Submit- Homework Submission Platform

[Design, Development and Evaluation of the features]

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ABSTRACT

Academic technologies, especially online or web-enhanced courses play a significant role in the creation of high quality learning environment. Apart from managing the courses, the courseware should provide ease of usability. In this paper, we evaluate usability drawbacks associated with the WolfWare and Moodle system being used at NC State University from perspectives of both students and teaching staff. We specifically identify the problems associated with homework submission and grading portal of Moodle. The conventional system creates an environment for incorrect submission where students forget one of the document during a multi-file submission. Also, the existing system requires teaching staff to download each submissions, grade them and then upload again. We developed a tool which eases the cumbersome task of managing homework submissions for students and grading process for teaching staff. The instructor/TA also generally try to understand the performance of a class for which we try to provide a dashboard with the basic statistics.

Categories and Subject Descriptors

H.4 [**Information Systems Applications**]: Miscellaneous; D.2.8 [**Software Engineering**]: Metrics—*observations, convenience measures*

General Terms

Analysis, Case Study, Assignments, Evaluation, Peer review

Keywords

Moodle, Google Calendar, Learning Management System, Homework Submission, Homework Analytics Dashboard

1. INTRODUCTION

In modern education, the information technology particularly the internet plays a very important role in imparting learnings to students. The best practices in education require usage of courseware tools in order to support the teaching and learning processes, as well as in efficient assessment of students. In this paper, we evaluate few courseware tools such as Wolfware and Moodle used at North Carolina State University for learning management platform and the problems and challenges faced by students, instructors, teaching assistants and graders in using them.

WolfWare is NC State's enterprise suite of academic technologies and tools that provide instructors, students, prospective students and staff with a cohesive online platform that facilitate teaching and learning in fully-online, face-to-face and blended environments [1]. Moodle is a web-based tool (often referred to as a learning management system or LMS) used for web-enhanced and online courses. NC State uses Moodle as its primary learning management software. Moodle enables instructors to communicate with students and provide a variety of activities and resources. Some of the features that Moodle provide are maintaining a website for the course, posting or linking to a variety of content such as syllabi, assignments, readings, reference materials or recorded media, e-mailing and posting messages to notify your students about important events, using forums and wikis to allow students to collaborate, posting grades securely, receiving and returning assignments from students and creating online assignments and quizzes [2].

In this paper, we discuss the features to solve the drawbacks in the existing system being used at NC State University. We conducted two surveys with target audience as students and teaching staff to understand and identify the most frustrating problems faced by them in using Moodle, WolfWare and other courseware. We also did a literature review to learn about the drawbacks in the usually used learning management systems. Our interviews with teaching staff helped us to understand their perspective of a good course management system, to learn more about how they currently use the system to manage the course and to brainstorm the problems with the current system that needs immediate attention and needs to be solved immediately to make their life easy in rightly delivering and managing the course. Our surveys with considerate amount of observations and analysis helped us identify the problems they face while interacting with the course management systems and which additional features they think that will benefit them to manage their courses, submit homework and assignments, enable collaborative learning through forums, chats, file storage areas and email notifications, and increase the ease of using course management portals. Also, we referred to the existing studies [3], [4] and [5] that investigates student's and teacher's experiences with the Moodle and analyzes their opinions.

From our study, we concluded that the most common problem faced by both students and teaching staff is related to the submissions and grading of assignments and homework through Moodle.

The rest of the paper is organized as follows. Section 2 presents our previous work and the features implemented. In section 3, results of a questionnaire and interviews regarding the problems with the existing system and expected

improvements by the stakeholders is presented. Conception of our idea is presented and Conclusions are drawn in Section 4 and Section 5 respectively which gives us possibility for implementing our solutions and solving the problems faced by students and teaching staff and thus, improving the education process.

2. SYNOPSIS

In this section, we discuss about the work done previously in homework submission platforms, the common problems users face in the systems and three solutions for improving the platform for students, graders, teaching assistants and instructors.

2.1 Previous work

There have been various web and desktop applications that implement the homework management systems in different ways with different features. One such tool which is widely used is Moodle. This application has a lot of features like a discussion forum, a portal for assignments submission and a deadline tracker. But the problem with Moodle alone is that it isn't sufficient to cover all the required elements.

Some of the issues with Moodle are discussed here. The discussion forum available in Moodle isn't the most user friendly tool and the deadline tracker doesn't have an option for reminders. The homework submission portal isnâĂŹt the most user-friendly one. Many professors use multiple platforms like Moodle, piazza, Top Hat and many more for a single course. This highlights the problem with the existing system. Our aim is to provide a solution to these problems and come up with a single platform that will make the both the instructors and students job easier.

