage (Figure 9), the RME character logo welcomes the user. The logo is a sketch of an atom and a globe in the middle of the atom. Characters on individual "stars" are on the "tips" of the atom. The user has the option to click on the globe or to click on a character's star.
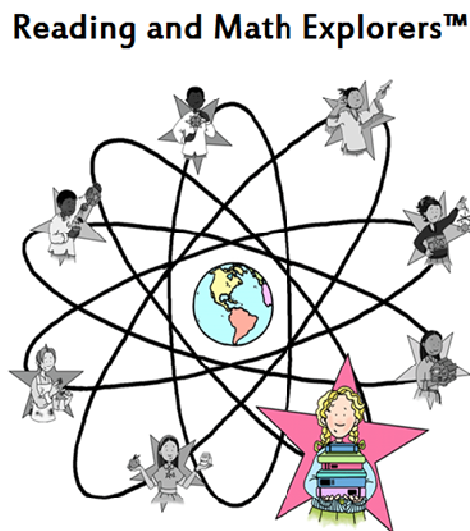
Figure 9: Screen Shot of the Final RME Homepage

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When the user selects the globe in the middle of the atom, the user is directed to the About RME Page which has background information about the Reading and Math Explorers™ program. The About RME Page also is accessible through the navigation bar on the character pages.

When the user clicks on a character's star on the RME Homepage, the user is directed to the selected character's Biography Page. They are taken to the biography in an attempt to make the user feel welcome and familiar with the character. Currently Lillian, on the pink star, is the only character who can be selected by the user. All other characters will remain grayed until their pages are completed by a future team. Instructions to complete the other characters are in the Maintenance Plan for the Reading and Math Explorers™ Website (Appendix L).

Each character's Biography Page (Figure 10) has a navigation bar at the top of the page. The navigation bar includes the links: Home, selected character's Page, Activities, About RME, and Glossary. There is a picture of the character on the top left of the navigation bar and the RME logo in the top left corner of the page. The navigation bar for each character is a different color, but consistent with the color of their star; Lillian's navigation bar is pink.

Figure 10: Screen Shot of Final Lillian's Biography Page

From the Biography, there is a direct link to Lillian's Glossary Page (Figure 11). Each character has a character-specific Glossary Page which lists words and definitions of selected words used throughout the character's curriculum; this glossary also is accessible through its own tab on the Navigation Bar. By being able to directly link to the Glossary from the Biography, the user is

encouraged to find the meaning of many words. This allows the user to gain familiarity with both the words associated with the character and the skill of researching and looking up information they do not know.

Any learning site can face the difficult challenge of being unable to reach a key portion of its target audience. In the case of the RME Website, this portion would be those students requiring assistance in reading at the level of the Website. The user has the option to select the content of each page to be read aloud (by a real person's voice), simply by clicking on a "listen" button at the top of each page. This feature is especially helpful for younger users and/or users who have difficulty reading. Without it, the RME Website would not be able to reach its widest audience.

The Login feature of the RME Website is such that a user who visits the RME Website has the option to login as a teacher or student/classroom or to visit as a guest.

Each teacher account allows for the ability to create, and modify, one student/classroom account. For example, the teacher is able to control which activities the student/classroom is able to access. The Teachers' Navigation Bar (Figure 12), accessed through logging in as a teacher, includes all the items from the standard navigation bar (Figure 13): Home, selected character's Page, Activities, About RME, and Glossary, as well as Student/Classroom Account Management Page, Activities Selection Page, and a Teacher Resources Page.

Figure 12: Screen Shot of Final Teachers' Navigation Bar

Figure 13: Screen Shot of Final Standard Navigation Bar

Teacher accounts allow teachers to login and access teacher resources. This includes reference materials as well as the ability to create and control a classroom account. Teachers have access to all reading and mathematics activities for the completed characters.

Student/classroom accounts have limited access (controlled by the teacher) to the Website, specifically each of these accounts has access to all of the (completed) characters' biographies but access to only those activities that have been pre-selected by their teacher. All

student/classroom accounts require the existence of a teacher account but a teacher account may exist without any associated student/classroom account. From the pre-selected list of activities, the student is able to select an activity; and upon completing the given activity, the student is able to return to the list of activities or continue on to the next available activity. The Website has a single set of login information for an entire class linked to and controlled by that teacher.

When visiting the site as a guest, the user is not required or asked to provide any type of login information. As a guest, the user has access to all the same pages as the teachers, with the exception of the account setup pages and those that allow the teacher to manage their classroom login. The user is able to view a full list of all the activities available for their selected character. (Figure 14 is a screen shot of the Activities page.) A guest has access to all reading and mathematics activities for all completed characters.

Figure 14: Screen Shot of Final Activities Page

The Teacher Resources Page consists of different features that are accessible by the teachers. These features include an Activity Selection Page (Figure 15), PDF curriculum, and additional information and pictures. One of these features allows each teacher to select which activities they want their students to focus on for each lesson. This selection page has a list of all of the Reading and Math Activity titles. The PDF copy of Lillian's curriculum enables the teachers to refer to Lillian's curriculum or printout activities. The additional information is a list of other Websites and books about Lillian and real life photographs.
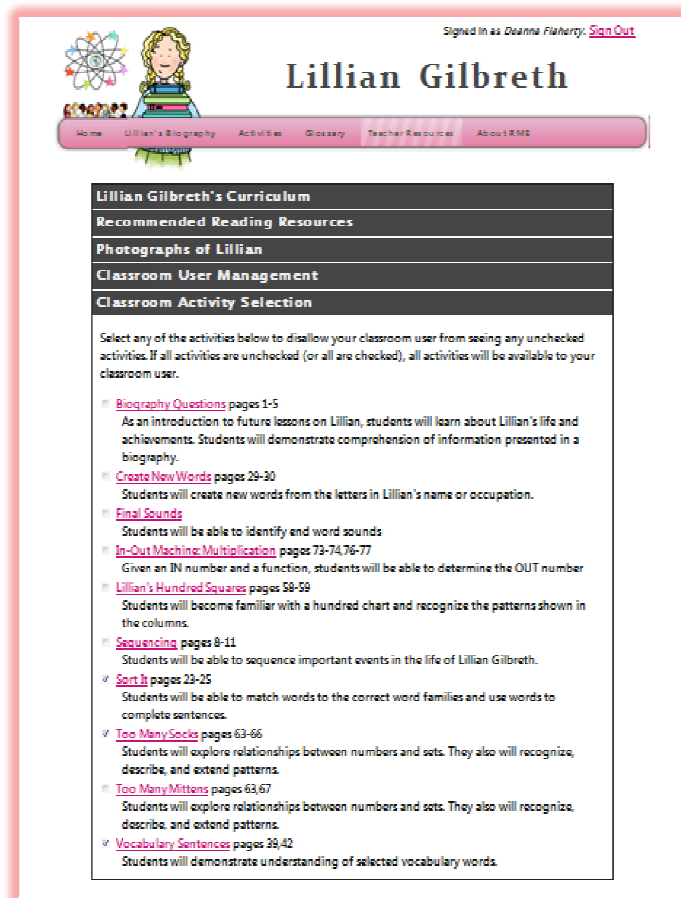
Figure 15: Screen Shot of Final Activity Selection Page

The full implementation of the RME Website was not planned to be part of this IQP. We

anticipate that future development of the Website will be addressed by future project teams

and/or members of the WPI K-12 Outreach office staff. The full implementation of the Website

includes all of the characters and the curriculum units with character biographies, reading and

math games, fun facts, and links to other Websites. Specialized pages just for teachers will be

accessible on the RME Website.

Conclusions

Our project team designed an interactive Website integrated with the Reading and Math Explorers™ curriculum supplement for elementary school students and their teachers. This Website provides a technological component of the Reading and Math Explorers™ curriculum supplement, which is based on a set of eight historical and contemporary characters (people). (The curriculum was in development through the WPI Office of K-12 Outreach.)

The success of the Website was due to the project team's use of a relevant focus group, the valuable input and feedback from the focus group, and the IQP team's ability to capitalize on the input and feedback from the focus group in the creation of guidelines for developing the Website.

Some key points/highlights of the Website are the interactive activities, the login system, the teacher option to create a classroom, and the audio supplement. Specific details of the RME Website include Website purpose, user needs, features/functions, and programming/technology demonstrated as follows:

1) The Website presents content and layout to help elementary school students successfully learn a structured curriculum through a Web interface.
2) The Website has been designed from the perspective of a student. The Website is:
   - Fun, child-user-friendly, conducive to different learning styles
   - Appropriate for the age, developmental, and academic level of users
   - Created with visually attractive/interesting pages
   - Designed with simple, easy to follow instructions
   - Filled with pictures/images rather than lots of words
   - Easy to navigate
   - Simple, adaptable to many ages/levels of users
   - Easy for a student to use with little or no teacher instruction
   - Filled with activities that reinforce skills taught in the classroom
   - Supplemented with audio, that is a real person's voice talking/reading to the user

- Complemented with visual indicators showing correct/incorrect responses
3) The Website design uses programming languages and tools which are compatible with all standard operating systems.

This project team has successfully implemented the first phase of this interactive reading and mathematics Website. We have built the foundation for future project teams to expand the scope of this Website.

