System Design Document

Course Evaluation System

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Client: Dr. Harlan Onsrud

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Course Evaluation System

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1 Introduction

Team EVAL is creating a system to more efficiently create and distribute post-semester teaching evaluations. The system will be built to interface with LimeSurvey, a popular open-source survey application.

1.1 Purpose of This Document

This system design document gives an overview of the structure and planned implementation of our course evaluation system. The first section describes the system architecture, how the components function, and how the components relate to each other. The second section covers the design of the data, detailing the database schema and the properties of the files that are used by the system. The document's third section has a table that lists the components that fulfill each functional requirement.

This document is intended for the development team, the product client, Dr. Harlan Onsrud, and potential users of the system. Team EVAL needs this document to ensure that the product works as intended. Dr. Onsrud needs it to know that the program that he desires will be fully realized. The document also helps the software's users in that they can learn more about the functions and architecture of the evaluation system.

1.2 References

Craig, J., Elliott, S., Judkins, R., & Small, S. 29 October 2018. System Requirements Specification.

Craig, J., Elliott, S., Judkins, R., & Small, S. 30 November 2018. User Interface Design Document.

Fowler, M. (2004). UML Distilled: A Brief Guide to the Standard Object Modeling Language. Boston: Addison-Wesley.

Using OAuth 2.0 to Access Google APIs — Google Identity Platform — Google Developers. Google, Google, 12 Nov. 2018, developers.google.com/identity/protocols/OAuth2.

Onsrud, H. "Example Question Selection Form." See Appendix D.

2 System Architecture

2.1 Architectural Design

Figure 1 is a high-level abstraction of the proposed system architecture. With this figure, we aim to communicate what components are in the system and the API allowing the components to communicate.

Figure 1: Component diagram of the system (left); sequence diagram of Google OAuth 2.0 (right)

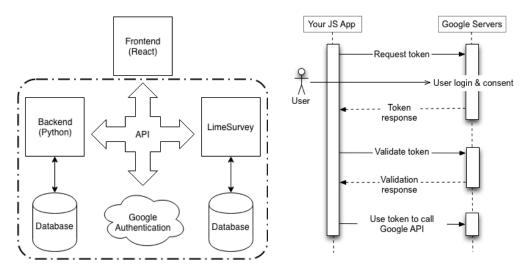


Figure 2 is a technology architecture diagram that shows the languages and frameworks that the team will use to make the system.

Javascript
W/ React
HTML & CSS

Python
W/ Flask

Apache, PHP,
& MySQL
(Back-End DB)

Apache, PHP,
& MySQL
(LimeSurvey)

Figure 2: Technology diagram of the system

LimeSurvey (version 3.15.3+181108) is running on an Apache web server that uses PHP version 5.6. This survey software maintains a database running on MySQL 5.5.61. The team will use Amazon Web Services to host the evaluation system on the Web at <u>teachingevaluations.org</u>, providing a scalable solution to fluctuating demand and peak use after the semester.

The system consists of three major components, which communicate via an API. The front end, which handles the user interface, and displays the visuals and data sent from the API. It will be written in JavaScript using the React framework, along with HTML and CSS. The back end communicates with the databases, which are hosted by the same database management system. It will be written in Python, and its endpoints will use the Flask library. The database stores survey templates and responses using MySQL.

A single API will connect the front end to the back end and the back end to LimeSurvey and our database. A REST interface connects the front end to the back end using endpoints. Separate functions will utilize the LimeSurvey API so that the back end can access the LimeSurvey database. LimeSurvey is outside the scope of the project and our system will not alter LimeSurvey in any way. A user will have no contact with LimeSurvey and will only communicate with the front end.

Google OAuth 2.0 will be used to authenticate users with their Google accounts. Each student at the University of Maine is issued a Google Apps account e-mail which can be used to log in to the teaching evaluation system. As shown in the right side of Figure 1, the application will request a token from Google. The application will then store this token in a cookie. When a page is refreshed, the token is validated on Google's servers. Google OAuth 2.0 can also provide information such as the user's name and e-mail.

2.2 Decomposition Description

Figure 3 abstracts the major functions that are expected to be in the system. This sequence diagram, shown on the next page, illustrates a typical session and is meant to communicate a more detailed view of the components and their relationships. The "Database" refers to the database that we will be implementing to store survey templates and responses.

