A Web-Based Content Management System
for

Melanie Tarr
CS470 Spring 2007

Table of Contents

A Web-Based Content Management System for Carol's Musik Garten Piano School
By Melanie Tarr

Abstract

This document provides an overview of the Web-based content management system designed to be an informative and instructional tool for prospective and current students, while satisfying the administrative needs of the teacher/owner. This document will describe the structures and methods that will be used during the construction of this content management system. Because this system is still evolving, as I continue to propose new ideas for faster, more usable implementation, this document may be altered accordingly in the future. This document will also serve as a user manual.

1. Introduction

This project was developed for a local piano school, Carol's Musik Garten. This piano school is composed of my client Carol Tisch and her students, who range from 5-years-old to adult. The philosophy of the Musik Garten Piano School is to make piano education available to all ages, helping students channel their energy and embrace the gift of music. Carol is both the teacher and administrator for the piano school. It is her job to keep track of her students' personal information (where they live, their phone numbers, etc.), as well as monitoring their progress in their piano studies (how many music theory quizzes they have taken, what level they are currently at, etc.).

2. Project Overview

The goal of this project is to provide a central hub for both my client and her students that supports the following features: a personal messaging system for teacher-student and student-student communication, music theory quizzes that may be taken, recorded and sent to the teacher, and a simple, updatable personal profile of every student.

3. Project Requirements

The requirements that my client entreated me with were very specific. After years of teaching and manually keeping track of her students, she knew exactly what she wanted. Because of this I was able to implement all of the requirements, using the prototype method of development with no feature creep or indecisive issues.

3.1 Functional Specifications

1. The system must require a valid username and password to access the database.

2. The system must allow a personal profile for each student that includes name, directions to their house, phone number, and current level of piano

education. This profile must be viewable and updatable only by the teacher only.

3. A personal messaging system that will allow students to communicate with the teacher as well as other students.

4. Access to music theory quizzes to be taken by the student, automatically graded then sent to the teacher.

5. The system must allow the teacher to post announcements, add and modify quizzes and student information accordingly.

3.2 System Specifications

1. The Web site will be tested to be compliant with both Mac and Windows Systems running Safari, Firefox.

4. System Design

This system is designed using the full-stack Web development framework, Ruby on Rails. This framework implements the model-view-controller design and employs a "convention over configuration" approach. This is beneficial to the business world because it allows new developers to quickly understand the code base.

4.1 User Interface Design

The user interface was stylized using CSS and html. My goals for the user interface were to follow standard Web guidelines of good usability and consistency, while also developing a colorful, fun site that the younger demographic (the majority of her students) will want to visit. The site must also possess a professional look and feel, as many potential students and her older client base will also be viewing the site. Below is a screen shot of the Web site as it appears online:

4.2 Data Structures

The database used in this system was created locally with SQLite, due to its powerful, lightweight nature. Once deployed on the Web, the database was moved to MySQL, which is what is running on the server.

5. Software Development Process

This system will be designed in stages. The system will be developed using a stable/beta versioning system. As development waypoints were reached they were tested and migrated into the stable version for use while I continued to develop new features in the beta version.

5.1 Products Used

The system was developed using XCode and the Unix development base afforded by Apple's Mac OS X. The system was prototyped using SQLite as a backend but was be deployed using MySQL on a Mac server. Dynamic code creation was accomplished through development using Ruby on Rails and stylized through CSS.

5.2 Coding Guidelines and Conventions

All coding was programmed using a primitive development environment rather than a WYSIWYG. This required more time and organization, but precluded any automatically generated superfluous code. Search engine optimization and other enhancements will be added as the opportunity arises in the future.

5.3 The Protocol of One or More Subsystems, Modules, or Subroutines.

All code was programmed to conform to most operating systems, allowing the users to access all features of the system regardless of hardware or software.

5.4 Testing and Debugging

Testing and debugging took place throughout the course of development. As each feature was completed and implemented, a team of individuals, as well as the teacher, carefully inspected it for usability and efficiency. Keeping an open and frequent line communication with my client precluded any misunderstandings or surprises, which made the development process relatively quick and smooth.

5.5 Work Breakdown

Task	Estimate/Actual	Task	Estimate/Actual
Initial Planning		Show Prototype	
Initial Requirements		Revised Requirements/Design	
Initial Design		Testing/Debugging	
Write Proposal		Code Review	
Proposal Presentation		Final Revisions	
Learning Ruby/ Tutorials		Final Write-up	
Main Web site		Final Presentation	

Estimate
Actual

6. Description and Implementation

6.1 Login

Each student will be issued a username and password, but only the teacher will have administrative rights to the system. Passwords are stored on the server in a hashed form for security. Below is a screen shot of the administrative options after logging in with a valid username and password.

