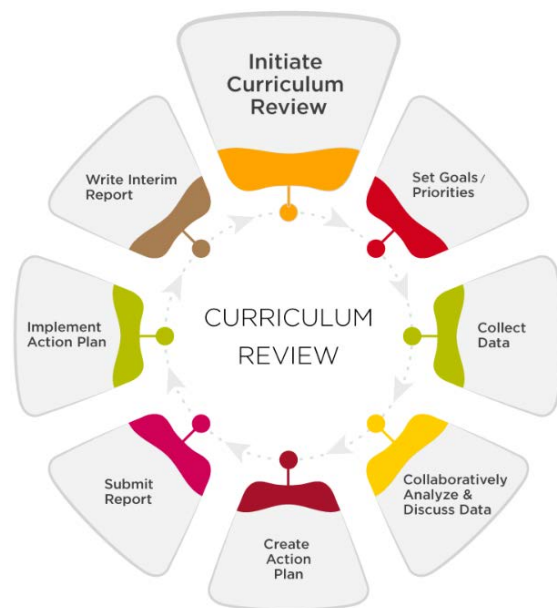# Curriculum Review:
Curriculum mapping

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Curriculum Mapping

What is curriculum mapping?

Curriculum mapping is the *process of associating course outcomes with program-level learning outcomes (PLOs) and aligning elements of courses with a program, to ensure that it is structured in a strategic, thoughtful way that enhances student learning* (adapted from Harden, 2001). While the language of mapping is used in the literature and these resources, the resulting diagrams often resemble a matrix more than a traditional map.

University of Calgary Definition and Description of Curriculum Mapping

- The process of associating course outcomes with program-level learning outcomes and aligning teaching and learning strategies and assessment methods for courses so the relationships between the components of the program can be identified. Curriculum mapping can include graduate attributes, where relevant to a program. The results are instrumental in identifying patterns, trends, gaps, and overlaps to ensure that the program is structured in a strategic, thoughtful way that enhances student learning. (University of Calgary, 2019, p. 6).
- Each faculty member who teaches in the program will participate in curriculum mapping by mapping their own courses (University of Calgary, 2019, p. 6).

Benefits of Curriculum Mapping

- Enhances standards of excellence in student learning
- Evidence-based means of evaluating programs
- Provides a view of the curriculum as a whole (Jacobs & Johnson, 2009)
- Relationships within the curriculum can be easily identified, such as connections between learning outcomes, student assessments, and teaching and learning activities (Tariq, Scott, Cochrane, Lee & Ryles, 2004)
- Encourages communication amongst faculty members within a program (Metzler, Rehrey, Kurz & Middendorf, 2017)
- Provides an opportunity for reflection (Fraser, Crook & Park, 2007; Tariq, Scott, Cochrane, Lee & Ryles, 2004)
- Helps faculty members to articulate tacit understandings about a program
- Helps faculty members to document program strengths (Uchiyama & Radin, 2009; University of Calgary, 2015; Wolf, 2008)
- Provides a context for planning and discussing the curriculum
- Easy identification of strengths, gaps and redundancies in a curriculum (Jacobs & Johnson, 2009)
- Supports the process of curriculum review and evaluation (University of Calgary, 2019)

Aligning Course Outcomes to Program-level Learning Outcomes (PLOs)

This example shows the alignment of a course outcome from a course to program-level learning outcomes (PLOs). The PLOs are listed across the top in abbreviated form. The instructor lists his or her course outcomes down the left-hand side. The instructor recorded the course outcome, and decided which of the PLOs it was associated with to a MODERATE to STRONG degree, not a weak or peripheral one.

The instructor will continue to add all course outcomes to the chart and note the alignment to PLOs.

	Disciplinary Knowledge	Critical Thinking	Communication	Research Skills	Ethical Reasoning
Write an essay, analyzing complex issues using multiple forms of evidence to support their argument.		X	X	X	

Aligning Learning Outcomes, TLAs, and Student Assessments

In addition to mapping learning outcomes, we can also map other activities such as teaching and learning activities and student assessments.

Constructive Alignment

Constructive alignment is a term used to describe *the fidelity between course outcomes, student assessment, and teaching and learning activities* (Biggs, 2014). Ideally an instructor will first define the course outcomes, and then align the student assessment and TLAs with the outcomes. A lack of alignment can be problematic in a course.

Learning outcomes — What are learners expected to know or be able to do?

Teaching & learning activities — How will the learners learn?

