Using Data Visualization to Align Course Learning Outcomes and Program Learning Outcomes

2023 Assessment Institute
Indianapolis, IN

WESTERN MICHIGAN UNIVERSITY

Jessica Cataldo, MPH, PhD
Faculty Specialist- School of Interdisciplinary Health Programs
Program Director- Health Administration

Thank you to the Office of Institutional Effectiveness at Western Michigan University who supported this work through funds from the Assessment Mini Grant Program.

WESTERN MICHIGAN UNIVERSITY
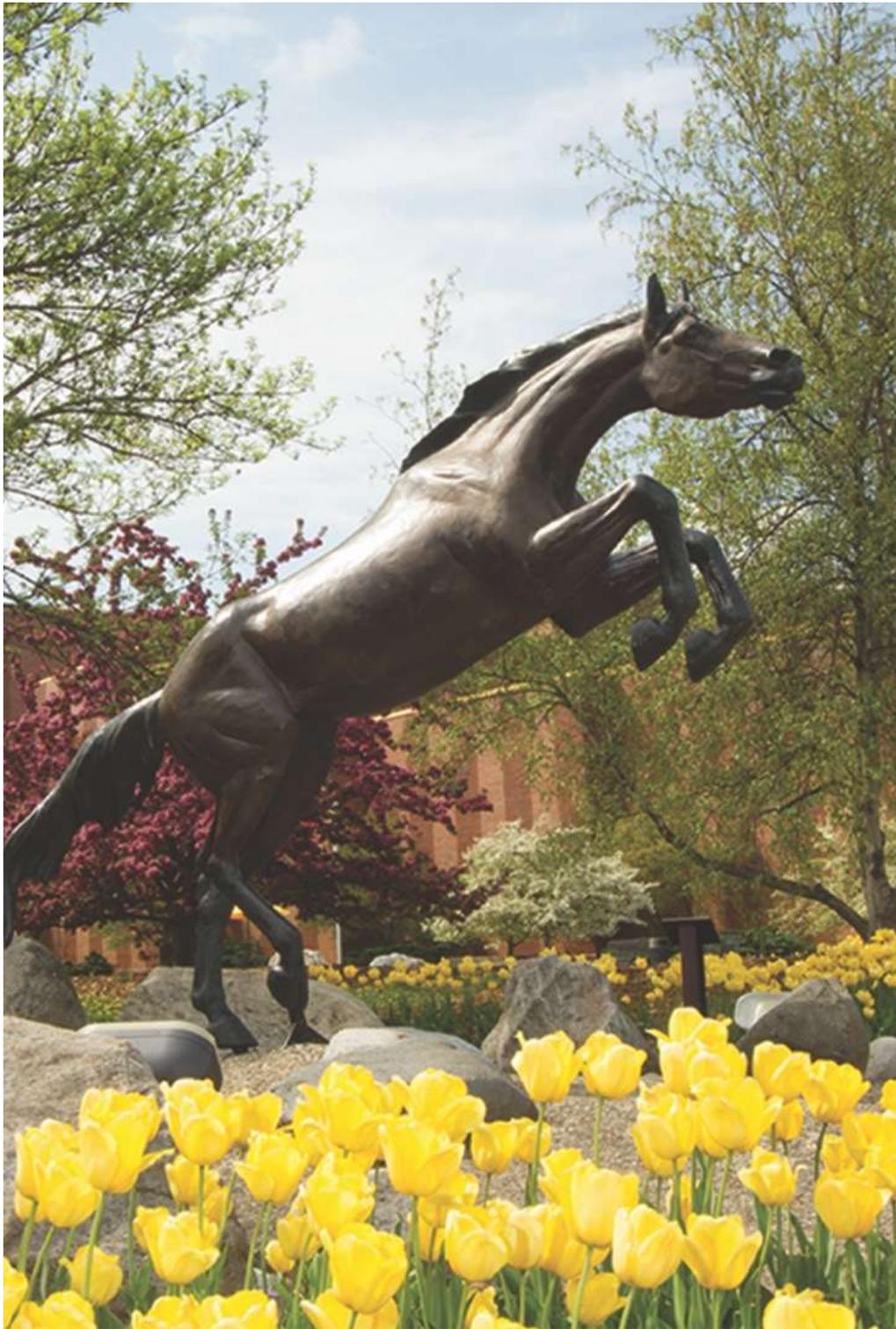
Session Learning Outcomes