Recommendations

We recommend that the entire Reading and Math Explorers™ curriculum ultimately be on the Website. This would include the remainder of Lillian's curriculum including her full list of activities as well as similar sections for each of the seven other characters.

We suggest that future project teams have the characters remain grayed until that character's part of the Website is developed and implemented.

We recommend that the Website be maintained as outlined in the Maintenance Plan (Appendix L) which was developed as part of this project.

We also recommend that during future enhancements of the Website, a live version of the Website should be running as well as a development version of the Website so that focus group members will be able to access and experiment with the Website simultaneously with new feature development. There should be a system of open communication to encourage the focus group members to make comments and recommendations on an ongoing basis.

We suggest a more individualized login system. Specifically, one which would allow the teachers to set up their "classroom" and instead of having a single login for the entire class, each student would have their own user name and associated login information. By having individual user names and login information the teacher will be able to view/track the progress and results of each of their students.

Based on the input from our advisors and sponsor, we suggest a few changes to features we have already incorporated. We recommend that minor technical changes be made first. These changes include: the page automatically returning to the top at the completion of an activity; the previous/back button include an arrow, as a picture representation, to make the website more child-user-friendly; the red/green, wrong/right, recognition get cleaned up; the answers for the in/out machine remain on the screen longer than they currently do, before moving to the list of equations; and for the early learner option, which activates an easier biography, to have an associated explanation so the teachers know what it is before selecting it.

We suggest redesigning how the definitions of glossary words are accessed when "clicked on" / selected. Consider having either a "back" button next to the word in the glossary or, instead of directly linking to the glossary, have the word and definition show up in a new window.

We suggest giving teachers the ability to create more than one classroom simultaneously. This would be especially useful for teachers/teacher's aides that work with multiple classrooms at different grade levels.

We also recommend several specific updates to activities. We recommend changing the list of words available in Create New Words to include not only the list of words from the solution but also an inclusive list of all words made from L-i-l-l-i-a-n G-i-l-b-r-e-t-h. We suggest extending the answer blanks in Too Many Socks/Mittens, allowing the user to enter multi-digit answers. This would help to minimize the amount of guessing. We also suggest working with the focus group to develop a more aesthetically appealing in/out machine.

Based on input from the focus group, we propose that future development of the Website include animation that could range from a simple object moving around the page to Lillian moving. We further recommend that future discussion include one of the focus group suggestions to have Lillian move, specifically her mouth, as if she were actually reading to the user.

As the site is further developed, the amount of audio should be increased. One possible type of increase might be to present the user with the option to have anything on the site read to them. As an increase in audio occurs, future discussion might focus on whether a different person should be the voice of each character or if the entire site should have a computer generated voice.

We encourage future project teams to explore new technologies (such as Google™ apps which are relatively new to the commercial market and more popular languages) for simplifying and improving the programming of the Website.

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Appendices

Objectives and Problem Statement Exercise

1.) Before we begin our project there are many questions relating to objectives that must be answered.

a.) Information that we need to know to fulfill the objective are: what characters we are developing, what age/grade are we focusing on, what literacy level the children achieved, what subjects we are working with, which lessons/activities have shown success with children, how much time the students will be spending with our material, if users will be uniquely identified, and how guided the lessons will be

b.) We need to know these things in section A to better understand the project and our goals.   We need to know what characters we are using because they are directly related to certain subjects. Also, we need to improve the character biographies so they are more interesting for the children. It is imperative that we know the age group for which we are designing the program so we can assume a background of knowledge and better develop the lessons.   Another important thing we must consider is the level of literacy of our children. This is because we must decide the best way to present our material to insure a level of understanding.   It would help immensely to know which activities were the most successful and enjoyable so that we could eliminate the undesirable ones. We must know how much time the students will be spending on our activities so that we can develop a lesson that will fit reasonably into the allotted time. We need to know if the students will be uniquely identified so that we may keep aggregate and statistical information or make dynamic content. Lastly, it is important that we find out if the website will be guided or if the user may navigate at will. We will then have to determine how the site will be used and programmed.

c.) For us to design the best user interface web site for children it is important that we find out what types of learning styles the children best respond to. We can do this by consulting the teachers that have been using the reading and math stars material. We should take surveys to see what activities and lessons the children enjoyed and understood the best.

d.) We will be looking for this information in publications, personal experimentation results, and in personal accounts from authoritative sources such as teachers and students.

e.) Through interviews and observations of human test subjects, we will gain our desired information.

A projected timeline:

A term:
Familiarize ourselves with the curriculum and the standards
Review other good websites and hear feedback from teachers
Research user interface methods for children
Possibly research user authentication methods for children
Research learning techniques for children

B term:
Select the design that we choose to be best
Create content for the website
Develop the character
Create a website mockup
Create a presentation

C term:
Production website creation
Probable requirement changes
Website revisions and finalizations

2.) Problem statement

a.) The overall goal for our project is to learn from our research and observations, after which we will create an interactive web interface. The website will be based on what we determine are the most effective methods of child self-learning and interfacing with children through a website. The goal of the website will be to allow young students with varying backgrounds to instruct themselves online.

b.) We will achieve this goal by working with students and teachers to determine a set of requirements. We will then do research using books and online resources. After this, we will design and build a website, utilizing our newly gained knowledge about interfacing with children.

3.) It is too early to specify what specific resources we will be using. We will look to books, online publications, research journals and other reliable sources of information throughout A term.

Title: Reading and Math Stars Website Development

Project Description

The IQP team would create an interactive website for elementary school students and teachers. The goal of this website would be to create a technological component to the Reading and Math Stars curriculum currently in development through the WPI Office of K-12 Outreach. The curriculum is an integrated reading and math program for students and teachers in grades K-4 and is based on a set of 8 historical and contemporary figures. The curriculum materials and artwork would be made available to the IQP team. Some possible features of the website would be biographies of the characters, reading and math games, fun facts, links to other websites, as well as teacher's pages.

Please help us improve our ideas and design by giving us feedback and answering the questions below.

Visual Aspects and Layout of the Website

1.) What would you recommend for changes to the home page? Should it be more visual allowing the children to click on pictures such as the character stars on the logo? Or do you prefer a traditional homepage with a navigation bar?

2.) What are your thoughts on animation? Is it essential? Or is it just something that would be "cool"?

3.) What do you think is the best way to present the activities? Should the activities be separated by character, or subject, or both? Should the activities be presented in a set list for the student to complete in sequence? Or should they be presented in a list for the student to select the activity?

4.) Are there any websites that you really like or find that work well that you would like to see us format the RME site like?

5.) Any other recommendations or suggestions you have about what the website should look like? Please elaborate. Feel free to create diagrams.

Functionality of the Website

1.) At this point we are not planning to include audio. Do you see a potential problem with this?

2.) How do you propose we prevent the children from guessing or using trial and error?

3.) How should we address the issue of difficult vocabulary words? Should there be a hyperlink to the glossary in order to look up the difficult words while the children are reading?

4.) Would it be valuable to you to be able to track your students' progress on the website? Or are you using the website as a simple engaging activity that is not graded? Tracking the progress would require the students to login or some sort of saving to a file, is this feasible for your grade level?

Activities

1.) Are there any activities that you really enjoyed? Are those activities included in our selection?

2.) Are there any activities that you didn't enjoy that are in our selection?

3.) At the moment we have not selected any open response activities because we did not know how the children's responses would be graded/recorded. Do you think we should include open response questions? If so how would you like the answers to be graded? Would you be grading them while on the screen? Or would they need to be saved and either printed or reviewed later?

4.) Please provide us with any other information/suggestions/feedback that you think would help us design an educational website for children.

Last Name	First Name	School	District	Grade
Amadio	Allison	Lincoln Street School	Northboro/Southboro	1
Bonbredi	Renee	Brookside Elementary	Milford	2
Jewers	Laurie	Glenwood Elementary School	Watchusett Regional	2
Fleck	Jayne	Dexter Park	Orange	3&4 **
Lizewski	Karen	Glenwood Elementary School	Wachusett Regional	1
McLaughlin	Kim	Abbey Kelly Foster Charter	Worcester	K
Morning	Carolyn	Lincoln Street School	Northboro/Southboro	K
Nevenglosky	Erica	Lake Street School	Spencer	2
Strand	Tara	Lake Street School	Spencer	1

** Resource room, where students are at a 1-2 grade level

Please help us improve our ideas and design by giving us feedback and answering the questions below.

<u>Visual Aspects and Layout of the Website</u>

1) What would you recommend for changes to the home page? Should it be more visual allowing the children to click on pictures such as the character stars on the logo? Or do you prefer a traditional homepage with a navigation bar?

- Logo on homepage, much more child/user friendly and stimulating
- Keep pictures of characters w/names
- Audio is crucial
- Have a 2nd homepage with the logo and access to all characters by clicking on the star to get to the character
- Possibly allow teachers a different homepage from students
- Add visuals
- I liked the homepage better with the logo

2) What are your thoughts on animation? Is it essential? Or is it just something that would be "cool"?