Assessment tasks — How will learning be assessed?
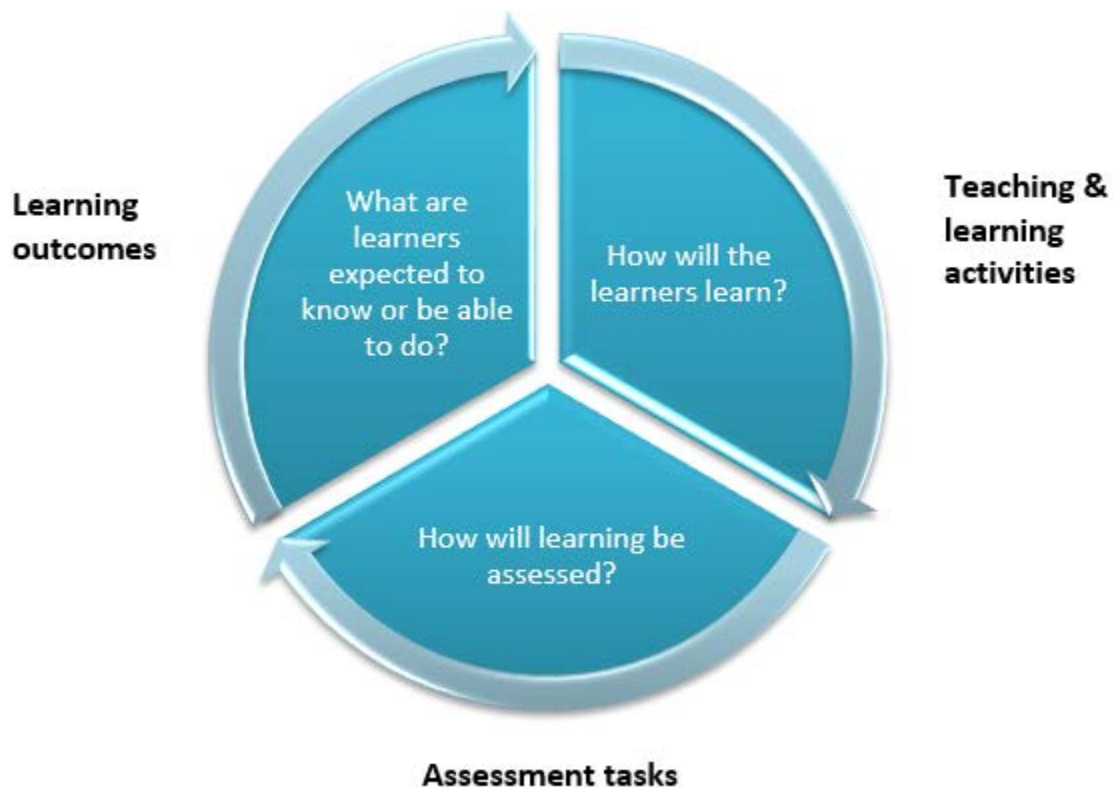
The following chart is similar to the one shown previously, but has two extra columns for teaching and learning activities (TLAs) and student assessments. The instructor has added information on the TLAs being used in the course to support student learning of the course outcome, and how it is being assessed.

	Teaching & Learning Activities	Disciplinary Knowledge	Critical Thinking	Communication	Research Skills	Ethical Reasoning	Student Assessments
Write an essay, analyzing complex issues using multiple forms of evidence to support their argument.	Lecture, readings, online resources		√	√	√		Research paper

In this example, the instructor has organized lectures, readings, and online resources for this learning outcome so that students can write an essay analyzing complex issues. The assessment is for students to write a research paper. While the teaching and learning activities should be helpful for students to achieve the learning outcomes, the instructor could strengthen the constructive alignment by building in some hands-on activities such as in-class writing, samples of multiple forms of evidence, peer feedback, and an example critique.

Mapping Scale

This same chart can also show the degree to which a program-level learning outcome is addressed by a particular course outcome by using a mapping scale. In this example, the scale used is I-D-A: Introductory, Developing, Advanced.

	Teaching & Learning Activities	Disciplinary Knowledge	Critical Thinking	Communication	Research Skills	Ethical Reasoning	Student Assessments
Write an essay, analyzing complex issues using multiple forms of evidence to support their argument.	Lecture, readings, online resources		D	D	I		Research paper

> **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 foundational knowledge, skills and/or competencies and entry-level complexity.
> **D = Developing:** The 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).

The scale indicates the expectations in the course regarding student learning. For example, at the introductory level, key ideas, concepts or skills are focused on foundational knowledge, skills and/or competencies and entry-level complexity. The mapping scale is particularly useful when examining courses across a program of study to see if student expectations of learning are scaffolded and progressing throughout.

Each program will identify a mapping scale that reflects their discipline and that people can use to indicate expectations of student learning. It is critical to define all mapping scale terms, and to discuss them with the group that will be doing the mapping. Everyone needs to be on the same page about the meaning of the terms to ensure that curriculum mapping data are valid. Working sessions or department meetings are both excellent opportunities to discuss mapping terms.

The University of Calgary does not require that a certain mapping scale be used. Each group can determine what works best for them. For example, if you are required to use a certain mapping scale for accreditation purposes, there is no need to repeat the mapping exercise. It makes most sense to use the same scale for both accreditation and curriculum review.

More examples of mapping scales can be found further on in the manual.

FAQs

Can I pick the mapping method?

- Typically the Review Lead picks the method that everyone will use to map the program
- Sometimes the Unit Lead, Associate Dean or Dean will define what mapping method will be used so that there is consistency across the faculty
- Everyone mapping a course within the same program will use the same tool and the same process.

Which courses are mapped?

