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Analyzing Curriculum Mapping Data: Enhancing Student Learning through Curriculum Redesign

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Presentation

ANALYZING CURRICULUM MAPPING DATA: ENHANCING STUDENT LEARNING THROUGH CURRICULUM REDESIGN

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This paper includes four examples of data representation from curriculum mapping activities in higher education. The first example shows course outcomes mapped to program-level learning outcomes (PLOs) for one course, and illustrates what one instructor might produce while mapping his or her course. The second example is a bar chart that summarizes the number and depth of course outcomes for identified program-level learning outcomes when counting all courses in a program. It shows at a glance which program-level learning outcomes are emphasized in the program and to what extent. In the third example, two accompanying charts illustrate how a specific PLO, written communication, is taught and assessed across a program. The fourth example details all required courses within a program and their emphasis on PLOs. This chart shows emphasis and progression of student learning for each PLO throughout a program. Questions to guide the discussion of interpreting the data are included for each one. The end of the paper lists some questions that can be used for discussing and interpreting curriculum mapping data.

What is Curriculum Mapping?

Curriculum mapping: The process of associating course outcomes with program-level learning outcomes and aligning elements of courses (e.g. teaching and learning activities, assessment strategies) within a program, to ensure that it is structured in a strategic, thoughtful way that enhances student learning (Harden, 2001).

Learning Outcomes: Backbone of Curriculum Mapping

A learning outcome is "an intended effect of the educational experience that has been stated in terms of specific, observable, and measurable student performance" (Veltri, Webb, Matveev & Zapatero, 2011). Program-level learning outcomes state the intended knowledge, skills, and abilities that students are expected to meet in an academic course of study.

Example: Students should be able to identify components and summarize results of a peer-reviewed academic paper.

Dyjur, Kenny

Learning outcomes can be written at the program, course, or lesson level. Sometimes the terms objective and competency are used instead of learning outcome. However, unless otherwise specified, we will assume that the meaning of the term is the intended knowledge, skills, and abilities that students are expected to meet at the end of the instruction.

Example:
The following is an example of a learning outcome, articulated at different levels:

> **Graduate attribute:** Research skills
> **Program-level learning outcome:** Students will be able to use research within the field to inform their understanding.
> **Course Outcomes:** Students should be able to critique the findings of a peer-reviewed academic article.
> **Lesson Objective:** Students should be able to state what information can be found within the sections of a peer-reviewed academic article.

Curriculum Mapping Example #1: Course Outcomes (COs) Mapped to Program-level Learning Outcomes (POs) for One Course

This map is a matrix showing the alignment of course outcomes from one course to program-level learning outcomes.

The program-level learning outcomes are listed across the top. Often they are abbreviated or summarized in a few words, such as "Knowledge of the discipline". The course outcomes are listed down the left-hand side, and are also often abbreviated rather than numbered.

The instructor for the course has looked at each course outcome, and determined which of the program outcomes it is associated with. Where there is alignment, the instructor has decided if the course outcome addresses the program outcome at an introductory level, if students are developing a higher level of competence, or if they are expected to show a more advanced level of expertise and sophistication in their learning.

The resulting map gives a snapshot of the alignment of course outcomes to program outcomes.

	Program Outcome #1	Program Outcome #2	Program Outcome #3	Program Outcome #4	Program Outcome #5
Course Outcome #1		D		D	
Course Outcome #2	I	D			D
Course Outcome #3		I		I	
Course Outcome #4		A		A	A
Course Outcome #5					

Scale:

I = Introduced: Key ideas, concepts or skills related to the learning outcome are introduced and demonstrated at an introductory level. Instruction and learning activities focus on basic knowledge, skills and/or competencies and entry-level complexity.

D = Developing: Learning outcome is reinforced with feedback; students demonstrate the outcome at an increasing level of proficiency. Instruction and learning activities concentrate on enhancing and strengthening existing knowledge and skills, as well as expanding complexity

A = Advanced: Students demonstrate the learning outcome with a high level of independence, expertise and sophistication expected upon graduation. Instructional and learning activities focus on and integrate the use of content or skills in multiple levels of complexity.

Adapted from California State University, Long Beach (n.d.) and Veltri, Webb, Matveev & Zapatero (2011).