NOTE: The above image is a composition of two screen shots so design may appear slightly skewed.

6.2 Theory Quizzes

Selecting the "Theory Quizzes" option the user (both administrative and student) will be redirected to a list of available quizzes to select.

Quizes:

Name	Level
level 1 quiz	1
Music Theory Quiz	1
Some Level2 Quiz	2

Current Students

Admin Section
User Management

New Announcement

Quiz Management

Messages (0)
New Message

Log out

Copyright © 2007 Musik Garten

The administrator can then view information about the quiz, including all of the multiple choice quiz questions, possible answers, and correct answer for the quiz selected. She can delete questions or create new questions here for this particular quiz.

View Quiz:

Name: Music Theory Quiz
Level: 1
Questions: 9

Questions:

Question	Answer 1	Answer 2	Answer 3	Answer 4	Correct Answer	
In a piece in the key of C Major, you encounter a chord spelled (from the bass up) G-C-E. What chord would you expect to follow?	D-F-A	F-A-C	G-B-D or G-B-D-F	C-E-G	3	x
You are writing a Bach style chorale in the key of F# major and want to include the following chord: B-D-G. Which of these three notes would you double (to accommodate the four-voice style)?	D	Any of the three may be doubled.	G	B	4	x
In the early 17th and 18th centuries, chords were abundant. This is mainly because chord inversion had not really been conceived. Which of these Baroque Composers/Theorists first conceived of chord inversion (and in the process saved freshman music theory students a lot of work)?	J.S. Bach	A. Scarlatti	G.F. Handel	J.P. Rameau	4	x

Admin Section
User Management

New Announcement

screen shot continued on next page…

The chord spelled (again from the bass up) Bb-D-E#-G# would most likely be found in which of the following keys?	Neither	D Minor	D Major	Both	3	x
The Phrygian cadence is a device employed in many baroque compositions. Which of the following progressions would result in a Phrygian cadence?	IV6 to V in Major	VI to V in Minor	vi to V in Major	iv6 to V in minor	4	x
Which of the following types of non-chord tones would be considered an unprepared disonance?	Appoggiatura	Escape Tone	Passing Tone	Suspension	1	x
In a Classical solo concerto, what is the chord that would most likely be played by the orchestra immediately before the soloist's cadenza?	Root position Dominant 7th chord	Second inversion Tonic triad	Root position Subdominant triad	1st Inversion Dominant triad	2	x
Consider the following progression: I - VI - IV - V7/V - V. What type of cadence ends this progression?	Half	Authentic	Deceptive	Plagal	1	x
We'll end with an easy one. According to rules of partwriting and resolution associated with western music, when a dominant 7th chord resolves to tonic, the 7th of the dominant 7th chord must ALWAYS resolve to the third of the tonic chord regardless of voice.	True	False			1	x

create new question...

At the bottom of the page, the scores are listed for each student who has taken the quiz. To delete these students and their scores, the administrator can select the "x" on the right-hand side of the table.

Scores:

Student Name	Student Score	
Melanie Tarr	4	x
CS470 Student	0	x
New Student	4	x

The administrator can also view this page by selecting the "Quiz Management" option in the right-hand side column.

The list of quizzes that will be shown to the student are only those quizzes that are the student's level or lower. When a student selects a quiz from the list, he will be redirected to that specific quiz. Upon completion of the quiz, the score is automatically generated and sent to the teacher. The questions answered correctly will appear in solid green, the questions answered incorrectly will appear as solid red with a green box outlining the correct answer.

Music Theory Quiz

Question 1

In a piece in the key of C Major, you encounter a chord spelled (from the bass up) G-C-E. What chord would you expect to follow?

D-F-A	F-A-C
G-B-D or G-B-D-F	C-E-G

Question 2

You are writing a Bach style chorale in the key of F# major and want to include the following chord: B-D-G. Which of these three notes would you double (to accommodate the four-voice style)?

D	Any of the three may be doubled.
G	B

Question 3

In the early 17th and 18th centuries, chords were abundant. This is mainly because chord inversion had not really been conceived. Which of these Baroque Composers/Theorists first conceived of chord inversion (and in the process saved freshman music theory students a lot of work)?

J.S. Bach	A. Scarlatti
G.F. Handel	J.P. Rameau

Question 4

The chord spelled (again from the bass up) Bb-D-E#-G# would most likely be found in which of the following keys?

Neither	D Minor
D Major	Both

Question 5

The Phrygian cadence is a device employed in many baroque compositions. Which of the following progressions would result in a Phrygian cadence?

Member Section
Messages (0)
New Message

Log out

11

IV6 to V in Major	VI to V in Minor
vi to V in Major	iv6 to V in minor

Question 6

Which of the following types of non-chord tones would be considered an unprepared disonance?