- All required courses in a program: This is the bare minimum
- Courses that fulfill a requirement, if possible
- Courses within the discipline, if possible
- Optional courses: if feasible
- Courses from other disciplines: Consider on a case-by-case basis
- Relevant educational experiences in graduate programs for instance professional development activities
- Thesis or dissertation when appropriate

What elements of a course are mapped?

- Course outcomes are mapped to program-level learning outcomes (PLOs)
- Student assessments are recorded and may be mapped to individual course outcomes *or* to the course as a whole
- Teaching and learning activities are recorded and may be associated with individual course outcomes or the course as a whole
- Other elements of a course may be mapped, depending on what the review team is investigating. Examples include high-impact practices (Kuh, 2008), experiential learning, labs, and faculty or institutional initiatives.

Who does the mapping?

- The instructor of the course
    - If there have been several instructors who taught it, who did it most recently? Most frequently? Is there a course coordinator who should do the mapping?
- If there isn't an instructor to do the mapping:
    - RA, program coordinator or review lead can map the course working from the syllabus

What about courses with multiple sections?

- If only one section needs to be mapped, who does the mapping? The answers to the following questions may guide decision making.
  - Is there a lead instructor or course coordinator?
  - Is there a section that is typical of most sections of the course?
- If you want to compare multiple sections of a course, have most/all instructors map their section. This strategy enables you to check for consistency of student learning experiences.

How long will it take?

- The first map typically takes about half an hour.
- After that, instructors might take 15-20 minutes to map each course.

How to determine if a course outcome aligns to a PLO?

- Look for MODERATE to STRONG alignment.
- If a course outcome is weakly or peripherally associated with a PLO, do not indicate an alignment.
- Charts that include weak or peripheral association make it harder to interpret where the focus of the program is.

What does the output of the mapping process look like?

- If mapping is done using Curriculum Links (taylorinstitute.ucalgary.ca/curriculum-links), there are a variety of charts and tables that can be automatically generated. See the section on Curriculum Links for more information.
- If done on paper or in a .doc file, the data will have to be aggregated before you can see trends and patterns in a program.
- If done using a tool such as an online survey tool, the report can vary depending on how you set up the mapping process.

Methods for Curriculum Mapping

This section will provide an overview of four commonly-used methods for inputting curriculum mapping information and creating reports from the compiled data.

1. Curriculum Links
2. Paper-based approach and .doc files
3. Online survey tools
4. Excel spreadsheets

1. Curriculum Links

Curriculum Links is an online tool that can be used for curriculum mapping in higher education. It is a customizable tool that collects information on courses within a program, including course outcomes, teaching and learning activities, and student assessments, to create visual maps that inform discussions about trends and patterns across the program.

Use the reporting feature to create standard and custom reports that can be used to reduce redundancies, identify gaps in the program, and generate strategies to enhance learning.

Benefits	Drawbacks
Curriculum Links was designed specifically for curriculum mapping	Less functionality than Qualtrics
Multiple options to customize data gathered and wording used	Less flexibility than paper-based
Step-by-step process to set up the tool	Fewer support materials than other approaches
Create a standard report with the click of a button	
The tool allows you to create multiple reports with subsets of the data	
Does not require previous experience with other software (i.e., Excel)	

Because the tool is designed and built specifically for curriculum mapping, Curriculum Links offers a number of benefits. The tool is straightforward to use. The program walks the administrator through a step-by-step process to set up the review, and initial feedback from instructors indicates that they find it easy to use. The power of the tool is most evident after the mapping when compiling reports on aggregate data. Curriculum Links allows you to create multiple reports using different subsets of the data. For example, you might create a report on all courses, one on required courses, focus only on 400-level courses or those with labs, and so on. Certainly you can do the same using Qualtrics; however, that requires you to download the data into an Excel file to work with it; Curriculum Links does not require advanced knowledge of Excel.

As with the other options, there are drawbacks to using Curriculum Links. It is not as robust as Qualtrics, which has far greater functionality. It also has fewer support materials than commercial tools such as Qualtrics. Also, if you prefer a certain way of mapping learning outcomes that requires a more paper-based approach, Curriculum Links may not be the best choice for you.

Using Curriculum Links

For University of Calgary users, go to:

curriculumlinks.ucalgary.ca

or

https://taylorinstitute.ucalgary.ca/curriculum-links

Click:

Launch Curriculum Links

New users will need to register for an account. Click the Register button in the top right-hand corner and follow the instructions. Curriculum Links is not connected to Central Authentication Service.

User manuals can be found at:

https://taylorinstitute.ucalgary.ca/curriculum-links/manuals

For more information, please contact:

Patti Dyjur   Kim Grant
pdyjur@ucalgary.ca   grantka@ucalgary.ca

2. Paper-based Approach and .doc Files

In the past, mapping a program on paper was essentially the only option, and many programs relied on this method for decades. We have expanded the paper-based approach to include both hard copies of a document and using a .doc file to do it electronically.