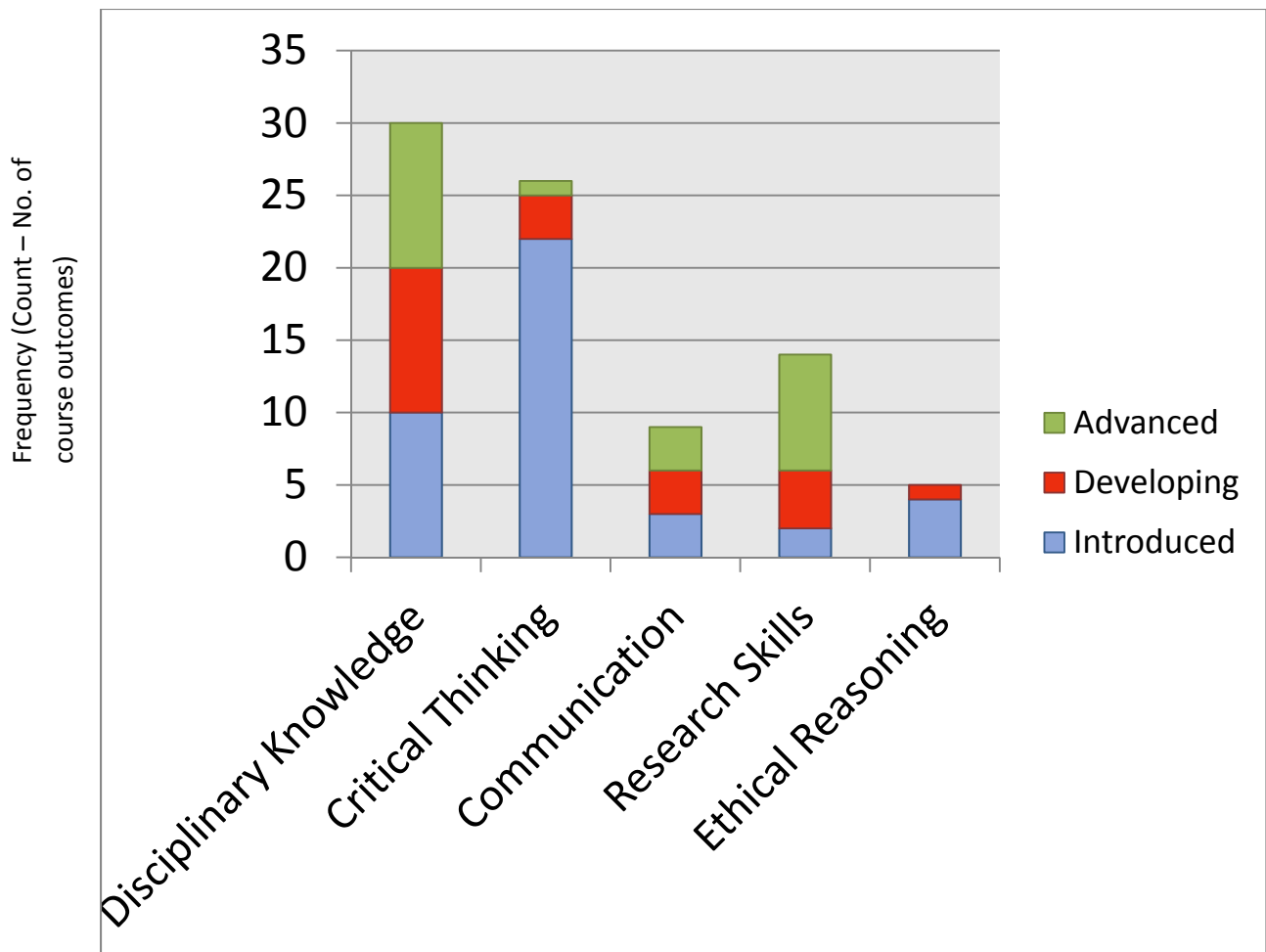### *Questions to Analyze the Map:*

1. Which program-level learning outcomes are being most emphasized? Least emphasized?
2. How well do course outcomes align with program-level learning outcomes?
3. Other observations?

Dyjur, Kenny

Example #2: Bar Chart Summarizing the Number and Depth of Course Outcomes per Program Outcome (PO)

This bar chart summarizes the number of course outcomes (CO) related to each of the program-level learning outcomes (PO). It tells you at a glance what program-level learning outcomes are being emphasized, and to what degree.

Bars indicate the number of course outcomes that contribute to each program-level learning outcome, added up from all courses in the program. Each bar is broken into three sections, representing the number of course outcomes at the Introductory, Developing, and Advanced levels.

Looking at program-level learning outcome #1, ten course outcomes address it at the Introductory level, ten address it at the level of Developing, and ten address it to an Advanced degree.