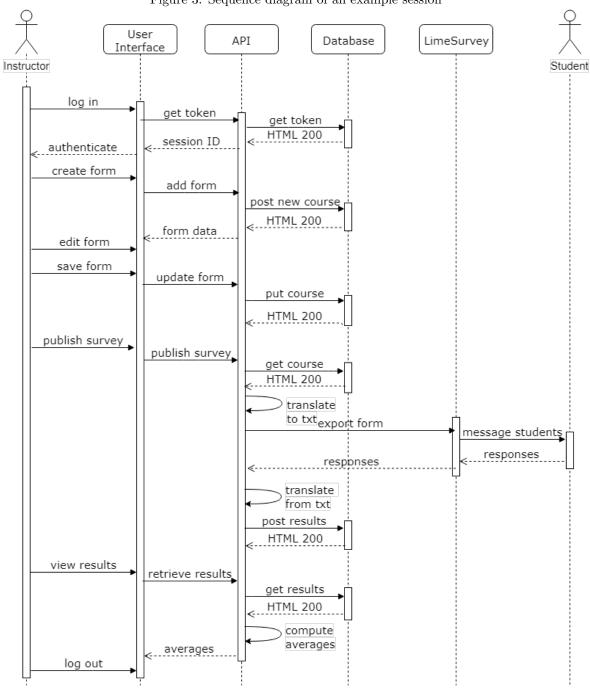


Figure 3: Sequence diagram of an example session

To begin using the course evaluation system, the instructor must first log in with a username and password ("log in"). The API retrieves the user's token from the database to confirm that the password is correct ("get token", "authenticate"). Next, the instructor creates an evaluation form to send to students ("create form"). The API adds an empty course to the database ("add form", "post new course"). The instructor then edits the survey with the appropriate info and saves the form ("edit form", "save form"). Upon saving, the API updates the database with the entered information ("update form", "put course").

With an evaluation form completed, the instructor can then publish it online ("publish survey"). The API retrieves the course information from the database to translate the survey form into a tab-separated .txt file ("get course", "translate to txt"). It then sends the .txt file to LimeSurvey and tells the survey software to message the students through e-mail ("export form", "message students"). The API retrieves the students' responses, translates them from another tab-separated .txt file, and stores them into the database ("translate from txt", "post results"). Finally, the instructor can view the survey results, with the help of the API getting the results from the database and finding their averages ("retrieve results", "get results", "compute averages").

2.2.1 Endpoint Descriptions

The following table briefly describes the API's endpoints, which query data from the back-end database:

Type	Name	Description
GET	/login	retrieves a token for a certain authentication key
POST	/create_user	adds a user to the database
GET	/courses	retrieves a list of all courses
GET	/course	retrieves the info for a given course
PUT	/course	updates the info for a given course
DELETE	/course	removes a given course
POST	/new_course	creates a new course
GET	/results	retrieves a list of survey results for a given course
POST	/results	updates a list of survey results for a given course

Table 1: API endpoint descriptions

3 Persistent Data Design

3.1 Database Descriptions

Our database will include tables that store information about courses, survey questions, and survey responses. A diagram of the database schema is shown in figure 4 on the next page:

survev ID URL e-mail int ID int address survey_ID int Composite primary key: survey_ID, tag_ID survey to tag Composite primary key: survey ID, question ID tag_ID int PK FK survey to question survey_ID question_ID int instructor ID int PK name varchar(50) question tag ID PK ID int PK helpText response mandatory bit ID int PK type group type text varchar(150) text varchar(150) int uestion_ID

Figure 4: Schema diagram of the back-end database

The database contains six object tables and two relationship tables. The **Survey** table contains survey IDs, the surveys' URLs (generated by LimeSurvey) and associated instructor IDs. The e-mail addresses to send the surveys to are stored in the **E-mail** table. The **Instructor** table contains the names of the instructors along with authentication tokens generated by Google OAuth. The **Tag** table contains additional information (e.g. course names) about the surveys. These tags are used to categorize and search surveys. The **Question** table contains all questions to be entered into the surveys, along with help text and the type of question. The **Response** table includes students' responses to certain questions. The relationship tables, **Survey-to-Question** and **Survey-to-Tag**, link the surveys to their appropriate questions and tags.

