The iCollaborate MSE Project - 2013
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Abstract

The overall objectives of the research proposed in the Collaborative MSE project are to research if improvements in student learning outcomes, student engagement, and successful course completion are possible if the structure of existing materials and engineering courses are transformed from a traditionally didactic and lecture-based teaching and learning environment. The specific innovations that are proposed in this project are the development of MSE education applications for the iPad Touch Pad that are designed to facilitate and support collaborative learning exercises which target specific student learning objectives which are known to be challenging for many students in MSE courses. It is hoped that the combination of specific learning objective targets, completed in collaborative groups, and supported by digital tools will achieve significant improvements in student learning outcomes.

The combination of a collaborative environment with a multi-touch, multi-functional, group “personalizable” device affords new opportunities to enhance cognitive development in an interactive student outcomes. The applications written for the iPad Touch Pad will be completed in collaborative group activities. The Collab Touch Pad application was designed to promote collaborative learning in an intuitive and user-friendly manner.

Collaborative MSE contains the following components:

- Student Learning Objective Targets within Conceptual Modules
- Collaborative Learning and Writing
- Low-Stakes In-Class Quizzes
- Concept Questions with Peer Learning
- Conceptually Contained Data Sets
- Evaluation of Student Preparation
- Uncovering Student Misconceptions

Collaborative MSE addresses the following Student Learning Outcomes (SLOs):

- Fundamental Characteristics of Materials
- Crystallography and Structures of Materials
- Behaviors of Different Classifications of Materials
- Properties of Materials
- Applications Involving Mechanical Properties
- In-Service Considerations

Research Questions

- Are the new learn anywhere, multi-touch, multi-media devices going to change education in ways yet to be understood just as PCs and the internet have and continue to do so?
- What role will these smart, multi-touch devices play in distributed cognition?
- Can the devices facilitate collaborative learning?
- Will learning outcomes be different for the collaborative groups using these smart devices?
- Will their use engage students in new ways?
- What is the cognitive impact engendered by these devices in learning activities?

Project Components

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Student Learning Objective Areas

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Apps Created – Alpha and Beta Tests

iCollaborate - Apps

- Fundamental Characteristics of Materials
- Crystallography and Structures of Materials
- Behaviors of Different Classifications of Materials
- Properties of Materials
- Applications Involving Mechanical Properties
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What’s Next?

- Student Learning Objective Areas
- iCollaborate MSE contains the following components:
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Student Perceptions of Components – Collaborative Work

Table 1: Initial Perceptions of Components - Collaborative Work

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Perceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative Learning</td>
<td>High</td>
</tr>
<tr>
<td>Low-Stakes Quizzing</td>
<td>Medium</td>
</tr>
<tr>
<td>Concept Questions with Peer Learning</td>
<td>Low</td>
</tr>
<tr>
<td>Conceptually Contained Data Sets</td>
<td>Very Low</td>
</tr>
<tr>
<td>Evaluation of Student Preparation</td>
<td>Very Low</td>
</tr>
<tr>
<td>Uncovering Student Misconceptions</td>
<td>Very Low</td>
</tr>
</tbody>
</table>

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