Re-Designing Moodle Courses: A Student – Centered Approach

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Introduction

• Every year, the global number of the delivered e-learning courses increases dramatically.
• Moodle Community has reported that more than 14 millions of Moodle courses have been so far delivered worldwide.
• There are many reasons for redesigning our e-learning courses such as increasing the learning effectiveness, updating the course content, etc.
• **Reducing the risk of students’ failure** is a major reason for redesigning a course.
Presentation Objective

• We are presenting a risk management framework for redesigning Moodle courses along with the application of the underlying framework to Moodle courses.
OUR FRAMEWORK
A Risk Management Framework

- We propose the following five phases:
  - Preparation
  - Risk Analysis
  - Warning System Generation
  - Risk Control
  - Review

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At the preparation phase we collect and pre-process the available course data from the learning environment (Moodle).
Risk Analysis Phase

- The Risk Analysis Phase uses the preparation phase outcome to come up with a model for risks factors identification and prioritization.
At this phase we generate a model for prediction purposes based on the risks factors identification model. The validated prediction model determines the requirements for the generation of the warning system.
Risk Control

- At the Risk Control Phase the warning system is being put into action in order to control the risk and identify the areas of the course that call for redesign.
Review Phase

- The entire process is reviewed on the occasion that we decide to redesign the whole course.
APPLYING THE RISK MANAGEMENT FRAMEWORK
The Moodle platform of PUAS
Courses’ Structure

- Each course consisted of a number of Learning Units and each Unit followed the below structure:
  - Interactive Multimedia Material
  - Videos with recorded lectures
  - Self-assessment exercises
- The students could participate into a forum for getting feedback
- The students in order to complete the course had to pass a final online test
Ενότητα 3η - Κωδικοποίηση & Παράσταση Δεδομένων

Στην συγκεκριμένη ενότητα παρουσιάζεται ο τρόπος που παριστάνονται και κωδικοποιούνται τα δεδομένα (αριθμοί και χαρακτηρίσεις) σε ένα υπολογιστικό σύστημα.

ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Ανώτατο Εκπαιδευτικό Ίδρυμα Πειραιώς Τ.Τ.

Εισαγωγή στην Πληροφορική και τον Προσωπικό

Ερωτήσεις

1. Φανέζης Ι. Ψυχόπτεινο Τμήμα

Ο ΒΑΘΜΟΣ ΣΑΣ: 86.66% (130 points)
ΠΡΟΒΙΒΑΣΙΜΟ ΒΑΘΜΟΣ: 60% (90 points)

07 Video 1 WinFormApp

Άλλες μορφές διασύνδεσης με το χρηστή

Kinect for windows

https://youtu.be/Hb71j5cvV8F
http://www.pomago.com/articles/03/2013/096.png
http://wwwยวไทย.com/2012/91L/
1η Ενότητα "Εισαγωγή"
Μια εισαγωγή στις τεχνητές εργασίες, υπολογιστικές ανάπτυξης λογισμικού και την εργασία του προγραμματιστή.

Διαφάνειες 1ης Ενότητας - Εισαγωγή
1η Ενότητα - Βιντεοσκοπημένη Διάλεξη - Μέθοδος εισαγωγής Αρχικής
1η Ενότητα - Βιντεοσκοπημένη Διάλεξη - Μέθοδος εισαγωγής Παραστάσεις ριάσεως
Ερωτήσεις Αυτο-αξιολόγησης 1ης Ενότητας

2η Ενότητα "Λειτουργία H/Y"
Στη συγκεκριμένη ενότητα παρουσιάζεται η αρχιτεκτονική των λειτουργιών του.

Διαφάνειες 2ης Ενότητας - Λειτουργία H/Y
2η Ενότητα - Βιντεοσκοπημένη Διάλεξη - Μέθοδος εισαγωγής Αρχικής
2η Ενότητα - Βιντεοσκοπημένη Διάλεξη - Μέθοδος εισαγωγής Παραστάσεις ριάσεως
Ερωτήσεις Αυτο-αξιολόγησης 2ης Ενότητας

1/12/2017
## Preparation Phase – Data Captured

<table>
<thead>
<tr>
<th>Metric</th>
<th>Percentage of interactive material parts studied (completed)</th>
<th>Percentage of self-assessment exercises parts completed</th>
<th>Percentage of videos parts watched (completed)</th>
<th>Number of activities started</th>
<th>Number of activities completed</th>
<th>Total posts in forum (new and follow up)</th>
<th>Total discussions viewed in forum</th>
<th>Time spent on interactive material completion</th>
<th>Time spent on self-assessment exercises completion</th>
<th>Time spent on videos watch (completion)</th>
<th>Time spent on forum</th>
<th>Total time spent on system</th>
<th>Total logins into the system</th>
<th>Final Test Grade</th>
</tr>
</thead>
</table>

