E²Coach – Coaching Students with Computer Tailored Communication

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INTRODUCTION

• Tailored communication is grounded in behavior change theory, and has been extensively tested in public health 1,2
• Through E²Coach (Expert Electronic Coaching), we applied tailored communication to four introductory physics courses to provide individualized feedback that recognizes the student’s strengths, weaknesses, performance trends, motivations, and goals.

WHAT IS E²COACH

E²Coach is a webapp with powerful back-end software that sends tailored messages to students based on their personal background, goals, and class performance.

How it works

Detailed information about thousands of students and their current status: i.e.
• Desired grade and confidence level
• Concentration
• Expected hours of study
• Previous physics experience
• Extracurricular activities
• Values
• U of M Cumulative GPA
• Gender
• Reason for taking the class
• Backgrounds of classes (based on CLASS)
• Grades from the physics department

MTS

The Michigan Tailoring System: a mature open-source software platform for creating content designed specifically for an individual based on data about that individual

Individualized messages: what we would say to each student, if only we could...

Student Usage

• Opt-in system for two full-length terms
• 5 sets of messages to students – 1 at start of term, 1 a week before exam 1, and after each of the 3 major exams
• Tracked student clicks over course of term
• Median clicks: term 1 = 18, term 2 = 27
• User groups decided as follows:

<table>
<thead>
<tr>
<th>Groups</th>
<th># Women</th>
<th># Men</th>
<th>Incoming GPA (M, SD)</th>
<th>Final Grade (M, SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non user</td>
<td>440</td>
<td>1163</td>
<td>3.195, 519</td>
<td>3.94, 12.49</td>
</tr>
<tr>
<td>Low user</td>
<td>246</td>
<td>138</td>
<td>3.254, 468</td>
<td>3.90, 11.54</td>
</tr>
<tr>
<td>Mod user</td>
<td>263</td>
<td>237</td>
<td>3.937, 431</td>
<td>3.99, 10.39</td>
</tr>
<tr>
<td>High user</td>
<td>194</td>
<td>271</td>
<td>3.43, 404</td>
<td>3.82, 8.88</td>
</tr>
</tbody>
</table>

Better-Than-Expected

• The BTE statistic serves as our main measure of student achievement, and compares actual performance to predicted performance.
• Predicted grade based on incoming GPA.
• BTE – students’ personal regression residual / SD of all residuals
• BTE statistic helps control for selection bias in the E²Coach user group.

CONCLUSIONS

• E²Coach’s tailored communication provides personalized feedback for students that has been shown to positively affect their course performance.
• Higher usage predicts better performance in the course, as measured by students’ Better-Than-Expected scores. The high users performed significantly better than all other types of users.
• Moreover, E²Coach affects student performance positively in the same manner for both males and females.
• Although preliminary, we have validated the BTE statistic (quadratic curve) as an improved measure for detecting changes in student performance.

FUTURE DIRECTIONS

The E²Coach Expansion Project:

• Aims to provide personalized instruction to each of the 11,200 students who take introductory Biology, Chemistry, and Statistics, in addition to Physics.
• In Fall 2011, E²Coach will be in Chem 130, MECB 310, and Stats 250.

Current Grades and Expectations in Target Expansion Classes

All four courses show significant grade penalties, as do almost all introductory STEM courses.

In Physics 140 and Chem 130, the grade penalties are much worse for female students. This performance disparity is common in intro STEM courses.

REFERENCES


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