Real-Time Learner Outcome Feedback:
Web Mash-ups Made Simple

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College of Osteopathic Medicine of the Pacific
Conflict of Interest Disclaimer

ExamSoft Worldwide, Inc. is financially supporting our travel expenses for this meeting.
Objectives

• Realize the importance of an interface to “tag” questions
• Recognize how to collect and generate data on student learning outcomes
• Acquire a mental framework of how to analyze and distribute data to drive decision-making
Organization of the Talk

- Why should we tag multiple choice questions with learner outcomes? (Thrush)
- How do we manage getting learner outcomes data at Western University of the Health Sciences College of Osteopathic Medicine? (Camberos)
- How do we catch students before they fail at Western University of the Health Sciences College of Osteopathic Medicine? (Thrush)
The Ever Expanding Curriculum

• **Access to information**
  - Internet
  - Electronic resources

• **Medicine/Science**
  - Constant expansion of knowledge

• **Are we teaching too much information?**
The Ever Expanding Curriculum

“Curriculum is like an animal without an excretory system.”

CAIR 2013
Assessment

• Signature assignments, capstone projects, etc. are good for assessing specific competencies.

• What about assessment at individual learning activity levels?
  – Exam questions
  – Tagged with learner outcomes
Organization of the Talk

• Why should we tag multiple choice questions with leaner outcomes? (Thrush)

• How do we manage getting learner outcomes data at Western University of the Health Sciences College of Osteopathic Medicine? (Camberos)

• How do we catch students before they fail at Western University of the Health Sciences College of Osteopathic Medicine? (Thrush)
Learning Outcomes

• What do we want our students to become?
  – WesternU ILOs
    • Critical thinking
    • Breadth and depth of knowledge in discipline
    • Interpersonal communication skills
    • Collaboration skills
    • Ethical and moral decision making skills
    • Life-long learning
    • Evidence-based practice
    • Humanistic practices
  – Medical school PLOs
  – CLOs
Need for Elegance

**Students**
- CLOs
- Outcomes & Competencies
- Students
- USDE
- ACGME
- Rotations
- SLOs
- Metadata
- ExamSoft
- IT/Al
- SPC

**Faculty**
- PLOs
- Objectives & WU / College Mission
- Faculty
- APP
- AOA
- COCA
- Residency
- OR DoE
- WASC
- ILOs
- Pre-clinical
- Admissions
- USDE
- ACGME
- Rotations
- SLOs
- Assessment
- Curriculum
- Metadata
- ExamSoft
- IT/Al
- SPC

**Administration**
- LCME
- ExamSoft
- Metadata
- SPC

**Outcomes & Competencies**
- Objectives & WU / College Mission
- Outcomes & Competencies
- Students
- Faculty
- Administration
- Outcomes & Competencies
Assessment of outcomes

• Collect the data

• How can we do this?

EXAMS

[Diagram showing overlap between Things in the Course and Things I studied, with an exclusion marked for Exam]
Assessment of outcomes

• Collect the data
• How can we do this? Make it “easy” on the faculty

– Question submission site (online form)
Assessment of outcomes

• Collect the data

• How can we do this?

  – Computer-based testing
  – Began with entering 1st year students
  – Courses are team-taught
    (up to 30 faculty per course!)
<table>
<thead>
<tr>
<th>Item Title *</th>
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<tbody>
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<td>Lecture Title *</td>
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<tr>
<td>Location *</td>
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<td>Question Text *</td>
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<td>Lecture Title *</td>
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<td>---------------</td>
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<tr>
<td>Instructor *</td>
<td>Location *</td>
</tr>
<tr>
<td>Question Text *</td>
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</tbody>
</table>

- Instructor options: Cyrus Parsa, Gerald Thrush, Glen Kisby, Jeffrey Felton, John Mata, Michelle Steina, Nissar Darmani, V. Venketaram
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<tr>
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<td>Location *</td>
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<td>Question Text *</td>
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<tr>
<td>M/C Ans Choice A *</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
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<table>
<thead>
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<tr>
<td>M/C Ans Choice A</td>
<td>M/C Ans Choice B</td>
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<tr>
<td>----------------</td>
<td>-----------------</td>
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<tr>
<td>Sample answer choice. Edit functions are possible.</td>
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CAIR 2013
<table>
<thead>
<tr>
<th>Correct Answer *</th>
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<tbody>
<tr>
<td>Distractor Order</td>
</tr>
<tr>
<td>Linked Questions</td>
</tr>
<tr>
<td>Comments/Feedback</td>
</tr>
</tbody>
</table>
This question from slide #25 and is from textbook page 32.
ILO

- Institutional:(1) Critical Thinking
- Institutional:(2) Breadth and Depth of Knowledge in the Discipline/Clinical Competence
- Institutional:(3) Interpersonal Communication Skills
- Institutional:(4) Collaboration Skills
- Institutional:(5) Ethical and Moral Decision Making Skills
- Institutional:(6) Life Long Learning
- Institutional:(7) Evidence Based Practice
- Institutional:(8) Humanistic Practice

