The Ultimate Course Search
Learning Tool

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Agenda

• Millennials!
• Our NSF Grant
• UCS and Learning Preferences
• Demonstration of UCS
• Implementation
• Preliminary Data
• Implications for Higher Education
We are Teaching Millennials!

- Multitask
- Have Short Attention Spans
- Tend to be Visual Learners
- Bore Easily
- Want Instant Gratification
- Want Control Over Their Learning
- Have an Expectation to Achieve
- Lack Self-Reflection Skills
- Need Individualized Educational Opportunities
Our NSF Grant - iSECURE

• To Reduce Attrition in Computer Science Security Courses
  • Increase availability to materials
  • Focus Studying Time
  • Access to Multiple Learning Materials
• Ultimate Course Search (UCS)
Our Objectives for UCS

• Create a program that will accurately search all electronic course materials
• Integrate UCS into Courses
• Help students understand learning preferences as connected to UCS
• Create a user friendly, clean interface
• Determine the effectiveness of the tool
Learning Preferences

- Index of Learning Preferences (Felder & Soloman, 1993)
  
  Four Types of Learners
  
  - Active – Reflective
  - Sensing – Intuitive
  - Visual – Verbal
  - Sequential - Global
Your Results

- **ACT**
  - REF
  - 11a 9a 7a 5a 3a 1a 1b 3b 5b 7b 9b 11b

- **SEN**
  - INT
  - 11a 9a 7a 5a 3a 1a 1b 3b 5b 7b 9b 11b

- **VIS**
  - VRB
  - 11a 9a 7a 5a 3a 1a 1b 3b 5b 7b 9b 11b

- **SEQ**
  - GLO
  - 11a 9a 7a 5a 3a 1a 1b 3b 5b 7b 9b 11b
What UCS Does

• Indexes PowerPoint Slides - The set of slides belonging to a presentation file are mapped relationally to that presentation along with the values of presentation title and presentation filename

• Segments Videos - In order to find where the slide exists in a video, the lecture video transitions are determined, and segmented. Then we determine the transition of videos.

• Indexes Textbook – The Textbook’s Index was used to determine the ontology to form our index (Apache Lucene)

• Creates Search Terms - The materials are searched for matches in keywords, and a presentation’s relevancy is calculated
The Tool!
The Research

Collected Data in a Security Course

- Control and Experimental
- Face-to-Face and Hybrid
- Same teacher, same book, same lectures
Research Questions

• Is there a statistically significant difference in post-test and final exam outcomes between the control and experimental groups?
• Is there a difference in attrition between the control and experimental classes?
• How did the students utilize the tool?
• How did the students utilize the learning preferences information?
# Student Learning Preferences

## Face-to-Face

<table>
<thead>
<tr>
<th>Control</th>
<th></th>
<th>Experimental</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td>6</td>
<td>Active</td>
<td>10</td>
</tr>
<tr>
<td>Reflective</td>
<td>21</td>
<td>Reflective</td>
<td>9</td>
</tr>
<tr>
<td>Sensing</td>
<td>20</td>
<td>Sensing</td>
<td>15</td>
</tr>
<tr>
<td>Intuitive</td>
<td>7</td>
<td>Intuitive</td>
<td>4</td>
</tr>
<tr>
<td>Visual</td>
<td>21</td>
<td>Visual</td>
<td>17</td>
</tr>
<tr>
<td>Verbal</td>
<td>6</td>
<td>Verbal</td>
<td>2</td>
</tr>
<tr>
<td>Sequential</td>
<td>14</td>
<td>Sequential</td>
<td>12</td>
</tr>
<tr>
<td>Global</td>
<td>13</td>
<td>Global</td>
<td>7</td>
</tr>
</tbody>
</table>
Student Learning Preferences

Hybrid

Control
- Active = 10
- Reflective = 7
- Sensing = 13
- Intuitive = 4
- Visual = 13
- Verbal = 4
- Sequential = 13
- Global = 4

Experimental
- Active = 18
- Reflective = 12
- Sensing = 22
- Intuitive = 8
- Visual = 28
- Verbal = 2
- Sequential = 19
- Global = 11
## Student Demographics F2F

### Control
- N = 28 (66 enrolled in course)
- Mean Age = 23.8
- Year in School = 3.54
- Gender
  - Female = 4
  - Male = 24
- Racial/Ethnic Identifiers
  - African American/Black = 5
  - American Indian or Alaska = 0
  - Asian = 3
  - Caucasian/White = 12
  - Hispanic/Latino = 9
  - Pacific Isl/Native Hawaiian = 1
  - Other = 4
  - No Answer = 3

### Experimental
- N = 21 (30 enrolled in course)
- Mean Age = 23.19
- Year in School = 3.52
- Gender
  - Female = 1
  - Male = 20
- Racial/Ethnic Identifiers
  - African American/Black = 2
  - American Indian or Alaska = 1
  - Asian = 6
  - Caucasian/White = 6
  - Hispanic/Latino = 8
  - Pacific Isl/Native Hawaiian = 1
  - Other = 5
  - No Answer = 0
Student Demographics Hybrid