- Some animation is important. Animating the biography and having it read aloud with words highlighted in yellow would be extremely useful for beginner readers (K-2).
- Animation is essential
- Possibly have the character pop up and dance when they get the correct answer
- Some animation is needed to hold children's interest. If it's too heavy I think the goal of teaching and enrichment is lost.
- Thumbs up for positive reinforcement
- Some animation is essential in order to keep things visually stimulating for younger students or for ESL/ELL students, but it doesn't have to be over the top.
- I would like real world pictures
- I would find animation distracting and over stimulating
- Could be a still photo when an activity is complete

3) What do you think is the best way to present the activities? Should the activities be separated by character, or subject, or both? Should the activities be presented in a set list for the student to complete in sequence? Or should they be presented in a list for the student to select the activity?

- By character
- I would like to be able to pick the character and activities only for that character
- Separate by character
- Students should be able to select what activities students do
- Putting all reading and math activities together would be too overwhelming, especially for students who have IEP

- I think math activities listed by topic, number sense, geometry, algebra, would be helpful
- Break up into reading and math by character

4) Are there any websites that you really like or find that work well that you would like to see us format the RME site like?
- Links for characters are helpful
- The links that were given to us last year for the characters may be helpful in the website for pre teaching activities
- Starfall and PBS kids
- Starfall!

5) Any other recommendations or suggestions you have about what the website should look like? Please elaborate. Feel free to create diagrams.
- Kid friendly
- Movement is fun
- Use pictures to support text as much as possible to make it child friendly and readable

Functionality of the Website

1) At this point we are not planning to include audio. Do you see a potential problem with this?
- Yes! Even a computer voice is better than no audio
- Yes, audio provides much needed extra modalities
- Audio is an absolute must
- Yes! Children with reading difficulties or have accommodation plans will need audio so they are able to enjoy the computer as much as their peers
- I would not be able to use the website without audio

2) How do you propose we prevent the children from guessing or using trial and error?
- Some visual to discourage guessing
- Use color as caution
- Progress tracking
- After 3 guesses the answers should appear
- Limit how many times they can enter an answer

3) How should we address the issue of difficult vocabulary words? Should there be a hyperlink to the glossary in order to look up the difficult words while the children are reading?
- Yes, vocabulary words should be defined
- Pictures; oral option
- This is essential, possibly have an asterisk above the word that they could click and the definition is read
- A glossary link w/a picture would be helpful

- Hyperlink to the glossary
- Use sound

4) Would it be valuable to you to be able to track your students' progress on the website? Or are you using the website as a simple engaging activity that is not graded? Tracking the progress would require the students to login or some sort of saving to a file, is this feasible for your grade level?
- End of Reading or Math activities ability to print a certificate of achievement would be exciting and motivating for students
- Data or login for students is important to track progress
- Tracking progress is a nice option
- Whole class login would be nice
- Validation certificate is great for students
- I don't think a login is an essential part of the program
- Progress tracking is not essential
- A pop up with their score at the end of each activity would be nice
- I don't need to track their progress because this website will be used for enrichment, not assessment; although, kids love to see how they do, so maybe a certificate or "congratulations"
- I would love to track my students supplement progress for tutoring to boost weak areas; but this wouldn't be used for grading
- I would like a login for my class to track the data

Activities

1) Are there any activities that you really enjoyed? Are those activities included in our selection?
- Sequencing/retelling – huge component of comprehension
- An alphabetizing activity would be great
- Making Inferences is great for grades 2-5
- I like them all

2) Are there any activities that you didn't enjoy that are in our selection?
- No
- I think the teacher should be able to pick and choose which activities they use
- I like them all and would most likely use them in the classroom

3) At the moment we have not selected any open response activities because we did not know how the children's responses would be graded/recorded. Do you think we should include open response questions? If so how would you like the answers to be graded? Would you be grading them while on the screen? Or would they need to be saved and either printed or reviewed later?
- For upper grades, open response would be a nice with a print to file option
- Because of MCAS I need to have open response questions and I have access to laptops and smart boards
- Print to file of a save to option would be great

- I don't see how open response could be graded; in 1st grade kids may not be able to spell/write/type even short answers
- I personally wouldn't use the open response feature if there was one because there are so many other opportunities in my day to direct students with this
- Open response questions would be good for the older grades, if there was a save feature or a print to file feature
- Personally, I wouldn't have 1st graders print. I think other teachers (2-5) would love the option
- I like the print to file for open response in prep for MCAS

4) Please provide us with any other information/suggestions/feedback that you think would help us design an educational website for children.
- Including as many of the five senses as possible for young children helps them learn and remember (pictures and audio together are very important)
- Audio is very important and visuals are important
- On activities where students may be guessing at answers – 3 guesses should be sufficient, then the answers automatically opens

Name _____

Lillian: Biography Questions

1. Which illustration shows someone doing a chore?

2. How did Lillian's family keep track of things they did at home?

3. How many are in a dozen?

4. What important job did Lillian have?

Illustrations by Laura E.H. Casselius

Name _____

Lillian: Sequencing

Cut out the pictures from the bottom of the page. Glue them in the correct order in the boxes.

1	2	3	4

70
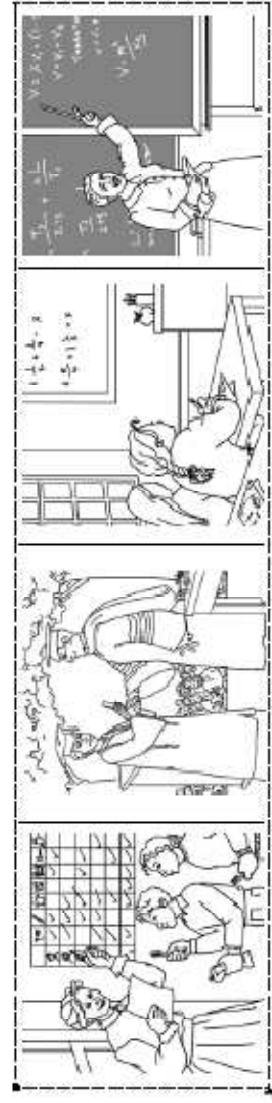
Name: _____

Sort It

Place each word cut-out in the column with the correct word family.

-ock	-art

Write a word to finish each sentence.

1. You use a _____ to tell time.

2. Lillian's children used a _____ for their chores.

Name: _____

Create New Words

Can you count the number of letters in her name?

LILLIAN GILBRETH

Number of Letters: _____

The letters can be mixed up to make new words! What are some new words you can make with her name?

New Words:

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

Illustrations by Laura E.H. Cassellius

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Name:_____

Vocabulary Sentences

Using the words in the Word Bank, complete the sentences below.

Word Bank: budget, business, college, data, dozen, education,
genius, inventory, learning, organized, professor, psychology

1. Lillian's father did not believe that women should go to
    _____, but Lillian convinced him that she should.

2. Frank was very interested in studying how people and work could be better
    _____. He and Lillian started a
    _____ together working on these ideas.

3. Lillian studied _____ at Brown University and earned
    her doctorate.

4. Besides being so busy with her _____ and career,
    Lillian also was a mom. She and Frank had a _____
    children!

5. The children also collected _____ by writing down
    their daily weight and recording the amount of water and electricity that they
    used.

6. The family held family meetings each week and they discussed activities,
    chores, and the household _____.

7. The children also took on special jobs like keeping
    _____ of grocery shopping needs and buying
    birthday presents.

8. Lillian never stopped _____.

9. She became the first woman engineering _____ at
    Purdue University in 1935.

10. She worked until she was in her eighties and was known as "a
    _____ in the art of living."

Name: _____

Lillian's Hundred Squares

1	2		4	5		7	8	9	10
11	12	13		15	16		18	19	
21	22	23	24		26	27		29	30
	32		34	35		37	38	39	
41	42	43		45	46		48		50
51	52		54	55	56	57			60
	62	63		65	66		68	69	
71	72		74		76	77	78		
81		83	84	85		87	88		90
91		93		95		97	98	99	

Name: _____

Too Many Socks & Mittens: Story

> Read the following story and then answer the questions
> on the *Questions* page.

On snowy days, Lillian and her 8 brothers and sisters liked to
play outside. One day, the children came in and left a pile of
coats, boots, socks, and mittens all over the floor!

Lillian's mother told them to hang up their coats and line up
their boots. She also asked them to wash their socks and
mittens in the sink and hang them up to dry on the clothesline.

The children only had one pair of socks each and one pair of
mittens each.

75

Name: _____

Too Many Socks & Mittens: Questions

After reading the *Story* page, answer the questions below.

1. How many children were playing outside if there were 12 socks to be washed? _____

2. How many children were playing outside if there were 4, 8, or 10 socks?

   4 socks = _____ children

   8 socks = _____ children

   10 socks = _____ children

3. How many toes were kept warm by 12 socks? _____

4. How many children were playing outside if there were 14 mittens to be washed? _____

5. How many children were playing outside if there were 6, 10, or 18 mittens?

   6 mittens = _____ children

   10 mittens = _____ children

   18 mittens = _____ children

6. How many fingers were kept warm by 14 mittens? _____

Name:_____

In-Out Machines: Oops!

Someone operating the machine wasn't very careful! Lillian knows the machine operation and the OUT numbers, but only one of the IN numbers. Can you help her figure out what the missing numbers are?