1/12/2017

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## Risk Analysis – Regression Model

<table>
<thead>
<tr>
<th>Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of interactive material parts studied (completed)</td>
<td></td>
</tr>
<tr>
<td>Percentage of self-assessment exercises parts completed</td>
<td></td>
</tr>
<tr>
<td>Percentage of videos parts watched (completed)</td>
<td></td>
</tr>
<tr>
<td>Number of activities started</td>
<td></td>
</tr>
<tr>
<td>Number of activities completed</td>
<td></td>
</tr>
<tr>
<td>Total posts in forum (new and follow up)</td>
<td></td>
</tr>
<tr>
<td>Total discussions viewed in forum</td>
<td></td>
</tr>
<tr>
<td>Time spent on interactive material completion</td>
<td></td>
</tr>
<tr>
<td>Time spent on self-assessment exercises completion</td>
<td></td>
</tr>
<tr>
<td>Time spent on videos watch (completion)</td>
<td></td>
</tr>
<tr>
<td>Time spent on forum</td>
<td></td>
</tr>
<tr>
<td>Total time spent on system</td>
<td></td>
</tr>
<tr>
<td>Total logins into the system</td>
<td></td>
</tr>
</tbody>
</table>

**Final Grade (studrisk)**

1/12/2017

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Regression model outcome (course-1)

Table 1: Variables participating into the model significantly

<table>
<thead>
<tr>
<th>N = 203</th>
<th>B</th>
<th>Sig</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of interactive material parts studied (completed)</td>
<td>-19.974</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Percentage of self-assessment exercises parts completed</td>
<td>-4.608</td>
<td>0.012</td>
<td>0.010</td>
</tr>
</tbody>
</table>

One unit increase in the percentage of interactive material parts studied leads to 19.974 units decrease in the logarithm of probabilities. In parallel manner, one unit increase in the percentage of self-assessment exercises parts completed leads to 4.608 units decrease in the logarithm of probabilities.
Regression model outcome (course-2)

<table>
<thead>
<tr>
<th>N = 234</th>
<th>B</th>
<th>Sig</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of interactive material parts studied (completed)</td>
<td>-10.177</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Percentage of self-assessments exercises parts completed</td>
<td>-4.759</td>
<td>0.007</td>
<td>0.009</td>
</tr>
</tbody>
</table>

Table 2: Variables participating into the model significantly

One unit increase in the percentage of interactive material parts studied leads to 10.177 units decrease in the logarithm of probabilities. In parallel manner, one unit increase in the percentage of parts of self-assessment exercises parts completed leads to 4.759 units decrease in the logarithm of probabilities.
Risk Factors

• The regression analysis outcome for both courses has proved that the variables that constitute risk factors of students’ failure for these courses are:
  – Percentage of **interactive material parts studied**
  – Percentage of **self-assessment exercises parts completed**
## Discriminant Analysis Outcome (course-1)

### Prediction Model

#### Classification Function Coefficients

<table>
<thead>
<tr>
<th>strisk</th>
<th>not at risk</th>
<th>at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of interactive material parts studied (completed)</td>
<td>30,331</td>
<td>19,588</td>
</tr>
<tr>
<td>Percentage of self-assessment exercises parts completed</td>
<td>21,187</td>
<td>16,403</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-19,871</td>
<td>-10,194</td>
</tr>
</tbody>
</table>

#### Classification Results

<table>
<thead>
<tr>
<th></th>
<th>strisk</th>
<th>Predicted Group Membership</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>not at risk</td>
<td>at risk</td>
<td></td>
</tr>
<tr>
<td>Original Count</td>
<td>161</td>
<td>26</td>
<td>187</td>
</tr>
<tr>
<td>%</td>
<td>86,1</td>
<td>13,9</td>
<td>100,0</td>
</tr>
<tr>
<td>at risk</td>
<td>1</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>at risk</td>
<td>6,3</td>
<td>93,8</td>
<td>100,0</td>
</tr>
</tbody>
</table>

a. 86,7% of original grouped cases correctly classified.