2.2 Features

For the purpose of this project, we built a new platform called Submit for testing the various features proposed below. The features are separated by access controls. There are 4 groups of users - students, graders, teaching assistants and instructors. Submit enables students to submit homeworks as file attachments, view deadlines for various courses, enables sharing of submission within the team for group submissions and also view inline feedback for the submissions. For graders and teaching assistants, it enables them to view, grade and provide feedback for the submissions by the students. For instructors and teaching assistants, it provides options for creating new assignments, as well as viewing the statistics like the mean, median and the distribution of the scores for the assignment.

2.2.1 Slotted submissions

One of the most important problems for any assignment is to figure out how many files need to be submitted and their file types. Submitting the wrong files in unexpected formats cause a lot of problems for the graders when the grading is automatic. This ensures that the grading process will be faster and efficient for the graders and teaching assistants. Another effect of this submission system is that once a member of the group submits the assignment, it will be available to all the members of the group ensuring that all the members of the group have access to the submission files.

2.2.2 Inline feedback for submissions

The traditional system of downloading assignments and saving feedback in the pdf files or as a separate document and then uploading them to the portal for students to view the feedback. The solution provides an inline viewer/editor where the graders and teaching assistants can view the files submitted if it is a PDF and save the comments/feedback as annotations i inside the PDF itself. The students can view the comments in the viewer available to them to check the feedback provided by the graders. This ensures that the graders need not download the files and maintain the files and feedback separately.

2.2.3 Stats dashboard

In many cases, the teaching assistants and instructors need to get an overall performance of the class based on assignments. This enables the instructor to change the course structure, modify the difficulty of the assignments, etc. based on the performance. Also, they can view the progress of the class based on the performance in the individual assignments. The stats board comprises of various features like the mean, median and mode. Various visual representations of the data is employed to provide an easy understanding for the TA/instructor to understand where the performance of the class stands.

3. ARCHITECTURE

We designed the application to be web application following a MVC architecture in the front end and a RESTful backend. In the front end, we used HTML5, CSS and javascript. We took advantage of the bootstrap framework to get a better user experience. The front end was designed in a proper model-view-controller format. All the communications with the server takes place using AJAX calls to the servers. The server is RESTful and always responds with a JSON. The client then parses the JSON response and performs the required actions with the data.

The backend consists of a cyclone server which is a python based server built on top of tornado web server. This server acts as the REST server. All the data is stored in a SQL based database. The database schema is designed in such a way that it will efficient and consistent to store the data. The server communicates with this database and responds to the requests it get from the client side.

Another important front end feature that we have is the document viewer. Though the document viewer is built using pdfjs, it is a custom implementation that allows the user to annotate inline on the pdf documents. So, the user can directly open the file in their browser itself and comment or annotate on the file itself.

The backend also acts a file storage system for all the homework file submissions which is then available for access through the server. This is very similar to a content delivery network which gives as more advantages like control and security on the file also. This also gives an extra advantage of letting the users take a look at the files they submitted at anytime and also let them view the reviewed documents also.

4. EXPERIMENTS

In this section, we discuss about the task methodology and the various participants involved in testing the effectiveness of the three features developed.

4.1 Task Methodology

We deployed the application in four different machines. We used these installations to test the usability of all the three different features. The test format was almost constant for all the three different features. First step was to get the participant to log in and get used to the application. We let them log in and play around the application and get a feel of the various features in the application. Second step was to ask them to perform an action relevant to the test. The third and final step was the after usage feedback we got from them. Now, let us get into more details on the test for each of these features.

For the first feature which is slotted submissions, we has created two different assignments to be submitted and asked the participants to submit each of these two assignments. After they finish submitting these assignments, we got a general feedback from the participants on ease of using the application and the usefulness of the application. For the second feature which is online grading, we asked the participants to grade two different assignments and then asked them to give feedback. For the third feature which is a statistics dashboard, we ask the participants to go through the dashboard, play with it and give us feedback on the usefulness of the dashboard. We also had a custom built timer in the application which records the time taken for each of the participant's actions and we used this timing as a metric to see how easy it was for the participants to perform the given tasks.

4.2 Participants

For conducting the tests on three different user groups, we needed three different set of participants namely, student, graders and teaching assistants or instructors. So, we divided the task and made each of our team member talk with three students, two graders and a teaching assistant. This gave us a participant group of twelve people for the first feature, eight for the second feature and four participants for the third feature. Next, we asked these participants to perform the steps that we discussed earlier and got the results.