Addition Machine:

For each row in the table, write out the mathematical form of the IN-OUT machine and find the missing IN number.

IN		OUT	Math Equation	The Missing IN Number
3	?	9	_____	_____
?	5	14	_____	_____
16	?	23	_____	_____
?	8	16	_____	_____

Subtraction Machine:

For each row in the table, write out the mathematical form of the IN-OUT machine and find the missing IN number.

IN		OUT	Math Equation	The Missing IN Number
12	?	6	_____	_____
?	20	5	_____	_____
7	?	0	_____	_____
?	29	1	_____	_____

Name: _____

In-Out Machines: Oops!

Someone operating the machine wasn't very careful! Lillian knows the machine operation and the OUT numbers, but only one of the IN numbers. Can you help her figure out what the missing numbers are?

Multiplication Machine:

For each row in the table, write out the mathematical form of the IN-OUT machine and find the missing IN number.

IN		OUT	Math Equation	The Missing IN Number
7	?	21		
?	30	60		
5	?	40		
?	6	24		

Division Machine:

For each row in the table, write out the mathematical form of the IN-OUT machine and find the missing IN number.

IN		OUT	Math Equation	The Missing IN Number
16	?	4		
?	3	10		
45	?	9		
?	7	8		

Illustrations by Laura E.H. Cassellius

Name:_____

Final Sounds

Write the correct letter to complete the words.

professo _____

drea _____

childre _____

schoo _____

presen _____

Choose one word and use it in a sentence.

_____

_____

Appendix G: Teacher Questionnaire 2

Welcome Page

1) Is there anything that should be added or removed from the welcome page?

2) Is it obvious what you need to click on to enter the website or does there need to be some sort of prompt?

   a) If a prompt is necessary, what type of prompt should be used? Visual or audio?

3) Other suggestions/comments about the welcome page.

Lillian's Page

1) Is the navigation of Lillian's section simple enough for children (your students)?

   a) If not, what would make it better/simpler?

2) Other suggestions/comments about Lillian's Page.

Activities

1) Are the instructions for the activities sufficient?

   a) If not, what should be improved? (too much instruction, too little, too complicated, etc.)

2) Other suggestions/comments about the activities.

Other

1) Are there any other comments/suggestion you would like to make about the site?

<u>Welcome Page</u>

1) Is there anything that should be added or removed from the welcome page?
   - Put a name under/beside each character
   - Put names on all characters
   - I think it looks good – not too overwhelming, but perhaps the names should be written below each picture so it is more clear
   - Make Lillian's star bigger or more colorful or and an effect around it
   - Add directions; "click on a character by placing your mouse over the character
   - Names under or next to the icons
   - No – seems to be user-friendly; nice graphics; on the character make the star bigger and add the names to the characters

2) Is it obvious what you need to click on to enter the website or does there need to be some sort of prompt?
   - Very obvious! I love it and would like to keep this feature for my students
   - It was not obvious, make the star bigger on Lillian
   - Looks fine to me
   - Yes it is obvious – with the exception of the globe in the middle – is that a link as well?
   - No – but again names would help, it blends in and was not centered
   - I think it is obvious and easy enough for students to click on people
   - Enlarge the star; younger students are used to teacher directed activity when starting something new
   - Not obvious; I clicked on three pictures before I found Lillian
   - Yes – the pages seem very user-friendly

   a. If a prompt is necessary, what type of prompt should be used? Visual or audio?
      - Put each character name under their picture and a listen button to read the names
      - A visual prompt would be helpful to first graders
      - If a prompt is added, an audio would be appropriate
      - At least visual – audio would be additional
      - Visual prompt
      - Visual should be fine – some flashing or movement helps for special needs or beginning readers
      - Maybe add a start button

3) Other suggestions/comments about the welcome page.
   - I like how the working character is colored and stands out! That makes it easier to see where I can go and I could do the same with my students. (This is a great feature for the teachers choices we spoke about last time)
   - Graphics next to words on navigation bar; larger font
   - You might want to put the names under the pictures
   - Maybe you could click on the globe, have it spin then all the names can appear under the pictures… like toss out the names as it spins
   - Label picture with explorer name
   - Add names of characters under each character on the home page
   - Needs to be clear where to start – either use the word "start" or really hi-light the character
   - The graphics are good!

Lillian's Page

1) Is the navigation of Lillian's section simple enough for children (your students)?
   - Very simple to navigate through; the "listen" link is in a great spot and large enough/self explanatory for a young child; bio – make font larger and add a picture for each header
   - Yes – good job! Love the "listen button"
   - Yes – however I think the content is too advanced for first graders – even with the audio – the vocabulary is advanced, wordy and there is a lot of info – maybe too much
   - Yes – my students would be able to find items easily
   - Yes! Choice would be nice: Please simplify Lillian's Biography for K-2 readers; use bigger font and make it like a picture book; a few sentences with headings and picture, then turn the page
   - Yes! I really like the listen button at the top of the page
   - Young children would need a bigger navigation bar, possibly with a picture to go along with the sub-areas

   a. If not, what would make it better/simpler?
      - Vocabulary links are a great feature
      - Maybe teacher needs to instruct students to click on highlighted words to get the meaning of the word

2) Other suggestions/comments about Lillian's Page.

- Maybe pictures with the bio, if at all possible, for beginning readers and to help with those who may have visual processing difficulties; add a listen feature in the glossary; in the glossary add picture just for word
- Larger font with space between sentences; the vocabulary and definitions is too advanced for first graders; repetition of words in biography is not needed such as "children" highlighted five times
- A more basic – easy elementary version (of the biography) would be great
- I think the glossary and its functionality is very good!
- I like the vocabulary highlighted in different color; linking it with picture Pictionary would be awesome
- Could you add a picture of her family, children or map of United States to see where California is
- Glossary looks great although there really are a lot of words and many of the words are beyond first graders; some words don't need to be there – glove, mitten, job, left, music, finger
- I like how the vocabulary words are pink throughout the text

Activities

1) Are there any other comments/suggestion you would like to make about the site?
- Larger font, something the equivalent of 14/16; add headings and pictures to missing biography words; make word bank words lower case unless it is the beginning of a sentence
- Good! Pictures are again helpful next to each activity title
- Yes, the directions seem very clear and to the point
- Pictures to go with each activity might be helpful so kids can select easily or number them so teacher can say to go to activity #1

   a. If not, what should be improved? (too much instruction, too little, too complicated, etc.)
   - Vocabulary Sentences – double space, larger font, all lower-case in the word bank
   - Need visuals for counting activities such as a row of socks/mittens for "Too Many Socks and Mittens"
   - Color coding each star explorer is very helpful
   - I like the activities page set-up; pictures would be good to distinguish words and make them about Lillian
   - Keep everything (colors) the same throughout the activities

2) Other suggestions/comments about the activities.
- Keep the red/green consistent throughout the website for right and wrong; add a congrats after they complete an activity
- Font size could be bigger
- Could you include the name above each star explorer?

- Add green = thumbs up for good job on top of the page
- Fonts bigger; more space between lines of text

Other

1) Are there any other comments/suggestion you would like to make about the site?
    - Pictures on took bar – for example: picture of Lillian behind "Lillian's Bio" will get bigger as the students runs the mouse over it to stand out, then as they run the mouse over "home" the RME logo gets larger and Lillian becomes smaller/regular size again; etc… for activities and glossary
    - Very colorful and kid friendly to use: teacher resources – great idea – love the pictures of Lillian; green box, "thumbs up", red box, "thumbs down"
    - Teacher resources – where you click on the pictures – make them larger with labels
    - Possible label for specification on grade level
    - I like the listen/audio choice; very important and kid friendly; please include: picture in glossary after each glossary term; lower case letters in the word banks; space in between each numbered sentence for ease of reading; floating word bank of going down the side
    - Change font to larger – stretch biography to two pages for younger students and pictures of Lillian; labels – for photos; hyper link Lillian Gilbreth's curriculum; add pictures and people for socks and mittens; lower case letters in the word banks
    - Pictures really help young students for labels and definitions; include a key thumbs up/down for an activity; double space text; add a congratulations when all activities are completed
    - When you are in the teacher resources possibly label photos

Thank you for participating in the testing of the Reading and Math Explorers™ (RME) Web site.

We appreciate your taking time from your busy schedule to help us. Please know that we value

your input and will use your input to improve the Web site.

The following notes include instructions for the testing as well as some questions for you to

answer. Please understand that there are no wrong or incorrect answers to the questions.

- Before you begin navigating through the RME website, please answer the following questions:

  What operating system are you running?

  What internet browser, including version, are you using? Please tell us about your use of

  computers. For example, I use the computer to check my email, I use the computer for

  classroom projects, I have a computer programming background, know how to program in

  six different languages, etc

- Before you begin navigating through the RME website, please enable the audio function on your computer. If you are unable to enable the audio function, please note that here.

- Please spend about 10 minutes to freely navigate through the website in order to familiarize yourself with the website. If you run into any problems/errors/bugs, please make note of them here.

- Please log / write detailed notes of the steps that you take to do the following:

  Using the RME website, locate the word "college" and look up the meaning of the word

college. As you navigate to locate this word please, log exactly what you clicked on to get there

(e.g., I clicked on the blue star, then I clicked on the red block, etc.) Also, please note how long it

took you to complete this task. Please write your notes here and please remember there are no wrong answers.