### Discriminant Functions:

**Discriminant Function for students not at risk:**

\[ y_1 = 30.331 \times \text{Percentage of interactive material parts studied} + 21.187 \times \text{Percentage of self-assessment exercises parts completed} - 19.871 \]

**Discriminant Function for students at risk:**

\[ y_2 = 19.588 \times \text{Percentage of interactive material parts studied} + 16.403 \times \text{Percentage of self-assessment exercises parts completed} - 10.194 \]
# Discriminant Analysis Outcome (course-2)

## Prediction Model

### Classification Function Coefficients

<table>
<thead>
<tr>
<th>Predictor</th>
<th>strisk</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>not at risk</td>
<td>at risk</td>
<td></td>
</tr>
<tr>
<td>Percentage of interactive material parts studied</td>
<td>11.803</td>
<td>-0.233</td>
<td></td>
</tr>
<tr>
<td>Percentage of self-assessment exercises parts completed</td>
<td>13.385</td>
<td>3.381</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>-5.343</td>
<td>-0.788</td>
<td></td>
</tr>
</tbody>
</table>

### Classification Results\(^a\)

<table>
<thead>
<tr>
<th></th>
<th>strisk</th>
<th>Predicted Group Membership</th>
<th>Total</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>not at risk</td>
<td>at risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original Count</td>
<td>126</td>
<td>24</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>84.0</td>
<td>16.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>at risk</td>
<td>5</td>
<td>79</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td></td>
<td>84.0</td>
<td>16.0</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>at risk</td>
<td>6.0</td>
<td>94.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

\(a\) 87.6% of original grouped cases correctly classified.

## Discriminant Functions:

**Discriminant Function for students not at risk:**

\[ y1 = 11.803 \times \text{Percentage of interactive material parts studied} + 13.385 \times \text{Percentage of self-assessment exercises parts completed} - 5.343 \]

**Discriminant Function for students at risk:**

\[ y2 = -0.233 \times \text{Percentage of interactive material parts studied} + 3.381 \times \text{Percentage of self-assessment exercises parts completed} - 0.788 \]
Prediction Model Validation

• The prediction model of each course was applied to a third course (N=227) in order to be validated in terms of its correct classification percentage.

• In a more explanatory way, the scores of the discriminant functions were used during the course period (before the final online test). According to the maximum score of these functions calculated for a student, students were classified either to the group of those who were about to pass or to the group of those who were about to fail.

• The classification outcome of the model for each student was compared to the classification after the final test on the base of the final grade in order to identify liable dissimilarities in the classification before the final online test (prediction model classification outcome) and the classification after the final online test.
Prediction Model Validation

• Thereby, in terms of the previously cited comparison, the prediction model for each course was granted with a correct classification percentage.

• It is important to highlight that the prediction model of the course-2 reached a high level of correct classification percentage (92%).

• The validated prediction model will constitute the base on which the generation system will be developed.
Warning System Generation

• Currently, we are working on developing a specific plugin for building the warning system based upon the validated prediction model.
Risk Control

• When the warning system is developed it will be put into action to check whether the risk of students’ failure is controlled or not.
Course Re-Design

- Analyzing the behavior of the two groups of students (students who are about to fail the course and those who are about to pass) we will be able to identify the areas of the course design that call for amendments (Course Re-Design)

- We have implemented a prototype plugin for this purpose that provides the ability to display for a particular course various usage statistics either by user or by group.
  - A user-teacher can form well focused statistical reports regarding different types of learning activities and resources in specified time periods. The statistics are equipped with suitable graphics helping further the teacher to monitor the course progress
Advanced Logs Plugin

Using this plugin, the user can create a usable way reports that focus on activities within a certain lesson and depict usage statistics per user or group users, per type of the learning activity/resource or per section of the course and over a specified time period in an online course.

User options

Select whether users will be selected by enrol date or last course access. Also you can manually select users or user groups.

Users Selection Based On: Enrol Date

Select Users

Select Analysis Type

Select whether to show overall stats or compare students/groups.

Show me Overall Stats With Selected Users/Groups

Show me Overall Stats With Selected Users/Groups

Compare Students

Compare Groups or Groups/Students

Show Resources/Activities Per

Select whether to show resources & activities per Course Section or per Resource/Activity Type.