Benefits	Drawbacks
Chart format makes it easier to see right away the constructive alignment (or lack of it) in an individual course	No report is automatically generated
Can be done electronically or in a face-to-face setting	Someone has to manually aggregate the data; the higher the number of courses that are mapped, the larger the workload
Complete flexibility to structure the mapping process to suit your department or faculty	

Using a paper-based approach offers a number of benefits when setting it up and during the mapping process. Mapping on paper allows for complete flexibility to structure the process to suit your group. Everything can be adjusted: the terms used, the number of course outcomes people can input, how the chart is arranged – things can be changed as needed. Piloting the mapping process is helpful in determining the changes needed prior to all faculty mapping their courses. A paper-based method is also beneficial for instructors when doing the mapping. Using a chart format makes it simple for them to see if their course is aligned with the program-level learning outcomes. The chart format makes intuitive sense to many instructors, and they can tell at a glance what is being asked of them (unlike online surveys that are often completed over multiple pages).

Challenges with this approach often occur when it is time to aggregate the data. In contrast to online surveys and Curriculum Links, there is no auto-generated report. Usually someone will have to put the data in electronic format so that charts can be made and the data can be properly analyzed. If there are only a few courses in the program, this isn't particularly problematic; in fact, it may be more time-consuming to use an online tool than paper-based if you are only mapping a few courses. However, the more courses that are being mapped, the greater the workload in digitizing and working with the data.

An additional factor to consider when deciding whether or not to use a paper-based approach is the preferences of your faculty members. If they vastly prefer a paper-based approach and you are not likely to get broad participation or buy-in using Curriculum Links or an online survey tool, then a paper-based approach makes the most sense.

More templates can be found at: https://curriculummapping.weebly.com/mapping-templates.html

Paper Based Approach and .doc File Example

Course Outcomes to Program-level Learning Outcomes: Adapted from an Undergraduate Program

Course Number and Name:	Teaching and Learning Activities (Identify)	Program-level Learning Outcomes									Student Assessment
		1. Knowledge of theories and concepts	2. Apply knowledge and skills in different contexts	3. Evaluate qualitative information	4. Evaluate quantitative information	5. Communicate orally	6. Communicate in writing	7. Critical thinking	8. Design and implement research	9. Ethical understanding	
Course Outcomes											

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).

Examples: Teaching and Learning Activities	Legend: Aligning Outcomes	Examples: Student Assessment
Lecture, demonstrations, reading, discussion, debates, problem solving, case studies, group projects, inquiry, essays, journals, research projects, field trips, practicum, simulations	**I: Introduced:** Concepts are introduced in this course but not explored in depth **D: Developing:** Students apply concepts to the level of competency **A: Advanced:** Students explore concepts to an advanced level	Exam with closed questions (multiple choice, true/false), Exam with open-ended questions (short answer, essay), report, research paper, portfolio, journal, reflection, written assignment, presentation, oral project, project, skill demonstration

3. Online Survey Tool – Qualtrics

The University of Calgary has purchased an institutional license to the online survey tool Qualtrics. The tool can be used to conduct curriculum mapping through a web browser, with results compiled into a basic report. Further analysis can be done by downloading the data into an Excel spreadsheet and working with it further.

Benefits and Drawbacks of Using Qualtrics

Benefits	Drawbacks
Flexibility with the number and types of questions and response formats	Vertical and horizontal scrolling
Better reporting than some of the other methods for those with expertise	If people are completing the survey from a distance, you need to give very clear directions so that they understand the task
Many participants will be familiar with the tool; support issues are likely to be fewer than other methods	Advanced reports will require time and effort to generate (just like other methods)

There are many benefits of using Qualtrics for curriculum mapping. It is a great option when some of the faculty members who will be doing the mapping are at a distance, or you have sessional instructors who will not be coming to campus to attend a mapping session. It allows for a wide range of flexibility in almost every aspect, including choice of terms, number and types of questions, and response formats. The generated report may be adequate for your purposes, and if not, you can download the data into an Excel spreadsheet for further analysis. Additionally, many participants are familiar with online surveys.

Several drawbacks also merit attention. First, if using the table format to indicate alignment between course outcomes and PLOs, the participant will probably have to contend with both vertical and horizontal scrolling, something that many users dislike. Instructions for the mapping process need to be very clear so that people understand the task. If not, the data collected will be less accurate. Additionally, creating advanced reports will require time and effort.

For more information about creating a Qualtrics account, go to:
https://oia.ucalgary.ca/qualtrics-login

To see an example of curriculum mapping done through Qualtrics, access the following survey:
try-curriculum-mapping-survey *(or the following)*
https://survey.ucalgary.ca/jfe/form/SV_8Cc1k5K6LM0qBWB

The sample survey is for test purposes so please feel free to test it out and submit any information.

Setting Up Your Qualtrics Survey

If you have a Qualtrics account, we can send you a copy of our curriculum mapping survey to modify. Please contact one of us for more information:

Patti Dyjur   Kim Grant
pdyjur@ucalgary.ca   grantka@ucalgary.ca

Course Mapping in Qualtrics:

It is possible to map course outcomes to program-level learning outcomes in different ways, depending on the functionality of the tool. The following example in Qualtrics uses text entry (form) to add course outcomes. Then a side by side table was added, using text piping to pull in previous answers (course outcomes) in the left-hand column.