The steps that I took to locate the word "college" and look up the meaning:

The problems that I had with this task:

How much time I spent on this task:

Using the RME website, locate, listen to, and complete Biography Questions. As you navigate to complete this task please log exactly what you clicked on to get there (e.g. I clicked on the blue star, then I clicked on the red block, etc.) Please note how long it took you to complete this task. Please write your notes here and please remember there are no wrong answers.

The steps that I took to locate, listen to, and complete Biography Questions:

The problems that I had with this task:

How much time I spent on this task:

On the RME website, using the login information provided, login as a teacher and create a classroom user and corresponding activity selection. Please select only three activities. Please list which activities you selected. As you navigate to complete this task please log exactly what you clicked on to get there (e.g. I clicked on the blue star, then I clicked on the red block, etc.) Please

note how long it took you to complete this task. Please write your notes here and please remember there are no wrong answers.

The steps that I took to login as a teacher, create a classroom user, and select activities:

The three activities that I selected:

The problems that I had with this task:

How much time I spent on this task:

On the RME website, using the login information provided, login as a student. What major differences did you notice from when you weren't logged in? As you navigate to complete this task please log exactly what you clicked on to get there (e.g. I clicked on the blue star, then I clicked on the red block, etc.) Please note how long it took you to complete this task. Please write your notes here and please remember there are no wrong answers.

The steps that I took to login as a student and locate differences:

The major differences between navigating while using a student login versus navigating without using a login:

How much time I spent on this task:

Thank you for participating in the testing of the Reading and Math Explorers™ (RME) Web site. We appreciate your taking time from your busy schedule to help us. Please know that we value your input and will use your input to improve the Web site.
The following notes include instructions for the testing as well as some questions for you to answer. Please understand that there are no wrong or incorrect answers to the questions.

Before you begin navigating through the RME website, please answer the following questions:

What operating system are you running?
- Windows 7
- Windows Vista
- Windows XP
- Mac OS X Version 10.5.7
-
What internet browser, including version, are you using?
- Firefox 3.5.8
- Safari Version 3.2.3
- Internet Explorer 8
- Internet Explorer 7
- Google Chrome

Please tell us about your use of computers. For example, I use the computer to check my email, I use the computer for classroom projects, I have a computer programming background, know how to program in six different languages, etc
- I use computer for email, classroom, research
- Minimal experience with basic scripting Unix shell/Perl/HTML/SQL
- I am a CS professor
- I use PC at work & home to check email, surf web, do projects on MS Office software
- I use my computer for e-mail, Skype, Internet and word processing

Before you begin navigating through the RME website, please enable the audio function on your computer. If you are unable to enable the audio function, please note that here.

Please spend about 10 minutes to freely navigate through the website in order to familiarize yourself with the website. If you run into any problems/errors/bugs, please make note of them here.
- Worded links in addition to pictures on the front page would be nice
- Not all glossary words were highlighted in the biography
- Make a way to pause/stop the audio without having to refresh the page
- Include a "back" button on all of the pages
- The navigation bar should not cover the other page content
- In Lillian's Hundred Squares, the instructions say "enter the missing numbers" but then the rest of the page is blank.
- Create New Words considered many words incorrect
- If you put a word in twice, it goes in the "incorrect words" column. Should you get a message instead?

- In Missing Biography Words and Missing Biography Words Part 2, the sound doesn't work when you click on listen and dragging the words doesn't work. When you drag the word, the word and the blank you are dragging to turns red and the word you dragged goes back to the top of the screen where it came from.
- In Vocabulary Sentences, dragging the words doesn't work When you drag the word, the word and the blank you are dragging to turns red and the word you dragged goes back to the top of the screen where it came from.
- In Sort It, nothing happens when you have sorted in the correct order (no congratulations).
- The audio only played once. To play more audio I had to restart my browser session.

Please log / write detailed notes of the steps that you take to do the following:

Using the RME website, locate the word "college" and look up the meaning of the word college . As you navigate to locate this word please, log exactly what you clicked on to get there (e.g., I clicked on the blue star, then I clicked on the red block, etc.) Also, please note how long it took you to complete this task. Please write your notes here and please remember there are no wrong answers.

The steps that I took to locate the word "college" and look up the meaning:
- Clicked on the colored icon; clicked on Lillian's Biography; clicked on college in the biography
- Clicked glossary; scrolled down to college; played the audio

The problems that I had with this task:
- None
- The sound didn't work
- Have the hyperlinked words tagged to show the glossary definition rather than navigating away from the page. Or maybe open a new pop-up window.

How much time I spent on this task:
- <1min

Using the RME website, locate, listen to, and complete Biography Questions. As you navigate to complete this task please log exactly what you clicked on to get there (e.g. I clicked on the blue star, then I clicked on the red block, etc.) Please note how long it took you to complete this task. Please write your notes here and please remember there are no wrong answers.

The steps that I took to locate, listen to, and complete Biography Questions:
- Clicked on pink star; clicked on activities; clicked on biography questions

The problems that I had with this task:
- I didn't know answer to last question, so went back to biography to find answer, when returned to questions my earlier answers had disappeared (please note I was already logged on as a teacher)
- The sound didn't work
- It was not immediately obvious what I was expected to do
- None

How much time I spent on this task:
- 3min

On the RME website, using the login information provided, login as a teacher and create a classroom user and corresponding activity selection. Please select only three activities. Please list which activities you selected. As you navigate to complete this task please log exactly what you clicked on to get there (e.g. I clicked on the blue star, then I clicked on the red block, etc.) Please note how long it took you to complete this task. Please write your notes here and please remember there are no wrong answers.

The steps that I took to login as a teacher, create a classroom user, and select activities:
- Clicked on pink star; clicked sign in; entered credentials; clicked on teacher resources; clicked on classroom user management; updated student/classroom credentials; clicked on classroom activity selection; selected three activities

The three activities that I selected:
- Various combinations

The problems that I had with this task:
- The instructions for selecting activities were very confusing
- It was not obvious that the "update user" and "save selections" did anything

How much time I spent on this task:
- 5min

On the RME website, using the login information provided, login as a student. What major differences did you notice from when you weren't logged in? As you navigate to complete this task please log exactly what you clicked on to get there (e.g. I clicked on the blue star, then I clicked on the red block, etc.) Please note how long it took you to complete this task. Please write your notes here and please remember there are no wrong answers.
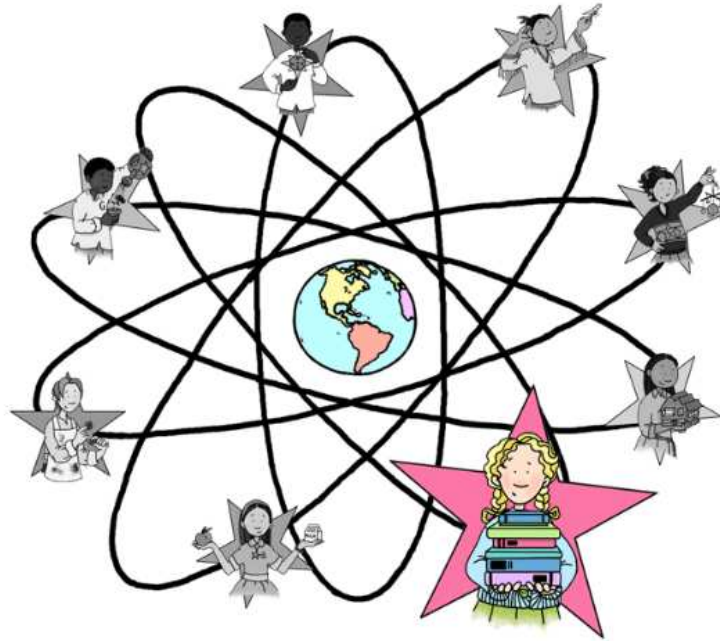
The steps that I took to login as a student and locate differences:
- I clicked on the character and signed in
- From the Bio page I clicked on the pink link titled "Sign In" in the top right corner. Two boxes appeared to the left and I entered the provided student username and password.
- The major differences between navigating while using a student login versus navigating without using a login:
- Less activities available
- No longer had access to teacher resources

How much time I spent on this task:
- 3min

Home Page

Lillian Gilbreth

◀)) ☺
Listen?

Young Lillian

Lillian grew up in a large family and often was responsible for taking care of the household. Born in California in 1878, Lillian was the oldest of nine children. She learned to take care of her brothers and sisters and helped her parents. School was very important to Lillian. She loved reading and music and always dreamed about going to college.

Education

Lillian's father did not believe that women should go to college, but Lillian convinced him that she should. She attended the University of California and received a master's degree in literature.

The Busy Years

After college, Lillian met and later married Frank Gilbreth. Frank was very interested in studying how people and work could be better organized. He and Lillian started a business together working on these ideas. Frank never went to college, but Lillian continued with her education. She studied psychology at Brown University and earned her doctorate. Besides being so busy with her education and career, Lillian also was a mom. She and Frank had a dozen children!