3.2 File Descriptions

The system requires several pieces of data, including database files, front-end markup, and LimeSurvey files, to run as intended. A file structure diagram is shown in figure 5 on the next page:

Figure 5: Diagram of the files used by the system File System Back-End Front-End Back-End Front-End Tab-Separated HTML and CSS Implementation Implementation txt Files Mark-Up Files py Files js Files Back-End Database Files

The back-end database has a file to keep track of all course information, survey forms, and survey responses that users have input. The schema in the previous section shows the fields and types in that file. To reduce the risk of a breach, any survey results in the database get removed by the system 60 days after viewed by the instructor.

The front end will be implemented in JavaScript, so our file structure will include .js files that operate the front end. There are also mark-up files, which specify the look and feel of the front end. The back-end will be implemented in Python and our file structure will include .py files that operate the back end. The JavaScript and Python files are static and permanent, and thus do not require maintenance.

Lastly, the system briefly stores LimeSurvey files in the form of tab-separated text documents. They either contain survey form data or student responses. The form data files are deleted immediately after they are sent to LimeSurvey, and the response data files are deleted immediately after they are stored in the database.

4 Requirements Matrix

The following table lists the functions in our system, as shown in the sequence diagram, that meet each functional requirement given in the system requirements specification:

Use Case Number	Use Case Name	System Component(s)		
1	Log on	log in, get token		
2	Create survey	create form, add form, post new course		
3	Edit survey	edit form, save form, update form, put		
		course		
4	Publish survey	publish survey, get course, translate to		
		txt, export form, message students		
5	View survey results	view results, retrieve results, get re		
		sults, compute averages		

Table 2: Requirements matrix

A Agreement Between Customer and Contractor

This page shows that all members of Team EVAL and the client, Harlan Onsrud, have agreed on all the information in the system design document. By signing this document, Team EVAL and Dr. Onsrud agree on the system's architecture, components, relations between the components, database schema, required files, and file descriptions.

The team will follow a process in the case that the design document is changed after we sign it. First, the team writes a rough draft of the changes to be made to the document. Second, all team members and Harlan Onsrud will sign the document agreeing to the changes. Finally, the changes are made to the final copy of the document.

Name	Signature	Date
Jovon Craig		
Sam Elliott		
Robert Judkins		
Stanley Small		
Harlan Onsrud		
Customer Comments:		

B Team Review Sign-off

This page shows that all members of Team EVAL have reviewed the system design document and agreed on its content. By signing this document, the team members agree on that all information about the system's architecture and design are accurate. There is nothing in the document that is a source of contention.

Name	Signature	Date
Jovon Craig		
Comments:		
Sam Elliott		
Comments:		
Robert Judkins		
Comments:		
Stanley Small		
Comments:		

C Document Contributions

Stanley Small included a template of the appendices and he wrote a draft of the title page, architectural design section, and database description. He also added the component diagram along with the Google OAuth sequence diagram, and helped with the database schema. Stan contributed approximately 30 percent of the document.

Jovon Craig wrote the purpose of the document, references, decomposition description, file descriptions, and requirements matrix. He made revisions to the title page, architectural design section, and database description. He also added the sequence diagram and file diagram, revised the technology diagram, and made a draft of the database schema. Jovon contributed about 40 percent of the document.

Sam Elliott created the technology diagram rough draft, and made revisions to the sequence diagram and the file diagram and added many of them to the document. He revised the architecture design section and the file descriptions section, as well as general changes based on feedback from the SRS and Dr. Onsrud. He was the main point of contact with Dr. Onsrud for reviewing the document and organizing meetings. Sam contributed about 20 percent of the document.

Robert Judkins converted the document to LaTeX and helped with front-end design. Robert contributed about 10 percent of the document.

D Example Question Selection Form

APPENDIX A

SELECTION OF QUESTIONS AND CONTENT FOR INCLUSION ON A WEB-BASED STUDENT EVALUATION OF TEACHING FORM

INSTRUCTOR OR ACADEMIC UNIT SELECTION OF QUESTIONS FOR USE IN A WEB-BASED FORM:

If you want information on this form auto-filled from a previous submission that you may then edit, please SELECT (Note to Team: SELECT leads to a pulldown menu that includes all previous submission forms. When selected, all information would be copied from a previous form to the current form below except as noted.)