1. Please enter your course outcomes. If you have fewer than 10 course outcomes, please leave the remaining fields blank. (text entry format, form)

2. Please indicate how each of your course outcomes, listed down the left-hand column, relates to the program-level learning outcomes (PLOs) which are located across the top.

Please indicate how each of your course outcomes relates to the program-level learning outcomes.

	Develop a knowledge base of theories and concepts within their primary area of study				Use different approaches to solving problems using well established ideas and techniques within the discipline				Locate and critically evaluate qualitative information				Locate and critically evaluate quantitative information				Formulate and communicate arguments in writing based on information, theories, and concepts				Formulate an communicat arguments orally based on information theories, an concepts		
	N/A	Introductory (I)	Developing (D)	Advanced (A)	N/A	I	D	A	N/A	I	D	A	N/A	I	D	A	N/A	I	D	A	N/A	I	D
Critically examine program evaluation approaches and processes	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Apply appropriate standards in program evaluation	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Note: As you can see, if you have several course outcomes and PLOs, it will require the instructor to do both horizontal and vertical scrolling in order to complete the mapping process in Qualtrics.

4. Excel Template

Using Excel to conduct curriculum mapping is not done frequently as we have tools that are generally easier to use and produce simple reports. However, if your faculty or department is accustomed to working in Excel, it could be the method for you.

Benefits	Drawbacks
You can produce some amazing charts and graphs if you have the skills to work in Excel	No report is automatically generated
Can be done electronically or in a face-to-face setting	Someone has to work in Excel to aggregate the data
If your group is accustomed to working with Excel it could make the most sense to use it	The Taylor Institute cannot provide support for curriculum mapping or data analysis in Excel

Excel Template Example

Please contact one of us for a sample curriculum mapping template in Excel:

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pdyjur@ucalgary.ca   grantka@ucalgary.ca

Instructions for Curriculum Mapping Online

It is critical to have clear, detailed instructions for online curriculum mapping, especially if some of the participants are mapping their courses from a distance and have limited or no opportunity to discuss the process in person. Although it is preferable to offer a workshop or drop-in session so people within the same program can discuss the mapping scale and the process of mapping their course, this is not always possible. Good instructions will help to ensure that the mapping information is accurate.

The following introductions will give you a starting point for your instructions. Please use or adapt them as needed.

Introduction:

> Thank you for filling out this survey. In it you will be asked questions about a course that you teach that is currently part of the curriculum review process. Please fill out a separate survey for EACH course that you are mapping, as identified by the Review Lead. You may find it helpful to work from your most recent course outline. It will take approximately 15 - 30 minutes to complete each survey.
>
> Information from all courses under review will be compiled to produce a report on the program. These data, along with student survey data, will inform discussions around what is working well in the program and changes that should be considered
>
> Thank you for your participation!

Mapping Instructions:

On this page, enter your course outcomes. For each course outcome, indicate which program-level learning outcomes (PLOs) it is associated with to a MODERATE or STRONG degree. Please do not indicate an alignment if the course outcome is associated weakly or peripherally to the PLO.

To indicate the expectations of the level of student learning we will be using the scale Introduced, Developing, Advanced. A description of the scale is as follows:

C
      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.

B
      Developing: The course 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.

- Locate and critically evaluate qualitative and quantitative information.
- Formulate and communicate orally and in writing arguments based on information, theories, and concepts.
- Apply knowledge and skills in a variety of contexts, including situations that are new to the student.
- Conceptualize, design, and implement research for the generation of new knowledge or understanding within the discipline (Council of Ministers of Education, 2007).

For assistance please contact your Review Lead or support person (names and contact information here).

Mapping Instructions:

Questions to Include in an Online Curriculum Mapping Survey

This section offers some suggestions and starting points for questions you might consider asking instructors as they map their courses. If you do not need the information for your program analysis it can be deleted.

Course demographic information:

3. Your name: (text box)
4. Email address: (text box)
5. Course code and number (eg. UNIV 201) (text box)
6. Course level: (radio buttons)
    - 200
    - 300
    - 400
    - 500
    - 600
7. When was the last time you taught this course?
8. Course requirement status (check all that apply):
    - Required for degree
    - Required for Honours degree
    - Can fulfill a requirement
    - Optional course
9. Does this course have labs?
    - Yes
    - No
10. Is this a seminar course?
    - Yes
    - No
11. In general, do students have the prerequisite knowledge and skills to be successful in this course? Please comment. (text entry)
12. What learning technologies are used in this course? (text entry)
13. How do you incorporate Indigenous perspectives into the course? (text entry)
14. Which of the following high-impact educational practices (Kuh, 2008) are emphasized in this course? (check all that apply)
    - First-year seminars and experiences
    - Common intellectual experiences
    - Learning communities
    - Writing-intensive courses
    - Collaborative assignments and projects
    - Undergraduate research

- Diversity/ global learning
- Service learning
- Community based learning
- Internships
- Capstone courses and projects

15. Please add any additional information that may be helpful in the curriculum review. (text entry)

Student Assessments and Teaching and Learning Activities

Mapping student assessments and teaching and learning activities is required as part of the curriculum mapping process. With both student assessments and teaching and learning activities, you have the choice of mapping them to specific course outcomes, or to the course as a whole. Both have benefits so you can pick the way that works best for your review. By mapping them to each course outcome, faculty members are prompted to think about whether or not they are including learning experiences for each course outcome, and how they are assessed. Through the mapping process they might make minor tweaks to the course to bring it into alignment. However, it requires more work on the part of the instructor. By mapping student assessments and teaching and learning activities to the course as a whole, the process is streamlined.