Managing a Family

Life at the Gilbreth house was exciting and fun. Imagine the busy mornings getting ready for school! Lillian studied the basic tasks that the children had to perform in order to find out if there were ways for them to accomplish the tasks faster or more efficiently. There were charts for brushing teeth, taking baths, combing hair, doing homework, and making beds. The children also collected data by writing down their daily weight and recording the amount of water and electricity that they used. The family held family meetings each week and they discussed activities, chores, and the household budget. The children could submit a sealed bid for special chores, such as painting a fence or doing a gardening project. The children also took on special jobs like keeping inventory of grocery shopping needs and buying birthday presents. The household ran smoothly and efficiently.

Later Years

Lillian never stopped learning. She always loved reading and developed a love of math too. She became the first woman engineering professor at Purdue University in 1935. She worked with many different companies, helping them to organize the way work was done. Her hard work, both on the job and at home, never stopped. She worked until she was in her eighties. When she died in 1979 at the age of 93, Lillian was known as "a genius in the art of living."
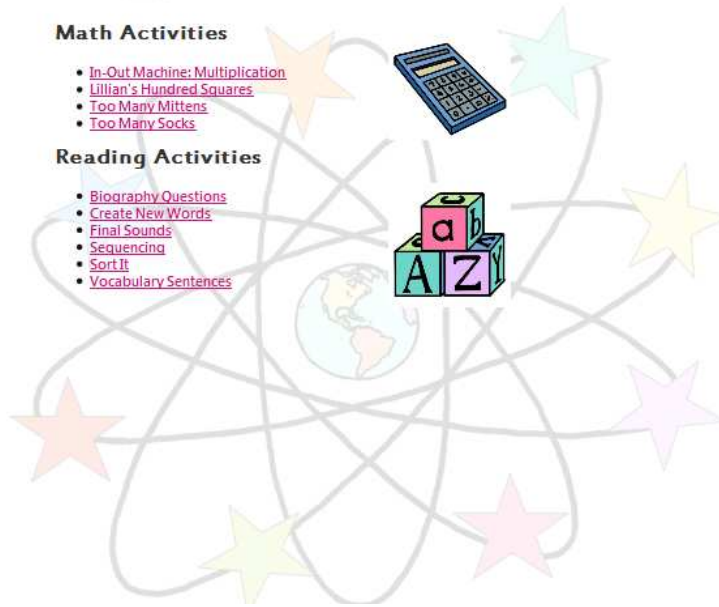
Lillian's Biography Page

92

Activity Selection Page

In-Out Machine: Multiplication

Lillian Gilbreth

Lillian's Hundred Squares

Type the missing numbers into the empty boxes in the hundred chart.

1	2	3		5		7		9	
11	12		14	15	16		18	19	
21		23		25	26	27	28	29	
31		33		35		37	38	39	
41		43	44		46	47	48		50
51	52		54		56		58		60
61	62	63	64		66	67		69	
71		73		75	76		78		80
81	82		84		86	87	88	89	90
91		93		95	96	97	98	99	100

Lillian's Hundred Squares

Lillian Gilbreth

Too Many Mittens

Listen?

On snowy days, Lillian and her eight brothers and sisters liked to play outside. One day, the children came in and left a pile of coats, boots, socks, and mittens all over the floor!

Lillian's mother told them to hang up their coats and line up their boots. She also asked them to wash their socks and mittens in the sink and hang them up to dry on the clothesline.

The children only had one pair of socks each and one pair of mittens each.

Type in the number that correctly answers the question.

How many children were playing outside if there were 14 mittens to be washed? ☐

How many children were playing outside if there were 6, 10, or 18 mittens?

6 mittens = ☐ children

10 mittens = ☐ children

18 mittens = ☐ children

How many fingers were kept warm by 14 mittens? ☐

Too Many Mittens

94

Lillian Gilbreth

Too Many Socks

Listen?

On snowy days, Lillian and her eight brothers and sisters liked to play outside. One day, the children came in and left a pile of coats, boots, socks, and mittens all over the floor!

Lillian's mother told them to hang up their coats and line up their boots. She also asked them to wash their socks and mittens in the sink and hang them up to dry on the clothesline.

The children only had one pair of socks each and one pair of mittens each.

Type in the number that correctly answers the sock question.

How many children were playing outside if there were 12 socks to be washed? ☐

How many children were playing outside if there were 4, 8, or 10 socks?

4 socks = ☐ children

8 socks = ☐ children

10 socks = ☐ children

How many toes were kept warm by 12 socks? ☐

Too Many Socks

95

Biography Questions

Lillian Gilbreth

Create New Words

Type the number of letters in Lillian's first and last name.

L I L L I A N   G I L B R E T H

Number of letters: [ ]

The letters in Lillian Gilbreth's name can be mixed up to make many new words. Type twelve of the words that can be made from the letters in her name.

new words: [ ]

correct words   **incorrect words**

[ ]   [ ]

Create New Words

Final Sounds

Listen?

Drag the correct letter to complete each word.

| n | m | t | or | l |

profess [ ]

drea [ ]

childre [ ]

schoo [ ]

presen [ ]

Final Sounds

Lillian Gilbreth

Home   Lillian's Biography   Activities   Glossary   About RME

Sequencing

🔊 Drag the pictures into the correct order that they happened in Lillian's Biography.

Sequencing

Lillian Gilbreth

Home   Lillian's Biography   Activities   Glossary   About RME

Sort It

🔊 Sort the words into the box of the correct word family. (Hint: a word family is a group of words that rhyme)

sock smart chart cart lock clock start block rock part

-ock	-art

Sort It

Lillian Gilbreth

🔊 ☺
Listen?

Vocabulary Sentences

Drag the words to where they correctly complete the sentences.

budget   business   college   data   dozen   education   genius   inventory
learning   organized   professor   psychology

1. Lillian's father did not believe that women should go to _____ but Lillian convinced him that she should.

2. Frank was very interested in studying how people and work could be better _____. He and Lillian started a _____ together on these ideas.

3. Lillian studied _____ at Brown University and earned her doctorate.

4. Besides being so busy with her _____ and career, Lillian also was a mom. She and Frank had a _____ children!

5. The children also collected _____ by writing down their daily weight and recording the amount of water and electricity that they used.

6. The family held family meetings each week and they discussed activities, chores, and the household _____.

7. The children also took on special jobs like keeping _____ of grocery shopping needs and buying birthday presents.

8. Lillian never stopped _____.

9. She became the first woman engineering _____ at Purdue University in 1935.

10. She worked until she was in her eighties and was known as "a _____ in the art of living."

Vocabulary Sentences

99

Lillian Gilbreth

Lillian's Glossary

🔊 accomplish   to finish or complete something

🔊 after   following something else

🔊 alternate   to go back and forth between two or more different things, place, or actions

🔊 artistic   having exceptional abilities in the realm of drawing, sculpting, etc.

🔊 backwards   with the back coming first; in reverse order

🔊 bottom   the lowest part of something

🔊 budget   a guideline for spending money

🔊 business   an organization that makes products or offers services in exchange for money

🔊 California   a state in the United States on the Pacific coast; Lillian was born here

🔊 career   a chosen profession or job

🔊 chart   a display of information that uses lists, tables, graphs, and/or diagrams

🔊 children   young people; sons or daughters

🔊 chores   regular work that needs to be done around the house or yard

🔊 college   a school attended after grade 12 that prepares a person for a special job such as a teacher or scientist

🔊 column   a vertical arrangement of writing or print

🔊 continue   to go on without stopping

🔊 could   to have been able to

🔊 data   gathered information

🔊 design   the pattern or patterns used in a decorative work such as a quilt

🔊 diagonal   lying in a slanting position; occurs when opposite corners of a four-sided figure are connected

🔊 doctorate   the highest level of education, signifies expertise in a given field

🔊 dozen   twelve of something

🔊 dream   a thought or aspiration

Glossary

100

Lillian Gilbreth

Home   Lillian's Biography   Activities   Glossary   About RME

About Reading and Math Explorers ™

Reading & Math Explorers is a fun and innovative K-4 program that includes eight curricular units and is designed to serve as a supplement to an instructor's current curriculum. The program units focus on the inspirational achievements and interests of a diverse set of historical and contemporary figures. These leaders and innovators are depicted as children, empowering students to recognize in themselves the potential for achievement.

Each unit includes a biography and accompanying language arts and mathematics activities that can be inserted into an existing K-4 curriculum at the instructor's discretion. The activities presented can follow any order, though it is highly recommended that each unit be started with the character biography. For each activity, grade level recommendations are provided.

The context of this unit is Lillian Gilbreth's life and achievements as an engineer and the mathematics focus is on algebra (patterns and functions). If you and your students enjoy this unit, you'll also enjoy the other units in the Reading & Math Explorers program. Be sure to check out the other Reading and Math Explorers characters.

This website was designed and built by Janese Cerulli, Michael Ficarra, and Deanna Flaherty as part of an Interactive Qualifying Project for Worcester Polytechnic Institute.