Course Designator (e.g. MUS)	
Course Number (e.g. 200)	
Course Section (e.g. 001)	
Course Title (e.g. Ballroom Dance)	
Is this a graduate course?	YesNo (bull's eye choices)
Semester and Calendar Year (e.g. Fall 2019)	(don't auto populate)_
Name of Faculty Unit (e.g. School of Music)	
Name of College (e.g. Liberal Arts)	
Name of University (e.g. Univ of Maine)	
Last Name of Instructor (e.g. Smith)	by last name) (need later in reporting to alphabetiz
First Name of Instructor (e.g. Elizabeth)	
Instructor Email	
Instructor Phone	
Full Name of Course Evaluation Administrator	
Email of Course Evaluation Administrator	
Beginning Date of Assessments	_(use calendar pulldown)_(don't auto populate)_
Time of Day for Any and All Mailings	_(use time select)(don't auto populate)_
Closing Date	_(use calendar pulldown)_(don't auto populate)_

NOTE TO CAPSTONE TEAM:

Variable names from some of the entries above include: {COURSEDESIGNATOR}, {COURSENUMBER} {COURSETITLE}, {ADMINNAME}, {ADMINEMAIL}, {BEGINNINGDATE}, {CLOSINGDATE}, {TIME} Some other variable names likely to be used coming from the student roll upload include: {FIRSTNAME}, {LASTNAME}, {EMAIL}

UNIVERSITY OF MAINE STUDENT EVALUATION OF TEACHING

Questions	1-5 Rating Scale	Include question? (If yes, indicate with)	Make response mandatory? (If yes, indicate with)
THE INSTRUCTOR		with)	with)
How prepared was the instructor for class?	often unprepared; well prepared		
How clearly were the objectives of the course presented?	unclear; very clear		
How enthusiastic was the instructor about the subject?	very little; very much		
How clearly did the instructor present concepts, principles and theories?	unclear; very clear		
How much were you encouraged to think for yourselves?	very little; very much		
How concerned was the instructor for the quality of	unconcerned; very		
student learning?	concerned		
Did the instructor show respect for the questions and opinions of the students?	rarely; always		
Did the instructor ensure an environment of respect for all groups of people in the classroom?	rarely; always		
Did the instructor inspire confidence in his/her knowledge?	very little; very much		
Overall, how would you rate the instructor?	poor; excellent		
Please list further questions to be added regarding the instructor, if any, indicating a 1-5 rating scale (i.e. 5 is best)			
(a)			
(b) Online creator should be able to add up to 15 questions			
THE COURSE			
Were class meetings profitable and worth attending?	rarely; always		
What is you overall rating of the primary readings?	poor; excellent		
How much did this course challenge you intellectually?	very little; very much		
How much did you learn from this course?	very little; very much		
What is your overall rating of this course?	poor; excellent		
Please list further questions to be added regarding the			
course, if any, indicating a 1-5 rating scale (i.e. 5 is best)			
(a)			
(b) Online creator should be able to add up to 15 questions			
STUDENT WORK ASSESSMENT			
Did the instructor let you know what was expected on the	unclear; very clear		
assessments (exams, assignments, projects, papers, etc.)?			
Did the assessments reflect the important aspects of the	rarely; always		
course?	0.1		
How fair were the grading procedures?	unfair; completely		
Overall, how would you rate the assessment process	poor; excellent		
(exams, assignments, projects, papers, etc.)?			
Please list further questions to be added regarding the			
assessment, if any, indicating a 1-5 rating scale (i.e. 5 is			
best)			
(a) (b) Online arcetor should be able to add up to 15 questions.			
(b) Online creator should be able to add up to 15 questions			

The following laboratory questions were copied from a previous University of Maine approved longer bubble form.

Questions	1-5 Rating Scale	Include question? (If yes, indicate with)	Make response mandatory? (If yes, indicate with)
THE LABORATORY EXPERIENCE			
Did this course have one or more regularly scheduled laboratory sessions? (If the student answer is yes, the following questions appear)			
How much did the laboratory experience contribute to your learning in this course?	very little, very much		
Overall, how would you rate the laboratory experience?	poor; excellent		
What was done particularly well in the laboratory experience?			
How could the laboratory experience be improved?			
Please list further lab questions to be added, if any, and a rating scale			
(a)			
(b) Online creator should be able to add up to 15 questions			

The following **teaching assistant questions** were copied from a previously used UMaine longer bubble form.