Student Assessments

Two common question types for identifying student assessments are check boxes and text entry:

> Indicate the ways in which you assess student learning of the course (or course outcome). Check all that apply:
> - Authentic assessment
> - Community action project
> - Documentary
> - Exhibit
> - Final exam
> - Paper, essay or written assignment
> - Performance
> - Portfolio
> - Presentation or oral assignment
> - Problem set
> - Project
> - Quiz or midterm
> - Reflection
> - Service learning project plan
> - Skill demonstration
> - Other (please specify)

Alternatively:
> How do you assess student learning in the course (or of this course outcome)? (text entry)

Teaching and Learning Activities

Indicate the teaching and learning activities associated with this course (or course outcome). Check all that apply:

- Conduct an experiment
- Connecting with Elders
- Cross-cultural dialogues
- Discussion
- Envisioning, learning through visualization
- Field trip
- Group work/ group project
- Homework
- Internship or practicum
- Labs
- Land-based activities
- Lecture or presentation
- Observations
- Online discussions
- Online tutorials
- Participating in Indigenous Ceremonies
- Peer evaluation
- Problem solving
- Readings
- Storytelling
- Talking circles or sharing circles
- Tutorial groups
- Writing activities
- Research
- Simulations
- Other (please specify)

Alternatively:

Indicate the teaching and learning activities associated with this course outcome: (text box)

Mapping Course Content

You may want to add additional questions related to the survey, relating to your guiding questions for the review, institutional or faculty priorities, or other things relating to courses in the program. The following questions are meant to provide some suggestions.

16. What are the major concepts and theories in this course? (text entry, form)

The needs of your faculty or department might require you to map course content in a more granular way; for example, you may need to show more detail as part of accreditation requirements. In that case, you might decide to map concepts, theories, topics, and so on to each course outcome.

Deciding Which Method to Use when Mapping Courses

This chart represents some of the considerations to think about when selecting a method for curriculum mapping. One important issue to consider is whether or not your faculty members have a preference for a specific method, tool or application. If so, it could be much easier getting buy-in if you are using a familiar method.

```
                                          Faculty        →    Use that
                                          preference           method

                         Which Tool?

      Few courses              Easy to use  ──────────────→   Robust
           ↓                        ↓                      functionality
       Maximum                  Easy setup                     ↓
       flexibility                 ↓                     Toggle between
           ↓                   Great reporting           chart types in
       Does not                    ↓                       the report
    require digital                                           ↓
        access

         ↓                         ↓                          ↓
        Word                  Curriculum                  Qualtrics
      Documents                  Links
```
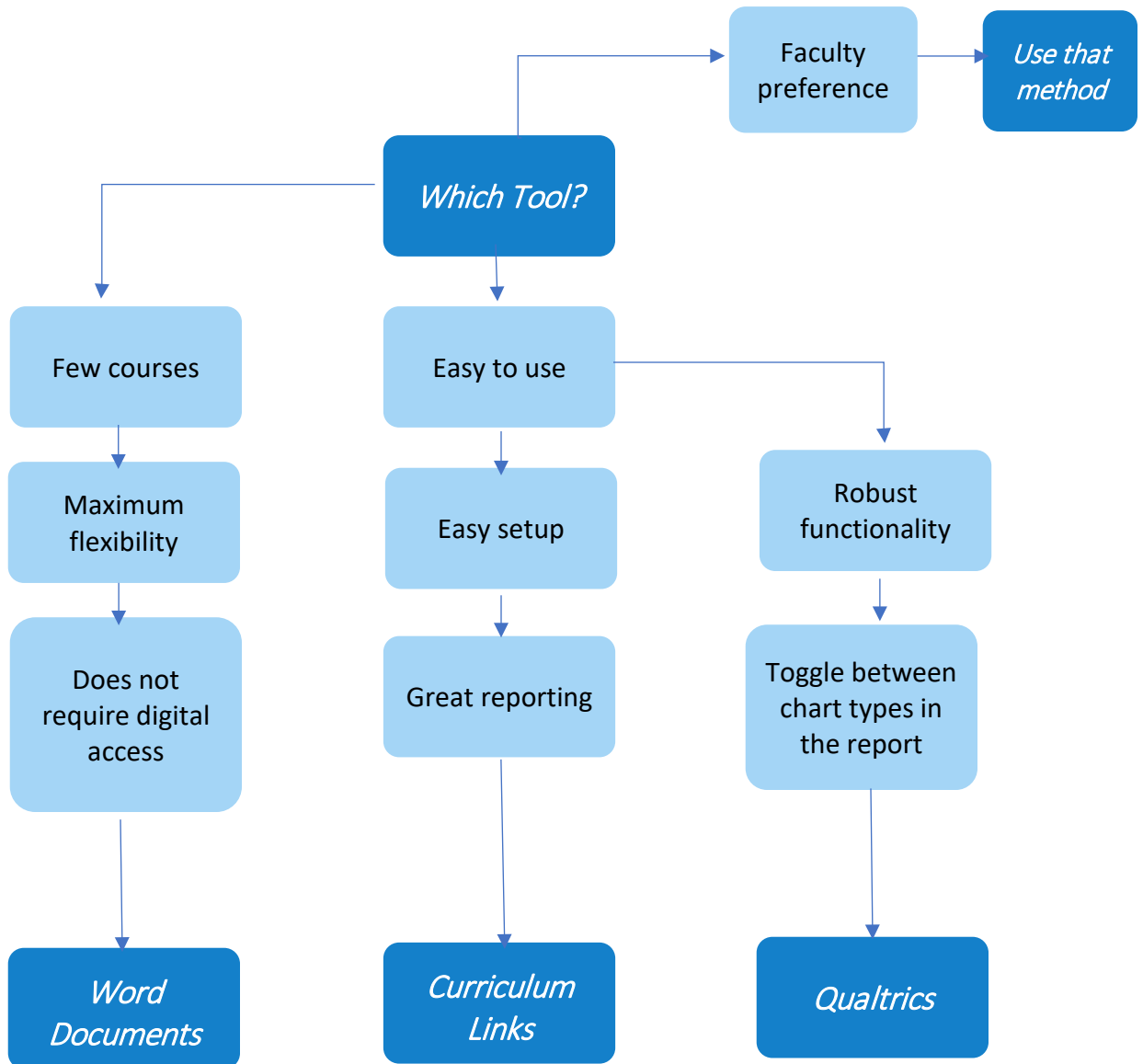
Recommendations for Curriculum Mapping