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Dyjur, Kenny

Questions to Analyze the Data (represented in a bar chart)

1. Which program-level learning outcomes (POs) are being most/ least emphasized?
2. How is learning progression encouraged for each learning outcome? Is learning scaffolded as students reach higher levels of understanding?
3. Is it necessary or even desirable to emphasize program-level learning outcomes equally? Who decides what emphasis should be given to the different POs?

Example #3: Bar Charts Summarizing Written Communication Skills, Taught and Assessed
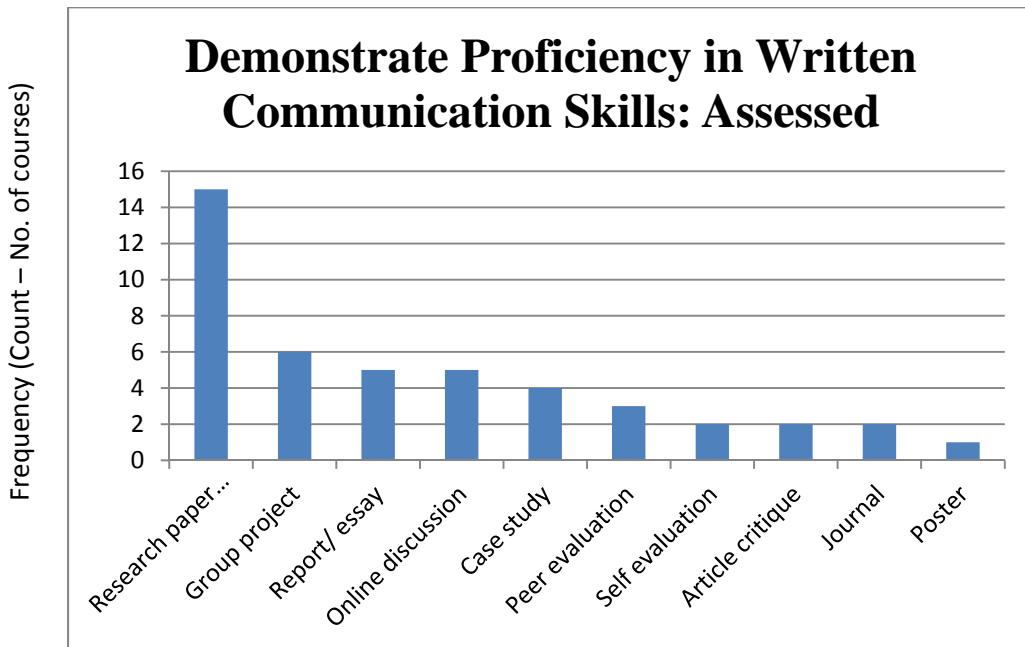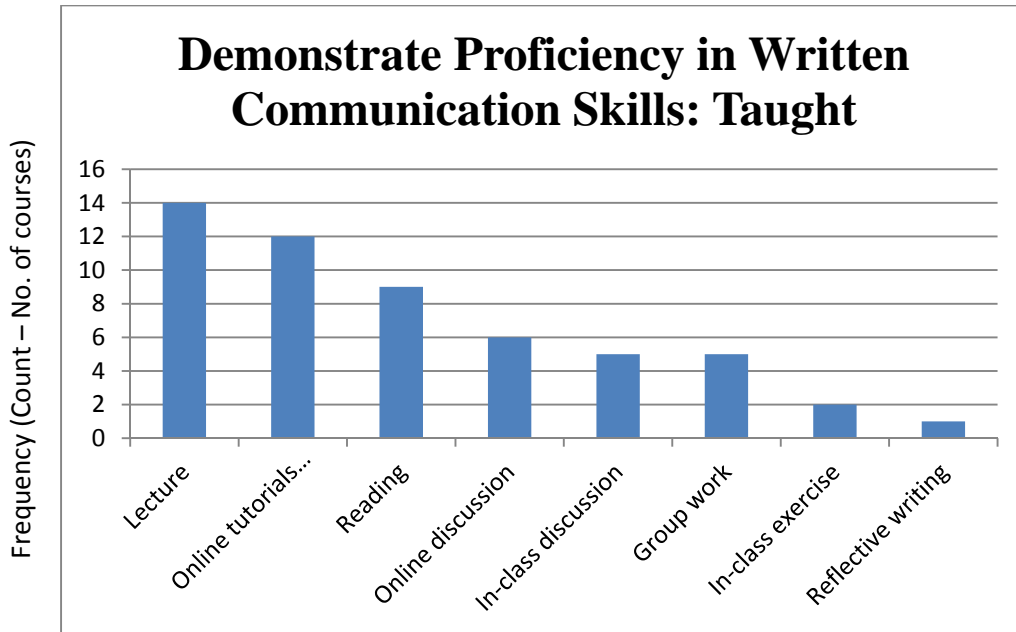
These bar charts show how one of the program-level learning outcomes (By the end of the program, students will be expected to demonstrate proficiency in written communication) is being taught and assessed in the program.