Appoggiatura	Escape Tone
Passing Tone	Suspension

Question 7

In a Classical solo concerto, what is the chord that would most likely be played by the orchestra immediately before the soloist's cadenza?

Root position Dominant 7th chord	Second inversion Tonic triad
Root position Subdominant triad	1st Inversion Dominant triad

Question 8

Consider the following progression: I - VI - IV - V7/V - V. What type of cadence ends this progression?

Half	Authentic
Deceptive	Plagal

Question 9

We'll end with an easy one. According to rules of partwriting and resolution associated with western music, when a dominant 7th chord resolves to tonic, the 7th of the dominant 7th chord must ALWAYS resolve to the third of the tonic chord regardless of voice.

True	False

Score: 4 / 9

The student can only take each quiz once unless the administrator is notified beforehand. This deters students from taking one quiz numerous times to obtain the correct answers, then re-taking the quiz to get a better score.

12

6.3 Personal Messaging System

These features are the same for both the administrator and the student. From the main page (after logging in) the user can either select the respective icons or the options in the right-hand side column. The number of new messages will appear in this column in red once the user logs in.

While viewing their messages, the students or administrator can either reply or delete the message. Sending a message is very straight-forward. The user selects the pen icon or the "New Message" in the right-hand side column, writes, then sends the message.

From: CS470 Student
Subject: Message!
Body: This is a new message.
Reply... Delete...

Admin Section
User Management

New Announcement

Quiz Management

Messages (0)
New Message

6.4 Announcements

Announcements will appear under "Current Students" in the right-hand column on every page of the Web site prior to logging in. Students do not have to be logged in to view the announcements. To view all announcements posed, both recent and former, students can select the "history" option.

Only the administrator may post announcements. To do this she must logged in with her secure username and password, then select "New Announcement" from the right-hand side column.

The start date will default today's date but may be changed to reflect when the announcement will actually appear on the Web site. The end date is when that particular announcement will expire and no longer be visible.

6.5 User Management

The administrator can access a list of users or create a new user (either administrator or student), modify existing student information or delete a user by selecting the "User Management" option from the right-hand column.

Current Students

Admin Section
User Management

New Announcement

Quiz Management

Messages (0)
New Message

Log out

User Listing:
id name
1 Melanie Tarr   delete edit
2 CS470 Student delete edit
3 New Student   delete edit
5 student   delete edit
create new user…

When creating a new user many fields appear, however, the only required fields are name, password and level. Level refers to where the student is at in his piano studies. The levels are created and monitored by the teacher. To grant admin rights to a user, the administrator simply adds a "-" in front of the level number (e.x. Level -1).

At any time the administrator may edit user information by selecting the "edit" that appears next to the users' name.

7. Results

7.1 Final Program Analysis

This system was successfully implemented on time and without errors. It provided a way for my client to focus her time and effort doing what she loves: teaching piano. This system also maximized her ability to challenge her students, using this as a tool for theory improvement. The students are now able to get more out of their piano studies, as they are now held accountable for their theory knowledge and have a quick way to contact their teacher with any questions. This Web-based content management system has successfully helped organize, educate and facilitate in the advancement of piano studies and, hopefully, the love of music.

7.2 Future Steps

In the future I have plans to include games for current students with a valid username and password. These interactive games will be programmed in Flash and will be available in numerous levels. This will improve the student's knowledge of theory while giving them a fun, learning atmosphere.

For the quizzes, I plan to implement a system that randomly generates a new quiz for each level when the student logs on to take a quiz. The main purpose of this feature is to deter cheating. The quiz will pull from a pool of test questions entered by the teacher.

A discussion board for current students will also be beneficial to both the students as well as the teacher. This would provide a support group for the students who are nervous about an upcoming recital or adjudication and want advice from a fellow student who has been there. This also gives the teacher valuable insight into what her students are feeling, thinking, etc.

8. Conclusion

This system was both challenging and fun to develop. As a newcomer to Ruby on Rails I had to learn the language and all the elements that came with this framework for the first time ever. Because it is so new I wasn't able to find information quickly. I did, however, learn my way around this new and exciting approach to Web development. The close relationship I have with my client made communication easy. Because she knew exactly what she wanted I had no problems employing the prototype method.

9. References

[1]   http://www.webstyleguide.com/index.html?/contents.html
[2]   http://www.math.uaa.alaska.edu/~afkjm/cs470/handouts/propdesign.pdf
[3]   http://api.rubyonrails.com/
[4]   http://demo.script.aculo.ua/ajax/autocompleter_customized
[5]   http://wiki.rubyonrails.org/rails