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Scalable, web-delivered supports to help students "Learn to Learn"

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Scalable, web-delivered supports to help students “Learn to Learn”

Matthew L. Bernacki
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PROJECT OVERVIEW: Learning Theory and Analytics as Guides to Improve Undergraduate STEM Education (Learning TAGs)

The Need
• Many graduate K-12 without skills necessary to manage learning (ACT, 2008)
• Incoming STEM majors typically fail to complete a STEM degree; more pronounced trend in underrepresented populations (Eagen, Hurtado & Chen, 2006)
• Primary reasons for leaving STEM include perceived lack of skills to perform critical STEM tasks and lack of motivation to continue with training (Perez, Cromley & Kaplan, 2013)

The Project
• Learning management systems (LMSs) are ubiquitous in higher education, provide a platform for scalable, web-delivered support
• Learning sciences provide insight about ways learning skills can be built and motivation can be supported
• LMSs + Learning Theory + Analytics provide an opportunity to
  1. Provide resources to students
  2. Teach students how to use resources effectively
  3. Observe & adaptively respond to student learning data
     • Capture learning behaviors using log files
     • Develop prediction models that accurately identify students likely to struggle, obtain poor grades
     • Provide adaptive, personalized feedback to students via the LMS, directing resources to those likely to struggle

THE SCIENCE OF LEARNING TO LEARN
• Web-delivered set of training modules delivered via LMS
• Embedded in students’ course site, teach students (in 30-45 min per module):
  1. cognitive strategies known to improve learning outcomes
  2. methods of managing their learning process
  3. methods of managing self, behaviors, & one’s environment
• Instructional methods aligned to research on learning (Table 1)
• Ongoing trace data on student learning behaviors collected from University servers using Splunk application, performance data from LMS gradebook

Table 1
<table>
<thead>
<tr>
<th>Instructional Design of Science of Learning to Learn Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brief explanation of the learning principle + assessment of learning with feedback</td>
</tr>
<tr>
<td>Description of studies showing practical effect on performance in a college course</td>
</tr>
<tr>
<td>Worked example illustrating how to use the learning principle in a STEM course</td>
</tr>
<tr>
<td>Vignette where learning principle is applicable, opportunity to advise a protagonist</td>
</tr>
<tr>
<td>Prompt to evaluate course resources that afford use of the learning principle</td>
</tr>
<tr>
<td>Prompt to develop a specific plan how to use the learning principle in the course</td>
</tr>
</tbody>
</table>

Module 1: Introduction & Learning Principles
Opening Vignette: Emily the struggling student

Instruction: Introduction to, evidence for learning principles
Self Testing • Spacing • Self Explanation

Worked examples demonstrating how to use them

Practice: Identify Resources. Use what you’ve learned!

Module 2: Planning, Organizing & Monitoring Learning
Training in self-regulated learning

Assess their course’s learning objectives

Plan study: set goals & subgoals, enact strategies

Monitor learning process & progress … and adapt.

Module 3: Regulating Behavior & Environment
Training to help students

Make implementation intentions

Engage in mental contrasting

Regulate their environment to avoid distraction

Make efficient use of study time, avoid pitfalls

RESULTS & FUTURE DIRECTIONS
• Learning to Learn training had a demonstrable impact on biology students’ (N = 205) learning behavior & achievement in a college course

• Learning to Learn training benefits struggling students, burdens others

NEW CHALLENGE: 1) identify students who need help

2) deliver timely help to them and only them

A pilot project (underway) targets training to students in need.

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