1. Identify the main steps in developing curricular heat maps
2. Discuss learning height and learning coverage as it relates to curriculum mapping
3. Reflect on the use of data visualization for program assessment

Context

- New program in 2022
- Cross-college collaboration
- Existing courses to meet AUPHA certification content areas

Program Learning Outcomes[1]

1. Demonstrate the ability to communicate professionally and effectively in oral and written formats
2. Demonstrate the ability to lead and productively participate as a member of a team
3. Demonstrate the ability to solve problems related to health administration
4. Demonstrate an understanding of public health and the healthcare system
5. Demonstrate an understanding of business principles and apply this knowledge in a health-related environment

WESTERN MICHIGAN UNIVERSITY

Theoretical Foundation

- Faculty perceptions, rather than data, often play a large role in curriculum mapping, which may not reflect reality[2]
- Syllabus is a good data source to examine the intended curriculum[3]
- Average Bloom taxonomy[4] value can reveal cognitive difficulty of courses[5]

Theoretical Foundation

- Outcome mapping model to align course learning outcomes with program learning outcomes[6]
- Heat mapping as a curriculum mapping tool to clearly visualize what is covered and where in the curriculum it is covered[7]

Methods

1. Compiled all CLOs into an Excel document
2. Map to Bloom's Cognitive Taxonomy and assigned a value based on action word used and/or the cognitive process described in the CLO

Course	CLO	Bloom Value
HSV 2650	Efficiently **locate** information resources appropriate to the purpose	1
HSV 2650	**Recognize** the applications and limitations of different information resources in health services	1
HSV 2650	**Evaluate** information resources based on authority, accuracy, currency, perspective/bias, and disciplinary evidence	5
HSV 2650	Correctly **format** work, cite sources, and reference work using APA style	3
HSV 2650	**Recognize** the boundaries between plagiarism and fair use in order to appropriately reference information resources used	1

WESTERN MICHIGAN UNIVERSITY

Methods

3. Map CLOs to PLOs based on content
   - Double-barreled issue identified

Course	CLO	Bloom Value	PLO 1: Demonstrate the ability to communicate effectively in oral and written formats
HSV 2650	Efficiently **locate** information resources appropriate to the purpose	1	
HSV 2650	**Recognize** the applications and limitations of different information resources in health services	1	
HSV 2650	**Evaluate** information resources based on authority, accuracy, currency, perspective/bias, and disciplinary evidence	5	
HSV 2650	Correctly **format** work, cite sources, and reference work using APA style	3	3
HSV 2650	**Recognize** the boundaries between plagiarism and fair use in order to appropriately reference information resources used	1	1
	appropriately reference information		

Methods

4. Average taxonomy value for each course by PLO

Course	CLO	Bloom Value	PLO 1: Demonstrate the ability to communicate effectively in oral and written formats		PLO 2: Demonstrate the ability to lead and productively participate as a member of a team	
			1a. Oral	1b. Written	Lead	Participate on Team
HSV 2650	Efficiently **locate** information resources appropriate to the purpose	1				
HSV 2650	**Recognize** the applications and limitations of different information resources in health services	1				
HSV 2650	**Evaluate** information resources based on authority, accuracy, currency, perspective/bias, and disciplinary evidence	5				
HSV 2650	Correctly **format** work, cite sources, and reference work using APA style	3		3		
HSV 2650	**Recognize** the boundaries between plagiarism and fair use in order to appropriately reference information resources used	1		1		
HSV 2650		2.2	#DIV/0!	2	#DIV/0!	#DIV/0!