Section (Topic/Weekly) Resource/Activity Type

Select Resources/Activities Per Section

Show me Overall Stats With Selected Users/Groups

Compare Students

Compare Groups or Groups/Students
1. User Selection Based on Date

Η επιλογή των χρηστών που θα αποτελέσουν το αντικείμενο της ανάλυσης δεδομένων, δύναται να περιοριστεί βάσει ημερομηνίας που αναφέρεται, ή στην ημερομηνία εγγραφής στο μάθημα, ή στην ημερομηνία τελευταίας πρόσβασής στο σύστημα.

2. Select Users or Groups

Οι επιλογές χρηστών που προσφέρονται, για το συγκεκριμένο φίλτρο της αναφοράς, είναι είτε μεμονωμένοι χρήστες είτε ομάδες χρηστών, είτε συνδυασμός χρηστών και ομάδων.

3. Select Analysis Type

Επιλογή του τύπου της ανάλυσης που επιθυμεί μπορεί να είναι συγκεντρωτικά στοιχεία χρήσης για ανασκόπηση της συνολικής δραστηριότητας στο μάθημα, ή συγκριτικά στοιχεία για χρήστες ή ομάδες, ή συνδυασμό χρηστών και ομάδων, ανά δραστηριότητα/πόρο του μαθήματος.

4. Selection of Activities / Resources

Ο καθορισμός των δραστηριοτήτων είτε με βάση την κατηgoriοποίηση των δραστηριοτήτων/πόρων που ακολουθεί το Moodle, είτε βάση των διακριτών ενοτήτων που έχει καθορίσει ο σχεδιαστής του μαθήματος.

5. Time Filters

 optionally, limit data in time:
Ποσοστά συμμετοχής σε Δραστηριότητες/πόρους

**Activities/Resources Aggregated Results**

- SCORM packages: 6347 (52.9%)
- Files: 324
- Pages: 228
- Forums: 228
- Chats: 228
- SCORM packages: 228
- Feedback: 16.7%
- Folders: 16.7%
- Assignments: 16.7%

Δραστηριότητα σε βάθος χρόνου ανά μαθησιακή δραστηριότητα/πόρο

**Επισκέψεις/εκτελέσεις SCORM δραστηριοτήτων**

- Date: Until now
- Users Selected: 365
- Completed status:
  - Completed: 274
  - Incompleted: 91

**Κατάσταση ολοκλήρωσης SCORM δραστηριοτήτων**

- Date: Until now
- Users Selected: 365
- Status:
  - Completed: 274
  - Incompleted: 91

**Κατάσταση επιτυχιών SCORM δραστηριοτήτων**

- Date: Until now
- Users Selected: 365
- Status:
  - Passed: 140
  - Failed: 225

**Κατάσταση βαθμολογιών SCORM δραστηριοτήτων**

- Date: Until now
- Users Selected: 365
- Score:
  - Minimum Score: 30
  - Average Score: 60
  - Max Score: 90

**Χρόνοι ενασχόληση SCORM δραστηριοτήτων**

- Date: Until now
- Users Selected: 365
- Time:
  - Minimum Time: 20
  - Average Time: 30
  - Max Time: 50

**Advanced Logs Plugin**
Advanced Logs Plugin

Activities/Resources Aggregated Results

Date: Until now
Users Selected: 31
Aggregated Results

```
<table>
<thead>
<tr>
<th>Category</th>
<th>Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Πηγές πληροφοριών</td>
<td>Group_1: 25.0</td>
</tr>
<tr>
<td></td>
<td>Group_2: 26.0</td>
</tr>
<tr>
<td>Σελίδες</td>
<td>Group_1: 12.5</td>
</tr>
<tr>
<td></td>
<td>Group_2: 13.0</td>
</tr>
<tr>
<td>SCORMs/AICCs</td>
<td>Group_1: 49.0</td>
</tr>
<tr>
<td></td>
<td>Group_2: 48.0</td>
</tr>
</tbody>
</table>
```

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Advanced Logs Plugin

Συμπεριφορά σε δραστηριότητες διαδραστικών παρουσιάσεων (Scorm)

Συμπεριφορά σε δραστηριότητες αυτο-αξιολόγησης (Scorm)

Συμπεριφορά σε δραστηριότητες βίντεο-διαλέξεων

Συμπεριφορά σε δραστηριότητες Εργαστηριακών Ασκήσεων
Conclusions

• Our framework provides a holistic approach to the problem of redesigning a course taking into consideration a major factor such as the students’ failure.

• We can apply this framework after any course delivery period to come up with a prediction model for any course with a view to developing a warning system for the course.

• Our initial findings suggest that courses with similar structures/design show similar risk factors. However, we need more data to come up with an integrated proposal.
Thank you!