PLO

- Program:(1) Osteopathic Philosophy and Osteopathic Manipulative Medicine
- Program:(2) Medical Knowledge
- Program:(3) Patient Care
- Program:(4) Interpersonal and Communication Skills
- Program:(5) Professionalism
- Program:(6) Practice Based Learning and Improvement
- Program:(7) Systems Based Practice
CLO

- IDIT: Microbiology
- IDIT: Immunology
- IDIT: Pharmacology
- IDIT: Pathology

Licensing exam topics

- NBOME: Anatomy
- NBOME: Behavioral science
- NBOME: Biochemistry
- NBOME: Microbiology
- NBOME: OPP
- NBOME: Pathology
- NBOME: Pharmacology
- NBOME: Physiology
Others?

Bloom’s taxonomy
<table>
<thead>
<tr>
<th>Item Title</th>
<th>Lecture Title</th>
<th>Instructor</th>
<th>Location</th>
<th>Question Text</th>
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<tr>
<td>Dietary Reference Intake</td>
<td>MCBM:Biochem - Introduction to Metabolism &amp; Nutrition</td>
<td>Katherine Mitsouras</td>
<td>Pomona</td>
<td>The Estimated Average Requirement (EAR) for nutrient intake is:</td>
</tr>
<tr>
<td>intake standards</td>
<td></td>
<td></td>
<td></td>
<td>KM - is this referring to calories or nutrients? can you add that to the distractors w/o giving too much away?</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Great comment - should have included it already</td>
</tr>
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</table>
What happens next?

• The Exam - Collect the data

And you think YOU have stress?
Ex. Individual student report

Strengths and Opportunities

Course LO

- **IDIT-Immunology**
  - Correct: 16/26

- **IDIT-Microbiology**
  - Correct: 26/31

- **IDIT-Pathology**
  - Correct: 15/21

- **IDIT-Pharmacology**
  - Correct: 8/12
Single Exam report
Faculty/Administration

Course LO / Discipline*  

*multiple faculty per discipline

MCBM-Biochemistry
Questions: 42

MCBM-Embryology
Questions: 14

MCBM-Histology
Questions: 15

MCBM-Molecular Biology
Questions: 20

MCBM-Physiology
Questions: 17
Single Exam report
Faculty/Administration

*individual faculty
Collect and analyze data on....

• Course, Student, & Faculty
  – ILOs
  – PLOs
  – CLOs

...and....
Now What?!!
Organization of the Talk

• Why should we tag multiple choice questions with leaner outcomes? (Thrush)

• How do we manage getting learner outcomes data at Western University of the Health Sciences College of Osteopathic Medicine? (Camberos)

• How do we catch students before they fail at Western University of the Health Sciences College of Osteopathic Medicine? (Thrush)
Academic Progress Portal (APP)

- Data Warehousing Platform
- Now includes learner outcomes
- To:
  - Catch students BEFORE they fail
  - Analyze (and correct) the curriculum
  - Feedback into admissions decisions
The Point

Continuous Improvement

Analytics

APP
**Mash-up:**

- **SharePoint**
  - Web form submission
  - Tag all items: easy & accurate
  - ILO, PLO, CLO, etc.

- **ExamSoft**
  - Computer based examination
  - Data collection
  - Data export

- **APP**
  - Results dissemination
  - Running tally
  - Analytics
Longitudinal Analysis
# Board exam outcomes Per Student

## Course Score

<table>
<thead>
<tr>
<th>Item</th>
<th>Grade</th>
<th>Average</th>
<th>Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Score</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Course Percent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recorded Alpha Grade</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Recorded Percent Grade</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Anatomy</strong></td>
<td>87.21</td>
<td>76</td>
<td>100</td>
</tr>
<tr>
<td><strong>Biochemistry</strong></td>
<td>86</td>
<td>82</td>
<td>100</td>
</tr>
<tr>
<td><strong>Physiology</strong></td>
<td>87</td>
<td>77</td>
<td>100</td>
</tr>
<tr>
<td><strong>Pathology</strong></td>
<td>98</td>
<td>88</td>
<td>100</td>
</tr>
<tr>
<td><strong>Microbiology</strong></td>
<td>91</td>
<td>79</td>
<td>100</td>
</tr>
<tr>
<td><strong>Pharmacology</strong></td>
<td>70</td>
<td>74</td>
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Exam Scores per Student (Ex. #2)

**Neuroscience (OM 5125)**

**DO 2016**

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<tr>
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<td>231.15</td>
<td>296</td>
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<td>78.09</td>
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<tr>
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<td>P</td>
<td>P</td>
<td>HNR</td>
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<tr>
<td>Recorded Percent Grade</td>
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<td>81.09</td>
<td>103</td>
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<tr>
<td>Exam 1 Score</td>
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<td>62.08</td>
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<td>Exam 1 %</td>
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<tr>
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### Neuro Learning Outcomes