Methods

5. Create a heat map to visually display where in the curriculum PLOs are addressed

Course	PLO 1: Demonstrate the ability to communicate effectively in oral and written formats		PLO 2: Demonstrate the ability to lead and productively participate as a member of a team		PLO 3: Demonstrate the ability to solve problems related to health administration	PLO 4: Demonstrate an understanding of public health and health administration		PLO 5: Demonstrate an understanding of business principles and apply this knowledge in a health-related environment	
	1a. Oral format	1b. Written format	2a. Lead	2b. Participate on Team		4a. Public Health	4b. Health Administration	5a. Understand business principles	5b. Applied in health-related environment
HSV 2650	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HSV 3700	0.00	0.00	0.00	0.00	0.00	0.00	2.60	0.00	1.00
HSV 3900	0.00	0.00	0.00	1.00	2.50	2.00	2.57	0.00	4.50
HSV 4100	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	1.67
HSV 4400	0.00	5.00	0.00	0.00	5.00	2.50	2.60	0.00	0.00
HSV 4780	2.00	3.00	0.00	0.00	4.00	3.00	0.00	0.00	0.00
HSV 4800	0.00	0.00	0.00	0.00	0.00	0.00	1.67	2.25	2.00
HSV 4820	0.00	0.00	4.00	0.00	2.00	0.00	2.67	2.00	3.80
HSV 4990	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
PH 2310	0.00	4.00	0.00	6.00	3.75	2.75	2.50	0.00	0.00
PH 2340	0.00	6.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00
ACT 2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	0.00
ACT 2110	0.00	0.00	0.00	3.00	0.00	0.00	0.00	2.00	0.00
BUS 1750	2.00	2.00	3.00	0.00	0.00	0.00	0.00	2.30	0.00
CIS 2500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.17	0.00
CIS 2700	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.88	0.00
ECON 2010	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00
ECON 3180	0.00	0.00	0.00	0.00	0.00	3.20	3.60	0.00	0.00
LAW 3800	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
FIN 3200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
MGMT 2020	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00
MGMT 2500	3.00	3.00	0.00	3.00	0.00	0.00	0.00	3.00	0.00
MGMT 2520	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00
MKTG 2500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00

Methods

6. Create a stacked column chart to visually display distribution of CLOs by taxonomy level across PLOs

Course Learning Outcomes by Program Learning Outcomes
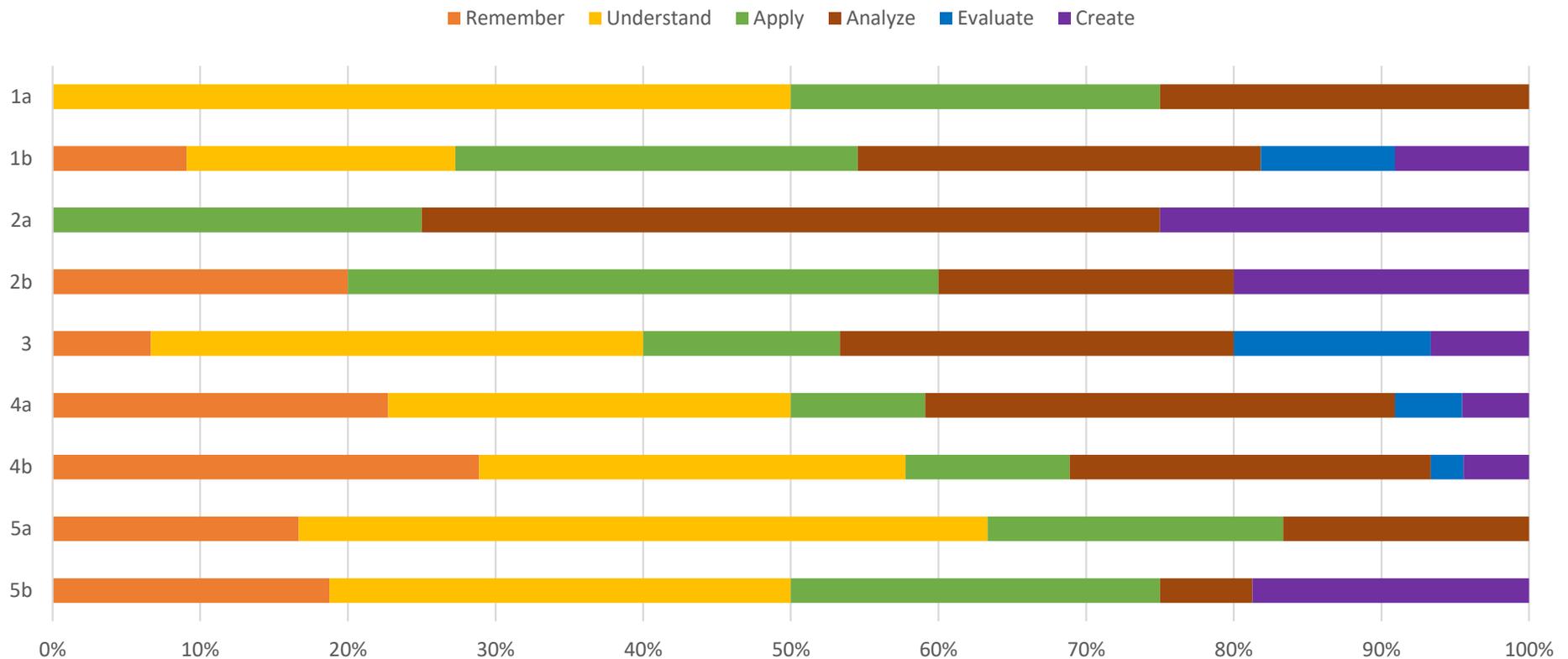
Methods