Regardless of the method:

- Clear and ongoing communication are critical. Your group needs to know how the process works, what the expectations are, what they are mapping for which courses, and due dates.
- Mapping a course is very challenging when the course outcomes are poorly written. Have a strategy for support regarding course outcomes. The Learning and Instructional Design Group at the Taylor Institute provides support on course outcomes across campus and may be able to facilitate a session for your instructors or provide one-on-one support.
- Have the course instructor do the mapping if at all possible.
- Discuss the mapping scale with the entire team prior to mapping so that people are using it in a consistent way.
- Have a strategy for mapping support. Some groups provide support in more than one way. For example, they schedule a drop-in session for those who have questions as well as providing one-on-one support.
- Identify who will be responsible for data representation and analysis.

Summary of the Curriculum Mapping Process

- The process of making associations or connections
- Must align with the needs of the program or faculty
- Easily accessible and portray a clear picture of what information should be recorded in the map
- Can be done in various ways
- Program-level learning outcomes must be written before a department/ faculty can do curriculum mapping
- Course outcomes must be written before an individual can map his/ her course
- Other things can be mapped as well

Examples of Scales to Map Course Outcomes to PLOs

There are a variety of scales that can be used to indicate the degree to which a program-level learning outcome is addressed by a particular course outcome. The following are examples that can be used or adapted. It is critical that all instructors are using the same scale when completing their maps, and that they are on the same page regarding the meaning of the terms used in the scale. Therefore, it is recommended that a definition of the terms is provided to instructors and that they have the opportunity to discuss and work with the scale prior to using it to map their courses.

Examples of Potential Scales:

Introduced (I)   Key ideas and concepts concentrate on knowledge or skills at a basic level. Instructional and learning activities address basic knowledge or skills at an entry-level complexity.

Developing (D)   Students demonstrate learning at an increasing level of proficiency. Instructional and learning activities concentrate on enhancing and strengthening existing knowledge and skills, as well as expanding complexity.

Advanced (A)   Students demonstrate the learning with an increasing 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 Veltri, Webb, Matveev & Zapatero, 2011).

Introduced (I)   Concepts are introduced in the course but not assessed.

Competency (C)   Students are expected to reach a level of competency regarding the outcome. Students are assessed on the learning outcome.

Advanced (A)   Students are expected to reach a level of proficiency regarding the outcome.

Novice (N)   Beginning level of understanding or performance.

Competent (C)   Adequate level of understanding or performance.

Proficient (P)   Advanced level of understanding or performance.

Introductory (I)	Beginning level of understanding; not assessed in the course.
Comprehension (C)	The learning outcome is assessed for mental understanding.
Applied (A)	Concepts are applied by the student and assessed. Examples: project work, problems, calculations, and demonstrations.

Introduced (I)	Concepts are introduced in the course but not assessed.
Practiced (P)	Students practice their ability and understanding of the learning outcome.
Demonstrated (D)	Students demonstrate their ability and understanding of the learning outcome.

Comprehension (C)	Students comprehend concepts or topics. Student assessment focuses on knowledge and comprehension of material.
Application (A)	Students are asked to analyze or apply concepts or topics. Student assessment focuses on analysis or application; for example, problem-solving or essays.
Evaluation (E)	Students used concepts or ideas to evaluate within the discipline or create something new. Examples include project work or generating plans for a client.