Questions	1-5 Rating Scale	Include question? (If yes, indicate with)	Make response mandatory? (If yes, indicate with)
THE TEACHING ASSISTANT		Í	·
Was there a teaching assistant supporting this course? (If			
answer is yes, the following questions appear)			
If there was more than one teaching assistant for the			
course, please name the TA you are evaluating. (open			
ended response)			
How much did the teaching assistant contribute to your learning in this course?	very little, very much		
How concerned was the teaching assistant for the quality	unconcerned; very		
of student learning?	concerned		
Did the teaching assistant show respect for the questions and opinions of students?	rarely; always		
Did the teaching assistant inspire confidence in his/her	very little; very much		
knowledge?	1 2 1 1		
Would you want to have this teaching assistant in the	definitely not,		
future in another course?	definitely yes		
Would you recommend this teaching assistant to assist in	definitely not,		
this course in the future?	definitely yes		
Overall, how would you rate the teaching assistant?	poor; excellent		
Name something the teaching assistant did particularly			
well.			
Name something the teaching assistant could do better in			
the future.			
Please list further TA questions to be added, if any			
(a)			
(b) Online creator should be able to add up to 15 questions			

Questions	1-5 Rating Scale	Include	Make response
Questions	1-3 Rating Scale	question? (If yes, indicate	mandatory? (If yes, indicate
ONLINE COMPONENT ACCECCMENT		with)	with)
ONLINE COMPONENT ASSESSMENT			
Did you take this course as a distance learning student? (If			
answer is yes, the following questions appear)			
Please indicate the primary online modality used with the			
course. [only one selection allowed]			
<radio> Sessions were primarily synchronous in that I</radio>			
was typically required or highly encouraged to interact live online with the instructor and other			
students in most or all sessions.			
students in most of all sessions. students in most of all sessions. sessions. <a hre<="" td=""><td></td><td></td><td></td>			
I primarily viewed recorded video lectures or class			
sessions on my own schedule and had only one or			
fewer opportunities per week to interact live			
online with the instructor or other students.			
<a href="mailto: <a a="" href="mailto:state <a href=" mailto:state<=""> and a state and a state and a state is a state of state and a state of state of state and a state of state			
synchronous and asynchronous interactions.			

Which statement best characterizes your belief about the	
grade you expect to receive in this course? [only one	
selection allowed]	
<radio> I worked MUCH LESS for my grade in this</radio>	
online class than I probably would have had to in	
the traditional format.	
<radio> I worked A LITTLE LESS for my grade in</radio>	
this online class than I probably would have had to	
in the traditional format.	
<radio> I worked ABOUT THE SAME for my grade</radio>	
in this online class than I probably would have had	
to in the traditional format.	
<radio> I worked A LITTLE HARDER for my grade in</radio>	
this online class than I probably would have had to	
in the traditional format.	
<radio> I worked MUCH HARDER for my grade in</radio>	
this online class than I probably would have had to	
in the traditional format.	
Please identify an e-learning aspect of the course that you	
found particularly valuable or beneficial	
Please identify an e-learning aspect of the course that	
could be improved.	
Please list further questions to be added, if any	
(a)	
(b) Online creator should be able to add up to 15 questions	

The following open-ended questions were copied from the current University of Maine bubble form.

Questions	1-5 Rating Scale	Include question? (If yes, indicate with √)	Make response mandatory? (If yes, indicate with √)
OPEN ENDED QUESTIONS			
Please identify the aspects of this course that were of most			
value to you.			
Please mention at least one additional topic or component			
that you would like to see included in this course.			
Please make any additional comments that you desire to			
make about the course instructor, materials or pedagogy.			
Please list further open-ended questions to be added, if any			
(a)			
(b) Online creator should be able to add up to 15 questions			

Additional Option for Mandatory Questions

For questions in the tables above that you have designated as mandatory, should the last response option for possible selection on all of these questions be "decline to respond? (If "yes", an option 6 will be added) Yes ___ No__

CLASS ROLL

Please insert in the field below the first name, last name and email of each student in the class. The information for each student should appear in a separate row and be separated by commas. (e.g. Mary, Smith, marysmith@qmail.com) You may cut and paste into the window at your option.

<window for entry – do not autopopulate in future subsequent uses of the form>

Alternatively, upload a cvs file with the content in the first row of the file being firstname, lastname, email. UPLOAD

EMAILS TO BE SENT TO STUDENTS Initial Email invitation to Participate

Although we recommend that you do not change the following email text, you may edit the *Invitation to Participate* as appropriate for your purposes if needed. Do NOT change any item listed as a {VARIABLE} because this will cause an error in your submission that you will be forced to correct prior to successful submission. This email will be sent to each student on the begin date at the time you specified above.