5. DESCRIPTION OF THE GRAPHS

The data collected through the interviews and observing the users gave an overall view of the problems faced by the users using the various learning management systems. Observing the users showed us about the problems faced during the assignment submission process like the format of the submission, the files to be submitted, switching between the various softwares for viewing the discussion about the assignment, etc.

The interviews and the discussions with the teaching assistants and the graders revealed another set of problems with the learning management systems they use. The results of the interviews are summarized and the set of features they prefer are shown in Figure 1.

6. DISCUSSION

After conducting our experiments and analyzing our results, we were able to come up with a number of conclusions. Few of them were not foreseen by us when we started working on our solutions. Firstly, when we were in the testing phase, numerous issues came up and many changes to our features followed. This happened mainly due to the fact
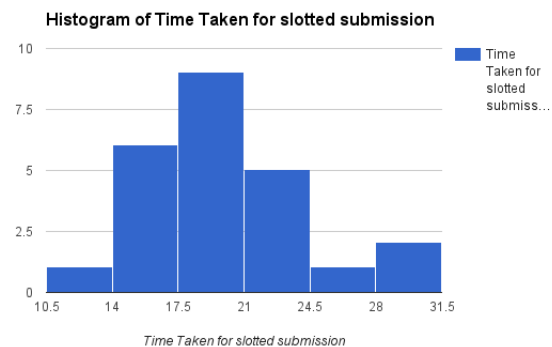

The histogram shows the time taken for submissions using the slotted submission feature. The time taken is calculated using the timestamps recorded when the user loads the various pages
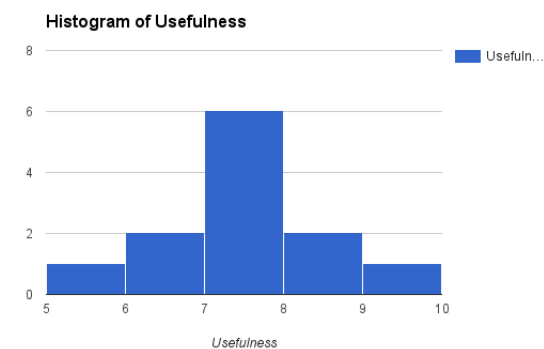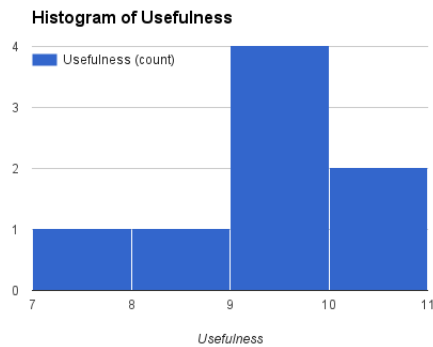

The histogram shows the usefulness of feature 1. Around 50% of the users gave a rating of 7 for the feature.
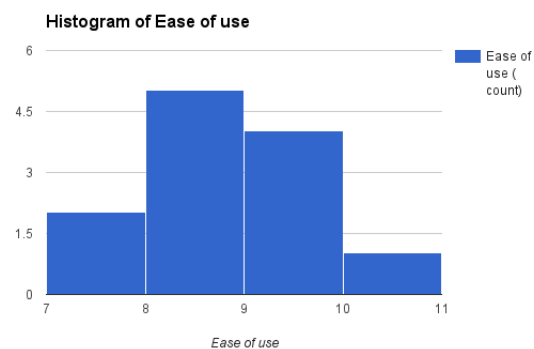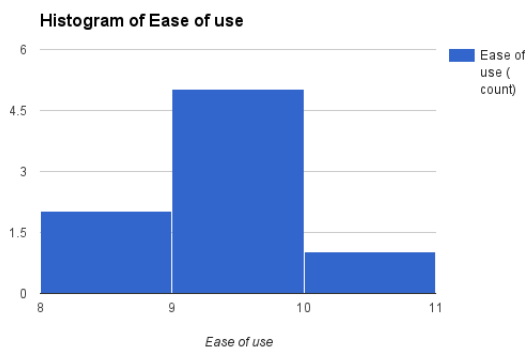

The histogram shows the ease of use of feature 1. The average rating for the feature is 8.08.