6. Create a skill level map

	PLO 1a	PLO 1b	PLO 2a	PLO 2b	PLO 3	PLO 4a	PLO 4b	PLO 5a	PLO 5b
BUS 1750	I	I	D, A					I	
ECON 2010								R	
MGMT 2020			D						
ACT 2100								I	
ACT 2110				D, A				R	
PH 2310		D		D	D, A	I	I		
PH 2340		D			D				
CIS 2500								I	
MGMT 2500	D, A	D, A		D, A				D, A	
MGMT 2520								R	
MKTG 2500								I	
HSV 2650		I							
CIS 2700								R	
ECON 3180						D, A			
FIN 3200								R	
HSV 3700							I		I
LAW 3800								I	
HSV 3900				I	R	R	R		D
HSV 4100							R		R
HSV 4400		D			D	R	R		
HSV 4780	R	D, A			D	D, A			
HSV 4800							R	R	R
HSV 4820			D		R		R	R	D, A
HSV 4990	D, A	D, A	D, A	D, A	D, A	D, A	D, A	D, A	D, A

Key Findings & Next Steps

- Using taxonomy values can help assess at the right level
- Unequal distribution of CLOs to PLOs
- Learning height vs. learning coverage[8]
- Faculty input

WESTERN MICHIGAN UNIVERSITY

Key Findings & Next Steps

- Course maps can help assess learning coverage
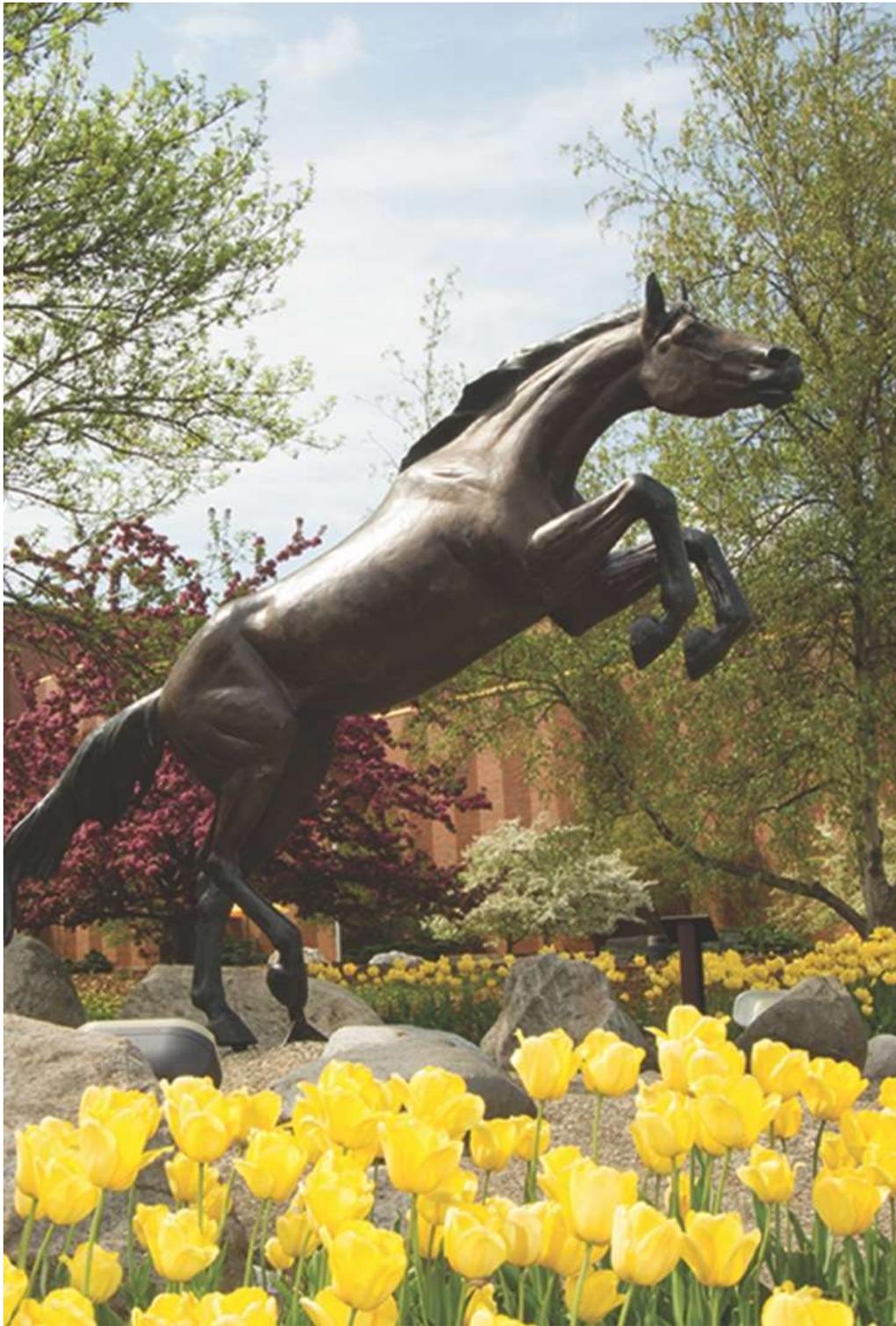- Faculty interviews can help identify missing pieces