< window for text – Team, Please insert from below the suggested text for DEFAULT INITIAL INVITATION TO STUDENTS>

Do you want one or more reminder emails sent to students who have yet to respond after a few days? Yes __ No __ (If the answer is yes, the following statements and questions appear)

Reminder Emails

You may send up to three reminder emails to those students who have yet to complete the teaching evaluation. The text for all reminder emails will be identical.

Although we recommend that you do not change the following email text, you may edit the *Reminder Emails* to students as appropriate for your purposes if needed. Do NOT change any item listed as a {VARIABLE} because this will cause an error in your submission that you will be forced to correct prior to successful submission.

<window for text – Team, Please insert from below the suggested text for DEFAULT REMINDER TO STUDENTS>

Reminder emails are sent spaced three days apart until the closing date is reached unless you specify a longer interval.

Please send reminder emails at intervals of <insert number of 3 or above> days.

Only a maximum of three reminders will be sent regardless of the spacing. Reminder mailings are sent at the same time of day as the initial invitation mailing.

Confirmation Message

Although we recommend that you do not change the following email text, you may edit the *Confirmation Message* reminder to students as appropriate for your purposes if needed. Do NOT change any item listed as a {VARIABLE} because this will cause an error in your submission that you will be forced to correct prior to successful submission.

<window for text - Team, Please insert from below the suggested text for DEFAULT CONFIRMATION>

Please double check all information provided above. Once you click SUBMIT you may not make further changes unless you receive an error notification. You will receive a summary of the student responses by email at the time and date you designated for the teaching evaluation process to end.

IMPORTANT: You have NOT successfully completed your assessment submission until you press the SUBMIT button below AND you are taken to a web page that states your submission has been successful. If you are returned to an earlier portion of this form, complete all information items now highlighted in red and then click SUBMIT again.

SUBMIT

Subject: Invitation to Complete Evaluation for {COURSEDESIGNATOR} {COURSENUMBER} {COURSETITLE}

Dear {FIRSTNAME},

Please complete the teaching and course evaluation for {COURSEDESIGNATOR} {COURSENUMBER} {COURSETITLE}.

This student evaluation of teaching is completely anonymous unless you purposefully identify yourself in response to one of the questions. The software system will send you automatic reminders every few days until you complete the evaluation.

To respond, simply click the link at the end of this message.

++++++++++++++++

DEFAULT REMINDER TO STUDENTS FOR EDITING BY THE INSTRUCTOR/ADMINISTRATOR USER – TO BE SENT AT REGULAR INTERVAL UNTIL STUDENT RESPONDS, MAXIMUM OF THREE IS REACHED, OR CLOSING DATE IS REACHED

++++++++++++++++

Subject: Reminder to Complete Evaluation for {COURSEDESIGNATOR} {COURSENUMBER} {COURSETITLE}

Dear {FIRSTNAME},

Recently we invited you to complete a teaching evaluation for "{COURSEDESIGNATOR} {COURSENUMBER} {COURSETITLE}". We note that you have not yet completed the evaluation, and wish to remind you that it is still available should you wish to take part.

To participate, please click on the link below.

The deadline for completing the evaluation is {CLOSINGDATE} at {TIME}.

Your participation is extremely important to the improvement of teaching and courses at the {UNIVERSITYNAME}

Sincerely, {ADMINNAME}

Click here to complete the teaching and course evaluation: {SURVEYURL}

NOTE TO TEAM: SHOULD THE FOLLOWING GREEN OPTION BE INCLUDED AND IMPLEMENTED? If you do not want to participate in the student evaluation process and don't want to receive any more email reminders, please click the following link: {OPTOUTURL}

Note: Such an option is required in many instances by "Do Not Spam" federal legislation but would not be required typically in a university mailing to your own students. Implement as good practice regardless?

{ADMINNAME} ({ADMINEMAIL})

DEFAULT CONFIRMATION

Subject: Completion of Course Evaluation for {COURSENUMBER} {COURSETITLE}

Dear {FIRSTNAME},

This email is to confirm that you have completed a student evaluation of {COURSEDESIGNATOR} {COURSENUMBER} {COURSETITLE} at the {UNIVERSITYNAME}. Your response has been saved. Thank you for participating.

If you have any further questions about this email, please contact {ADMINNAME} at {ADMINEMAIL}.

Sincerely,

{ADMINNAME}