Control
- N = 19 (27 enrolled in course)
- Mean Age = 22.89
- Year in School = 3.16
- Gender
  - Female = 1
  - Male = 18
- Racial/Ethnic Identifiers
  - African American/Black = 2
  - American Indian or Alaska = 0
  - Asian = 9
  - Caucasian/White = 4
  - Hispanic/Latino = 5
  - Pacific Isl/Native Hawaiian = 0
  - Other = 2
  - No Answer = 2

Experimental
- N = 30 (36 enrolled in course)
- Mean Age = 21.97
- Year in School = 3.40
- Gender
  - Female = 6
  - Male = 24
- Racial/Ethnic Identifiers
  - African American/Black = 2
  - American Indian or Alaska = 0
  - Asian = 11
  - Caucasian/White = 11
  - Hispanic/Latino = 9
  - Pacific Isl/Native Hawaiian = 1
  - Other = 5
  - No Answer = 0
## Pre and Post Test Results F2F

<table>
<thead>
<tr>
<th>Control</th>
<th>Experimental</th>
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</thead>
<tbody>
<tr>
<td>Pre Test Mean</td>
<td>9.39</td>
</tr>
<tr>
<td>Standard Dev</td>
<td>2.25</td>
</tr>
<tr>
<td>Post Test Mean</td>
<td>12.18</td>
</tr>
<tr>
<td>Standard Dev</td>
<td>2.29</td>
</tr>
<tr>
<td>Change in Scores</td>
<td>2.79</td>
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</tbody>
</table>
Pre and Post Test Results

Hybrid

<table>
<thead>
<tr>
<th>Control</th>
<th>Experimental</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pre Test Mean</td>
<td>• Pre Test Mean</td>
</tr>
<tr>
<td>= 8.89</td>
<td>= 10.13</td>
</tr>
<tr>
<td>• Standard Dev</td>
<td>• Standard Dev</td>
</tr>
<tr>
<td>= 2.424</td>
<td>= 2.569</td>
</tr>
<tr>
<td>• Post Test Mean</td>
<td>• Post Test Mean</td>
</tr>
<tr>
<td>= 12.59</td>
<td>= 11.69</td>
</tr>
<tr>
<td>• Standard Dev</td>
<td>• Standard Dev</td>
</tr>
<tr>
<td>= 2.647</td>
<td>= 3.253</td>
</tr>
<tr>
<td>• Change in Scores</td>
<td>• Change in Scores</td>
</tr>
<tr>
<td>= 3.7</td>
<td>= 1.56</td>
</tr>
</tbody>
</table>
Final Exam Results - F2F

Control
- Mean Score = 144.57 (out of 200)
- Standard Dev = 47.60

Experimental
- Mean Score = 150.86 (out of 200)
- Standard Dev = 17.59

An independent T-test showed no between statistical significance in the final exam scores: $t(47) = 6.286$, $p=.568$. 
Final Exam Results Hybrid

Control
- Mean Score = 116.68 (out of 200)
- Standard Dev = 24.347

Experimental
- Mean Score = 123.97 (out of 200)
- Standard Dev = 23.576
Attrition Findings - F2F

Control
- 66 students enrolled
- 39 students completed the semester
- 41% attrition rate

Experimental
- 30 students enrolled
- 26 students completed the semester
- 13% attrition rate
Attrition Findings Hybrid

Control

- 27 students enrolled
- 26 students completed the semester
- 4% attrition rate

Experimental

- 36 students enrolled
- 36 students completed the semester
- 0% attrition rate
Survey Feedback: How did the students use UCS?

• Study for the exam
• Review lecture videos – past and present
• Search for Information/specific words & terms
• Review video podcast lectures
• As a reference and to take notes
• To help complete homework assignment/class projects
• To ‘test the tool’
Survey Feedback: What did the students like about UCS?

- User friendly
- Freeware
- Search engine
  - Fast and accurate
  - Search exact words
  - Tabs and specific information
  - Search Videos
  - Searches lead to a lot of information
- Helped Students Understand Concepts
  - Made studying easier
  - Able to better understand material covered in class
Survey Feedback: Comments About UCS

- “I didn’t feel overwhelmed cause I had all the information in tools.”
- “…it was like having the professor actually explaining & answering the questions I had.”
- effectiveness of the search when looking for a topic to study about”
- “All needed information in one place.”
- “it was excellent reference on slides where the prof. talked about how to do something like spinning tree”
- “fast search engine.”
- “taught me tricks I didn’t know.”
- “it saves me the work of actually taking notes.”
- “maybe have most viewed notes, or what topic most students have problems maybe put as the 1st thing.”
Implications for Higher Education

• Reduce attrition
• Increase clarity of course organization
• Increase accessibility of materials – One stop shop
• Increase student interaction with materials
• Individualize learning
• Create connections within and between courses
Questions?

• Our YouTube Channel: http://bit.ly/1imcF8o

• This Presentation on Slideshare: http://www.slideshare.net/renfromichel/final-ucs-eld-2015