**Time taken for online grading 1 and Time taken for online grading 2**
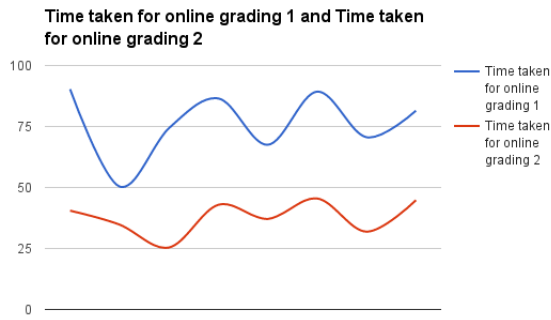
The time taken for evaluation of the submissions for two different submissions. The 8 graders were asked to evaluate 2 different assignments and the time taken to complete the evaluation was recorded by the system. This was compared with the average value expected when using some other evaluation systems.

Histogram of Usefulness

The histogram shows the usefulness of feature 2. 50% of the graders gave a rating of 9 while 25% gave a rating of 10 suggesting that the feature is useful.

Histogram of Ease of use

The histogram shows the ease of use of the system. 5 graders gave a rating of 9 for the feature.

Histogram of Usefulness
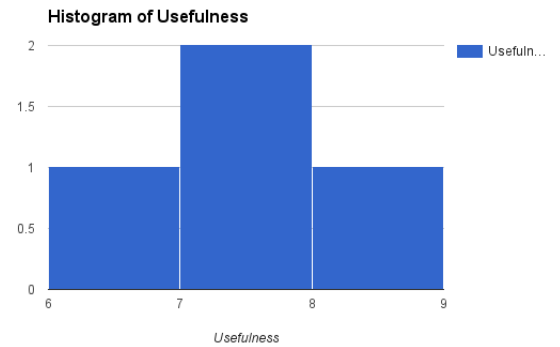
The histogram shows the usefulness rating of the third feature - stats dashboard. A rating of 7 by 2 out of the 4 teaching assistants suggest that the feature is not of much significance compared to the others.

that, while developing the solutions, we had a narrow view, which led to the assumption that the solutions were complete and error free. Only after finishing the test cycle, we saw the flaws that we couldn't notice while development.

To evaluate our feature sets, we let a group of users who had any kind of experience as graders for a course in the past. The users were asked to review each feature one by one and test it in various scenarios. As they had prior experience in dealing with assignments, they came up with test scenarios which we initially did not think of. We also asked the reviewers to evaluate the interface convenience as this is an entirely new application.

6.1 Limitations

The various limitations in the features developed are discussed in the following section.

6.1.1 Feature 1: Slotted Submissions

This is a great feature in cases where multiple types of files are to be submitted. But in some cases, instructors might request to submit a single zip/rar file which consist of all the files. This feature isn't very useful in such cases, but we can still restrict the file types to zip/rar format.

6.1.2 Feature 2: Inline Feedback for Submissions

Using inline feedback, the graders can provide comments by typing into the PDF itself. But the limitation of such a feature is that, for courses which include a lot of formulas and computation, typing in the feedback could become harder. This solution can be optimized by changing the input type from keyboard to a mouse or a digital pen where the grader can encircle the errors and write his comments on the file.

6.1.3 Feature 3: Stats Dashboard

Although the dashboard is a great tool to look at the performance of the class, it currently has restricted access. Only the instructors can look at the stats right now. The students are not given access because it is not really important for them to view the progress of the whole class.

7. CONCLUSION

The three features implemented as solutions in this project were for different user groups with different scopes for each feature. The features solve different purposes with the homework submission process for the users. We had an assumption about the best feature during our initial proposal stage and during the development. The final evaluation revealed that each feature has its own merits and demerits and taking into consideration of all the factors, the inline feedback system was rated the best out of the three which is the same as the expectation of the team. The slotted submission solution had its merit of restricting the files to be submitted and performing the necessary checks while submitting. The stats dashboard had merits of its own. This enabled instructors to concentrate on difficult topics and provided analytics about the performance which is vital information for the course. It had an indirect effect on the homework submission process for the users.

We conclude that if we were to pick one feature and develop it further, it would be the inline submission feedback feature. It has a lot of scope for improvement as discussed in section 8. It also makes the evaluation process easier for the users.

8. FUTURE WORK

A lot of work still exists to be done in this project. We found a lot of improvements that can be made to all the three features. Some of the improvements are small which makes it easier to use.

For the slotted submissions, once the file is uploaded the user should be able to preview the file. Also, an online editor to support editing text files and doc files is an ideal feature to support in the future. The inline evaluation feature has a lot of scope for improvement. Currently, it supports only PDF and text file rendering. It should support inline viewer for other formats of files too. Also, downloading of the files should be enabled. The stats dashboard can be more interactive and provide deeper insights about the performance.

9. REFERENCES

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