About Reading and Math Explorers™

Signed in as *Deanna Flaherty.* Sign Out

Lillian Gilbreth

Home   Lillian's Biography   Activities   Glossary   Teacher Resources   About RME

Lillian Gilbreth's Curriculum

Recommended Reading Resources

Photographs of Lillian

Classroom User Management

Classroom Activity Selection

Teacher Resources

Recommended Reading Resources

Lillian Gilbreth

Lillian Gilbreth's Curriculum

Recommended Reading Resources

Photographs of Lillian

Classroom User Management

Classroom Activity Selection

Photographs of Lillian

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Classroom User Management

Lillian Gilbreth

Home   Lillian's Biography   Activities   Glossary   Teacher Resources   About RME

Lillian Gilbreth's Curriculum

Recommended Reading Resources

Photographs of Lillian

Classroom User Management

Classroom Activity Selection

Select any of the activities below to disallow your classroom user from seeing any unchecked activities. If all activities are unchecked (or all are checked), all activities will be available to your classroom user.

☐ Biography Questions pages 1-5
As an introduction to future lessons on Lillian, students will learn about Lillian's life and achievements. Students will demonstrate comprehension of information presented in a biography.

☑ Create New Words pages 29-30
Students will create new words from the letters in Lillian's name or occupation.

☐ Final Sounds
Students will be able to identify end word sounds

☐ In-Out Machine: Multiplication pages 73-74,76-77
Given an IN number and a function, students will be able to determine the OUT number

☑ Lillian's Hundred Squares pages 58-59
Students will become familiar with a hundred chart and recognize the patterns shown in the columns.

☐ Sequencing pages 8-11
Students will be able to sequence important events in the life of Lillian Gilbreth.

☐ Sort It pages 23-25
Students will be able to match words to the correct word families and use words to complete sentences.

☑ Too Many Socks pages 63-66
Students will explore relationships between numbers and sets. They also will recognize, describe, and extend patterns.

☐ Too Many Mittens pages 63,67
Students will explore relationships between numbers and sets. They also will recognize, describe, and extend patterns.

Classroom Activity Selection

Lillian Gilbreth

Home   Lillian's Biography   Activities   Glossary   About RME

Listen?

Young Lillian

Lillian grew up in a large family and often was responsible for taking care of the household. Born in California in 1878, Lillian was the oldest of nine children. She learned to take care of her brothers and sisters and helped her parents. School was very important to Lillian. She loved reading and music and always dreamed about going to college.

next

Early Learner Biography

Website Maintenance

Configuration Files

The files noted in the following are intended as a reference to the specific locations of these files

on the live server. As with software updating, they should not be modified unless a problem

arises. The files can serve as references to indicate exactly how things are setup in the case

where questions arise.

Apache:

- /etc/httpd/conf/httpd.conf
  Contains basic apache configuration

- /etc/httpd/conf.d/haml.conf
  Instructs Apache to use /usr/lib/ruby/1.8/apache/haml-run.rb when handling .haml files

- /etc/httpd/conf.d/sass.conf
  Instructs Apache to use /usr/lib/ruby/1.8/apache/sass-run.rb when handling .sass files

- /etc/httpd/conf.d/erubis.conf
  Instructs Apache to use /usr/lib/ruby/1.8/apache/erubis-run.rb when handling .rhtml files

- /usr/lib/ruby/1.8/apache/haml-run.rb
  Handles all requests for .haml files and runs the requested file through the Haml compiler

- /usr/lib/ruby/1.8/apache/sass-run.rb
  Handles all requests for .sass files and runs the requested file through the Sass compiler

- /usr/lib/ruby/1.8/apache/erubis-run.rb

  Handles all requests for .rhtml files and runs the requested file through Erubis

Website:

- /var/www/html/includes/conf.yml
  YAML file containing site configuration and options

Documentation

The following lists general documentation for the technologies being used by the website.

Follow the web links to view the documentation.

Ruby

- Ruby Documentation < http://www.ruby-doc.org/core/ >

- Ruby in 20 Minutes < http://www.ruby-lang.org/en/documentation/quickstart/ >

- Try Ruby in Your Browser: Tutorial < http://tryruby.sophrinix.com/ >

Haml
- Haml/Sass Documentation < http://haml-lang.com/docs/yardoc/ >

- Haml Tutorial < http://haml-lang.com/tutorial.html >

- Haml Reference < http://haml-lang.com/docs/yardoc/HAML_REFERENCE.md.html >

Erubis

- Erubis Documentation < http://www.kuwata-lab.com/erubis/users-guide.html >

- Erubis Tutorial < http://www.kuwata-lab.com/erubis/users-guide.02.html#tutorial >

Sass

- Haml/Sass Documentation < http://haml-lang.com/docs/yardoc/ >

- Sass Tutorial < http://sass-lang.com/tutorial.html >

- Sass Reference < http://sass-lang.com/docs/yardoc/SASS_REFERENCE.md.html >

MooTools

- MooTools Documentation < http://mootools.net/docs/core >

Markdown

- Markdown Syntax http://daringfireball.net/projects/markdown/syntax

SQL

- Tutorial http://www.w3schools.com/sql/default.asp

File Descriptions

Files located in the root directory

/.htaccess	mod_rewrite directives, used for making pretty URLs
/about.haml	Configuration information for the inner about page
/activity.haml	Displays an activity
/activity_list.haml	Lists activities available to the current user
/bio.haml	Configuration information for the characters bio pages
/favicon.ico	Icon displayed in browser tab/favorites list
/global_about.haml	The global about page
/glossary.haml	Lists glossary words associated with a given character
/index.haml	Homepage
/inner_page.haml	The template used when rendering pages other than the homepage
/Rakefile	Instructions for rake
/teacher_resourses.haml	Configuration information for the teacher resources page

Files located in the activities directory: activities

/activities/<character>/*.haml	Structure for one of given characters activities
/activities/<character>/*.sass	Style for one of given characters activities
/activities/<character>/*.js	Client side script for one of given characters activities

Files located in the ajax directory: handlers of any XMLHttpRequest calls

| /ajax/login_handler.rhtml | Handles login ajax requests |
| /ajax/logout_handler.rhtml | Handles logout ajax requests |

Files located in the audio directory: audio files

/audio/player.swf	A flash audio player
/audio/<character>/activities/*	Audio used in activities for given character
/audio/<character>/general/*	General character specific audio
/audio/<character>/glossary/*	Audio used in glossary for given character

Files located in the bios directory: character bios

| /bios/<character>.md | A markdown document containing the bio of a given character |

Files located in the css directory: stylesheets

/css/about.sass	Style for the character specific about page
/css/activity.sass	Style for the activities
/css/bio.sass	Style for the biography page
/css/glossary.sass	Style for the glossary page
/css/homepage.sass	Style for the homepage
/css/main.sass	Style for the inner template
/css/teacher_resources.sass	Style for the teacher resources page
/css/<character>.sass	Character specific styling for the inner template

Files located in the images directory: imagery

/images/<character>/activities/*	Images used in giving characters activities
/images/<character>/teacher_resources/*	Images used in giving characters teacher resources page
/images/<character>/*	Images used in inner page templating for a given character
/images/*	Non character specific templating images

Files located in the includes directory: classes and framework

/includes/character.class.rb	The character class, used for retrieving character information from the database
/includes/common.inc.rb	Common framework that is used by every page
/includes/conf.yml	A YAML file that contains website configuration including debug flags, MySQL credentials etc
/includes/db.class.rb	DB class, which handles database connection and querying
/includes/glossary.class.rb	The glossary class, which is used for retrieving a character's glossary words from the database and replacing a given text with links to the words
/includes/session.inc.rb	Maintains a session for users of the website
/includes/user.class.rb	The user class which handles user login, registration, and related methods
/includes/util.inc.rb	Common utility functions

Files located in the js directory: scripts to be run by the client's browser

/js/glossary.js	JavaScript used on the glossary page
/js/listen_button.js	The ListenButton class which is used to make clickable audio
/js/login.js	Enables the login/logout form on all pages
/js/mootools_core.js	MooTools core
/js/mootools_more.js	MooTools more
/js/teacher_resources.js	JavaScript used on the teacher resources page

Files located in the partials directory: content rendered by another haml page (like a server-side include)

/partials/about.part.haml	A haml partial that contains the content on the about page
/partials/activity_list.part.haml	A haml partial that lists the activities available to the current user, used in the activities page
/partials/bio.part.haml	A haml partial that contains instructions for interpreting the markdown file associated with the given character
/partials/glossary.part.haml	A haml partial that contains instructions for rendering the list of glossary words on the glossary page
/partials/nav.part.haml	A haml partial rendered at the top of every inner page that contains the navigation bar and its associated logic
/partials/teacher_resources.part.haml	A haml partial that renders common teacher resources content as well as character specific content from the teacher_resources directory

Files located in the resources directory: files for developers, not to be used by web server

/resources/homepage.psd	Photoshop document containing a representation of the homepage
/resources/inner_page.psd	A Photoshop document containing a representation of the content common to character specific pages
/resources/technologies.dop	A Graphviz DOT directed graph representing the flow of an HTTP request through the software that runs the website
/resources/technologies.png	A rendering of the technologies.dot directed graph

Files located in the teacher_resources directory: character-specific content for the teacher resources page

/teacher_resources/<character>.part.haml	A haml partial used to render character specific parts of the teacher resources page

Typical Haml File Layout

The following outlines how a page is constructed in code, by trying to visualize how each file will be rendered on screen for a user of the website. It should be used as a guide when making modifications to the website. That is, if a change is needed to the navigation of all the pages, consult the navigation part file. If changes are needed to all pages outside of the navigation bar, then the inner_page file might be the place to start. Changing individual pages should consult their specific haml or part.haml files.

sample.haml   <page-specific configuration, includes, partials

inner_page.haml   <standard templating>

Lillian Gilbreth

Home   Lillian's Biography   Activities   Glossary   About RME

Listen?