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<tr>
<td>Microbiology</td>
<td>76</td>
<td>82</td>
<td>21</td>
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<tr>
<td>Clinical Neurology</td>
<td>84</td>
<td>83</td>
<td>82</td>
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### Neural Dev. (N)

- 88
- 72
- 8

### Neuroanatomy

- 72
- 71
- 78

### NEUROPHARM

- 42
- 68
- 34

### Neurohistology

- 100
- 88
- 15

### Neurophysiology

- 84
- 76
- 37

### Neuropathology

- 93
- 79
- 15
## ILOs Per Cohort (Class of 2016)

<table>
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<th>Item</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Course Score</td>
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</tr>
<tr>
<td>Course Percent</td>
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<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Recorded Percent Grade</td>
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<tr>
<td>(1) Critical Thinking</td>
<td>87</td>
<td>79.74</td>
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<tr>
<td>(2) Knowledge</td>
<td>85</td>
<td>79.07</td>
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<tr>
<td>(3) Interpersonal</td>
<td></td>
<td></td>
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<tr>
<td>(4) Collaboration</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(5) Ethical and Moral</td>
<td>100</td>
<td>92.93</td>
<td>100</td>
</tr>
<tr>
<td>(6) Life Long Learning</td>
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<td></td>
</tr>
<tr>
<td>(7) Evidence-Based</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(8) Humanistic Practice</td>
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</tbody>
</table>

**NOTE:**
Curriculum Gaps
Before Spring ‘13
## ILOs per Cohort (Class of 2016)

<table>
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<th>Item</th>
<th>Grade</th>
<th>Average</th>
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<td>Recorded Percent Grade</td>
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<tr>
<td>Cumulative WU Outcomes</td>
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<td>(%)</td>
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<tr>
<td>(1) Critical Thinking</td>
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<td>75</td>
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<tr>
<td>(2) Knowledge</td>
<td>81</td>
<td>79</td>
<td>1578</td>
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<tr>
<td>(3) Interpersonal</td>
<td>86</td>
<td>78</td>
<td>28</td>
</tr>
<tr>
<td>(4) Collaboration</td>
<td>100</td>
<td>95</td>
<td>3</td>
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<tr>
<td>(5) Ethical and Moral</td>
<td>77</td>
<td>69</td>
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<td>(6) Life Long Learning</td>
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<td>3</td>
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<tr>
<td>(7) Evidence-Based</td>
<td>76</td>
<td>74</td>
<td>30</td>
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<tr>
<td>(8) Humanistic Practice</td>
<td>78</td>
<td>75</td>
<td>18</td>
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NOTE: Curriculum Gaps Filled
### PLOs Cumulative/cohort (Class of 2016):

<table>
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<tr>
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<th>Average (%)</th>
<th>Possible</th>
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<tr>
<td>Cumulative COMP Outcomes</td>
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<tr>
<td>(1) OMM &amp; OPP</td>
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<td>(3) Patient Care</td>
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<td>100</td>
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<td>(4) Communication</td>
<td>85</td>
<td>77</td>
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<td>80</td>
<td>73</td>
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<td>(6) Practice-Based Learning</td>
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<tr>
<td>(7) Systems-Based Practice</td>
<td>94</td>
<td>86</td>
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Analytics
### Inter-Course Correlation

**E.g. Anatomy vs. other courses:**

<table>
<thead>
<tr>
<th>Course</th>
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<th>$R^2$</th>
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<tr>
<td>Biochemistry</td>
<td>0.71</td>
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<td>Physiology</td>
<td>0.63</td>
<td>0.39</td>
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<tr>
<td>Pathology</td>
<td>0.40</td>
<td>0.16</td>
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<td>Microbiology</td>
<td>0.63</td>
<td>0.40</td>
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<tr>
<td>Pharmacology</td>
<td>0.51</td>
<td>0.26</td>
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**Strong**

**Moderate**

**Modest**
Data Visualization
Technology to Track Learner Outcomes

Submission

Collection

Agree on Data

- Ontology
- Taxonomy
- Vocabulary

Analyze & Disseminate
Sidestep
Working with Information Technology

- IT understands data management
- IT can work with you to define data needs
- IT can work with you to develop data collection systems
- IT can work with you to collect the necessary reports.
Closing the Loop
Lessons learned

- Must have **well-defined** outcomes
- Must provide **training** of the faculty
- Must get **feedback** and **listen** to the faculty
- **Show** data analyses to faculty AND students
- Data must be **meaningful**
- **Work with** your IT and IR departments
- Use data for **continuous improvement**
Discussion

Thank You

Please feel free to contact us!

Gerald Thrush: gthrush@westernu.edu
Patricia Camberos: pcamberos@westernu.edu