Different methods of teaching and assessing written communication are listed across the bottom. The bars indicate the frequency, or number of courses that include the method.

Questions to Analyze the Maps:

Hint: In some courses writing is assessed but not taught.

1. Where are the strengths in how written communication is being taught and assessed in the program?
2. What opportunities do you see to enhance student success regarding demonstrating proficiency in written communication?
3. What questions do you have about your own program that could be informed by this type of data representation?

Demonstrate Proficiency in Written Communication Skills: Taught

Frequency (Count – No. of courses)

Categories: Lecture, Online tutorials..., Reading, Online discussion, In-class discussion, Group work, In-class exercise, Reflective writing

Demonstrate Proficiency in Written Communication Skills: Assessed

Frequency (Count – No. of courses)

Categories: Research paper..., Group project, Report/ essay, Online discussion, Case study, Peer evaluation, Self evaluation, Article critique, Journal, Poster

Dyjur, Kenny

Example #4: Required Courses and Emphasis on Program-level Learning Outcomes

This chart lists the PLOs across the top, with course numbers of required courses listed down the side. It notes the depth to which each course contributes to student learning for each of the PLOs. When color coded, the result is similar to a heat map, showing at a glance the depth and emphasis of PLOs across the program.

COURSE No.	Disciplinary Knowledge	Critical Thinking	Written Communication	Research Skills	Ethical Reasoning
COURSE 112	I	I	I		
COURSE 115	I	I		I	
COURSE 120	D	I			I
COURSE 135	D	D	I	I	
COURSE 140	I	I			
COURSE 201	D	D		D	
COURSE 204	I	I	D	I	
COURSE 221	D	I			
COURSE 223	A	D			
COURSE 224	D	D	D	D	
COURSE 235	D	D			
COURSE 301	D	I	I	D	
COURSE 306	A			D	
COURSE 310	D	D		I	
COURSE 315	A	D		D	
COURSE 320	A	A	D		
COURSE 321	D	D		D	
COURSE 401	A	D	D	A	
COURSE 420	D			D	D
COURSE 430	A	A		D	D
COURSE 435	A	A		A	
COURSE 440	A	D			
COURSE 450	A	A	A	A	A
COURSE 460	D	D		D	

Scale:

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Adapted from California State University, Long Beach (n.d.) and Veltri, Webb, Matveev & Zapatero (2011).

Questions to Analyze the Data

1. Which program-level learning outcomes are being most/least emphasized? Is this intentional?
2. How is learning progression encouraged for each learning outcome? Is learning scaffolded as students reach higher levels of understanding?
3. Where are the gaps and redundancies? Does the program focus on what is important?
4. Is the program current and relevant?
5. What changes need to be made for the program to be the most sought-after of its kind?

Questions to Guide Discussions and Interpret Curriculum Mapping Data

General

- What general trends do you see in the data?
- What data presented most surprised you? Why?
- Where are our strengths? What are we doing well?
- Where are some areas for improvement?
- How do these results align or conflict with any other curriculum assessment results (e.g. student/faculty/employee feedback) or past program reviews? Where are areas of congruency or divergence?
- What are the next steps we can take improve and align our curriculum?

Learning Activities and Student Assessment Methods

- What learning activities/ student assessment strategies are we most/least using?
- How are the learning activities and student assessment methods used in the courses congruent with the discipline?
- How are the learning activities and student assessment methods used in the courses congruent with our program's/ faculty's/ institution's mission and vision?
- How are high-impact educational practices embedded throughout the curriculum?

- In terms of supporting student learning, how well are the learning activities and student assessment methods that we use working?

Learning Outcomes

- What learning outcomes are we most/least emphasizing?
- Where are the strengths and gaps in the teaching and assessment of these learning outcomes?
- How do our learning activities and student assessment strategies align with the intended learning outcomes?
- Which learning outcomes resonated (i.e. were clearly stated, and easily interpreted)? Which ones were confusing? How could learning outcomes be further clarified?

Workload and Progression

- How does student learning progress across the program for each of the learning outcomes? How could student achievement of the learning outcomes be better supported through this progression?
- How is student workload distributed across the semester?
- When have students and instructors expressed concern over workload during the semester? How could workload be more evenly distributed (Banta & Blaich, 2011)?

9

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Dyjur, Kenny

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