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Common Tasks

The common tasks are a very broad set of activities that a maintainer or modifier of the website might need to execute. They include making modifications to the actual content of the website, rather than the configuration of the server.

To get to the root directory, login to the server via putty (http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html). For the host name, enter rmexplorers.wpi.edu and then click on open. Enter your username, then press enter; enter your password, press enter again. Type 'sudo bash', press enter, and enter your password. Now, type 'cd /var/www/html' to get to the root directory. In the root directory, you are able to enter commands.

Note that a working knowledge of SQL and some familiarity with mySQL is essential to complete these steps. Refer to the documentation for a primer. To run an SQL statement for any of the activities below, you first run the command

```
mysql rme
```

This will give you access to the RME database so that you can make updates. Note that all statements end in a semicolon. To view all the entries in a given table (i.e. users, activities, etc.) run the statement

```
SELECT * FROM <table>
```

replacing <table> with the desired table.

Adding A User

Insert a row into the users table in the database. The role column comes from the ID field of the rows table. View all records in that table to see what the options are. The salt column should be a 32 character random string, MD5(RAND()) should suffice. The password hash should be a sha1 hash of the concatenation of the salt column, the user's desired password, and the salt class variable stored in the user class. The SQL for this column would look something like SHA1(CONCAT(`salt`,'password','salt_value_in_class')). The teacher column should be null except for student users. Student users' teacher column should be the id of the user assigned as their teacher. For instance, to insert a teacher, you would run:

```
INSERT INTO users (role, enabled, username, salt, name, teacher,
early_learner) VALUES (2, 1, new_username, MD5(RAND()), 'New Username',
NULL, 0);

SELECT max(id) FROM users;
```

You will see some text listing an ID. This is the number to use in the next statement.

```
UPDATE users SET
password=SHA1(CONCAT(salt,'users_password','0GnwDDxlUn2SzfGxdicG'))
WHERE id=<ID from previous statement>
```

The first statement (the INSERT statement) will create a new user. If we analyze the values, we see the following:

- Role = 2 indicates a teacher user. To insert a student, set role = 1. To view all roles, look at the roles table

- Enabled = 1 means that the user can login. Set to 0 to prevent a user from logging in.

- Username is the text the user will use to login to the website

- Salt should be copied exactly as is. It's a random string that helps make the passwords hard to guess.

- Name is the text that will display once the user is logged in

- Teacher is either the ID of the teacher that the user is associated with, or NULL if the user is a teacher. To find the id of the teacher, run

```
SELECT * from users;
```

Find the username/name of the teacher you want, then look at the 'id' column.

- Early_learner indicates whether to show the early learner bio or not. Set to 0 to show the normal version, or 1 to show the early learner bio.

The second statement will set the user's password. In this example, it will be set to 'users_password'. You can pick any text you like. WARNING: be sure to include the WHERE clause. Otherwise, you will reset the password of EVERY user.

Adding Roles

Insert a row into the roles table. For instance, to add a role called 'classroom', use the statement:

```
INSERT INTO roles (role_name) VALUES ('classroom')
```

Adding An Activity

Insert a row into the activities table, using a statement like:

```
INSERT INTO activities (character, name, safe_name, type, pages,
grades, description) VALUES (1, "My New Activity", "new_activity",
"reading", "12-15", "K, 1", "This is the long description that appears
on the teacher page");
```

- The character column should contain the id of the character associated with the activity. See the character table for options.

- The safe_name column should contain a unique string used for referencing the associated file in the /activities/<character>/ directory.

- The type column should be either "reading" or "math"

- The name, pages, grades and description field will be used on the teacher resources page as extra information.

After the row has been inserted, create the /activities/<character>/<safe_name>.haml file associated with the activity for it to be seen in the activity list. Creating /activities/<character>/<safe_name>.{js,css} files will cause them to be automatically included with the activity.

Adding Glossary Words

Insert a row into the glossary table using a statement like:

```
INSERT INTO glossary (entry, definition, character) VALUES ("term",
"this is the definition", 1);
```

- The (entry,character) pair must be unique.

- The character column should be the id of the character associated with the glossary word. See the characters table for options.

Adding A Character

Insert a row into the characters table using a statement like:

```
INSERT INTO characters (name, safe_name) VALUES ('My New Character',
'new_character');
```

- The safe_name value should be a unique, user-friendly, filesystem-safe string used to identify the user both in the filesystem and in the URL.

Create the folders: /activities/<safe_name>/, /audio/<safe_name>/, and /images/<safe_name>/.

Create the Markdown file /bios/<safe_name>.md. Create the sass file /css/<safe_name>.sass.

Add the character's curriculum as /teacher_resources/curricula/<safe_name>.pdf. Create the haml file /teacher_resources/<safe_name>.part.haml.

Setting up a new server

Step 1:
Install a Linux OS. If you have no distribution preference, install Fedora:
http://fedoraproject.org/. Documentation can be found at http://docs.fedoraproject.org/
Step 2:
Install the following required software: Apache HTTP server with headers and libraries, MySQL
server, MySQL client, MySQL headers and libraries, and Ruby. The following command will
install these, assuming the OS is using yum as the package manager (e.g. Red Hat or Fedora).

```
sudo yum install httpd httpd-devel mysql mysql-devel ruby ruby-devel ruby-libs
```

Step 3:
Download and install rubygems from rubyforge.org: http://rubyforge.org/projects/rubygems/.
This should involve extracting the gzipped tar file to a temporary directory and running setup.rb.
This may need to be done as root.
Step 4:
Run the following commands:

```
sudo gem install erubis haml maruku rake
sudo gem install mysql -- --with-mysql-config=$(which mysql_config)
```

Step 5:
Download mod_ruby from modruby.net and extract it to a temporary directory.

```
wget -o - http://modruby.net/archive/mod_ruby-1.3.0.tar.gz > /tmp/mod_ruby.tar.gz
cd /tmp/
tar xvzf mod_ruby.tar.gz
```

Open mod_ruby.h in the root directory of the files that were extracted in your favorite editor.

```
cd mod_ruby-X.X.X
vim mod_ruby.h
```

Change the line reading

```
#define MR_DEFAULT_SAFE_LEVEL 1
```

to read

```
#define MR_DEFAULT_SAFE_LEVEL 0
```

Exit the editor and run the following commands:

```
./configure.rb --with-apr-includes=/usr/include/apr-1
make && sudo make install
```

Step 6:
Copy the files provided at location x to /usr/lib/ruby/1.8/apache/

cp x/* /usr/lib/ruby/1.8/apache/

Copy the httpd.conf provided at location y to /etc/httpd/conf/
cp y/httpd.conf /etc/httpd/conf/

Copy the files provided at location z to /etc/httpd/conf.d/
cp z/* /etc/httpd/conf.d/

Step 7:
If you plan to use the WPI Sourceforge system, follow the steps below.   Otherwise, use your own source control system starting with the provided source code for the website.

Go to https://sourceforge.wpi.edu/sf/sfmain/do/createUser , requesting a WPI Sourceforge user with access to the rmsiqp project. After your request is approved, you'll be able to login to the Sourceforge website and view the project source code and other documents.
Execute the following commands:

```
cd /var/www/html/
rm -rf *
svn co –username <username> --password <password> https://sourceforge.wpi.edu/svn/repos/rmsiqp .
rake
```

Suggestion: If any step is unclear, search Google's specialized Linux engine for it: http://www.google.com/linux. For example:
http://www.google.com/linux?hl=en&q=install+fedora

Keeping Software Updated

After the initial setup of the server, an admin can choose to update the software on the server at any time. In general though, follow the rule that "if it isn't broken, don't fix it". That is, if the server appears to be running well and there are not any issues, software updates are unnecessary.

The steps below will update all of the software used to run the website, including the core server and the various add-ons necessary for Ruby and the database. Some knowledge of Linux is useful for troubleshooting.

Step 1:
Execute the following commands:

```
sudo yum -y update
sudo gem update
```

Step 2:

Download mod_ruby from modruby.net and extract it to a temporary directory.

```
wget -o - http://modruby.net/archive/mod_ruby-1.3.0.tar.gz > /tmp/mod_ruby.tar.gz
cd /tmp/
tar xvzf mod_ruby.tar.gz
```

Open mod_ruby.h in the root directory of the files that were extracted in your favorite editor.

```
cd mod_ruby-X.X.X
vim mod_ruby.h
```

Change the line reading

```
#define MR_DEFAULT_SAFE_LEVEL 1
```

to read

```
#define MR_DEFAULT_SAFE_LEVEL 0
```

Exit the editor and run the following commands:

```
./configure.rb --with-apr-includes=/usr/include/apr-1
make && sudo make install
```