Course Map

Week: Topic	Module Learning Outcomes (Course Objectives)	Instructional Materials	Assessments/Activities (Module Learning Outcomes)
Module 1 (Weeks 2-7): Policy & Policymaking Foundations			
2: Policy & Policy Analysis	1.1. Define what's meant by policy (CO1). 1.2. Identify the chain of effects for different policy tools (CO1, CO6). 1.3. Discuss the role of values in policymaking (CO2, CO6).	Wilensky & Teitelbaum- parts of Ch. 1, 2, & 14 Stewart (2009)- What are policy values? Tradeoffs Episode 228	Reading quiz/review activity (1.1, 1.3) Applied activity (1.2, 1.3)
3: Federal Policymaking	1.4. Identify the steps and stakeholders in the federal policymaking process (CO2). 1.5 Examine policy trends within major political parties (CO2, CO6).	Wilensky & Teitelbaum- parts of Ch. 2 & 3	Reading quiz/review activity (1.4) Applied activity (1.5)

WESTERN MICHIGAN UNIVERSITY

Conclusion

- Outcomes mapping with taxonomy values link intended course learning with program outcomes
- Curriculum heat maps are easy to interpret and visually appealing
- Both processes yield important information to guide program assessment

References

1. Stefl, M.E. (2008). Common competencies for all healthcare managers: the Healthcare Leadership Alliance model. *Journal of Healthcare Management, 53*(6), 360-373.
2. Amayor, G.M. & Leonard, S.T. (2010). Graphic strategies for analyzing and interpreting curricular mapping data. *American Journal of Pharmaceutical Education, 74*(5), 81. https://doi.org/10.5688%2Faj740581
3. Ewell, P.T. & Jones, D.P. (1996). *Indicators of "Good Practice" in Undergraduate Education: A Handbook for Development and Implementation.* https://eric.ed.gov/?id=ED403828
4. Anderson, L.W. & Krathwhol, D.R. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives.* New York: Addison Wesley Longman, Inc.
5. Oliver, D., Dobele, R., Greber, M., & Roberts, T. (2004). This course has a Bloom rating of 3.9. *Proceedings of the Sixth Australasian Computing Education Conference,* 227-231.
6. Arafeh, S. (2016). Curriculum mapping in higher education: a case study and proposed content scope and sequence mapping tool. *Journal of Further and Higher Education, 40*(5), 585-611. https://doi.org/10.1080/0309877X.2014.1000278
7. Clark, R., Bell, S., Roccisana, J., Oien, K.A., & Sneddon, S.F. (2021). Creation of a novel simple heat mapping method for curriculum mapping, using pathology teaching as the exemplar. *BMC Medical Education, 21*, 371. https://doi.org/10.1186/s12909-021-02808-3
8. Al-Bahi, A.M. (2007). Exposure matrix: an approach to evaluate program outcomes using course level direct assessment. *Proceedings of the 2nd International Conference on Engineering Education & Training,* Paper 1058.

WESTERN MICHIGAN UNIVERSITY

Questions?