Another approach would be to use the ICE (Ideas, Connections, Extensions) model developed at Queen's University by Fostaty, Young and Wilson (2000), based on Bloom's Taxonomy:

Ideas	Ideas represent the building blocks of learning. They can be discrete 'chunks' of information; facts, definitions, vocabulary, steps in a process; or discrete skills. Assessed by tasks requiring (or allowing) recall and repetition of information from books or from lectures.
Connections	At the subject or topic level, connections are made by making appropriate links between ideas (or chunks of information). At the personal or broader level, connections are made by relating new knowledge to what is already known, in a course, in other courses, or in a student's personal or professional experience.
Extensions	Extensions involve re-working students' knowledge and understanding by extrapolating, predicting outcomes or working out implications.

Inquiry Learning Scale:

This scale can be used or modified to capture the level of inquiry learning being used across the program in courses that include labs:

Confirmation	Students replicate results using predetermined processes.
Structured	The question and methods are predetermined for students, who investigate for a solution.
Guided	Students select an inquiry question from a predetermined list. They decide on the methods to be used in the investigation. An answer has not been predetermined.
Open	Students select the question to be investigated, and the methods they will use to study it. The results have not been predetermined.

(Adapted from Arslan, 2013, and Bell, Smetana, & Binns, 2005)

Two-Step Scale for Non-credit Learning Opportunities

Foundations	Foundational knowledge is emphasized, including information, discrete facts, concepts, or basic skills. There may or may not be evidence of learning from participants.
Extensions	Learning goes beyond the foundational level to make connections between facts or ideas, relating knowledge to personal experience, understanding multiple perspectives, and/or analyzing information. Participants evidence their learning in one or more ways.

Two-Step Scale for Graduate-level Degree Programs

Core	Fundamental learning is demonstrated at a moderate level of competence. Learners demonstrate strong knowledge and skills of foundational concepts and can apply them in a variety of contexts.
Advanced	Learners demonstrate a high degree of knowledge and skill in a variety of foundational concepts.

Mapping Other Characteristics of a Program

While it is extremely beneficial to map learning outcomes across a program of study, you may also want to capture other characteristics of a program. To do so you will create a customized mapping strategy which will likely require a different mapping scale than those suggested in this manual.

Example: Level of Inquiry in Lab Courses

Year and Course	Labs	Confirmation	Structured	Guided	Open Inquiry	Notes
Year 1: 201	Lab 1	x				Required course
	Lab 2	x				
	Lab 3	x				
	Lab 4	x				
Year 2: 301	Lab 1	x				Required course
	Lab 2	x				
	Lab 3		x			
Year 3: 401	Lab 1	x				Required course
	Lab 2		x			
	Lab 3		x			
	Lab 4			x		
Year 4: 501	Lab 1		x			Required course
	Lab 2			x		
	Lab 3			x		
Year 4: 550	Lab 1		x			Optional course
	Lab 2			x		
	Lab 3				x	
	Lab 4				x	

Scale:
Confirmation: Students replicate results using predetermined processes.
Structured: The question and methods are predetermined for students, who investigate for a solution.
Guided: Students select an inquiry question from a predetermined list. They decide on the methods to be used in the investigation. An answer has not been predetermined.
Open: Students select the question to be investigated, and the methods they will use to study it. The results have not been predetermined.
(Adapted from Arslan, 2013, and Bell, Smetana, & Binns, 2005)

By mapping the level of inquiry in each of the labs, instructors can see how inquiry-based learning is developed in students across the lab components of a program.

Example: Mapping the Graduate Attribute Life-long Learning

You may want to investigate a specific learning outcome deeply. In this example, the graduate attribute 'life-long learning' is being mapped to discover what assignments and activities contribute to student learning in required courses in the program, where feedback is provided, and how life-long learning is being assessed.

Rather than mapping to program-level learning outcomes (PLOs), in this example we are mapping to characteristics of life-long learning. The characteristics were determined by using the definition of life-long learning provided by the Canadian Engineering Accreditation Board and an environmental scan. Another source could be literature in the field.

Activity/ Assignment	Characteristics of Life-long Learning			
	Identify & Address One's Own Educational Needs	Maintain Competence	Reflection	Metacognition
UNIV 201				
Research paper		G		
Accuracy check		I		
In-class small group debrief of exam results				I
UNIV 301				
Project		G		
Research paper		G		
UNIV 311				
None				
UNIV 401				
Professional development plan	G			
Process analysis			G	
UNIV 430				
Journal review	G			
UNIV 450				
Interest/knowledge/ skills pre/post checklist	I			

Mapping Scale:

I: Informal activity — An activity done in class, out of class or online that is not graded. Students may or may not receive feedback on the activity.

G: Graded assignment — An assignment for which students receive a mark that contributes to their final grade in the course.

Decisions to be made for all Curriculum Mapping Approaches

Decision	Notes
Method or Tool	
Who selects the tool?	
What are the needs of faculty?	
What method would work best considering your guiding questions?	
Mapping Scale	
How will the scale be determined?	
How will you test the scale and revise wording to suit your group?	
How will you work with faculty to calibrate the scale and ensure the data are valid?	
Communication Plan	
How will instructors be informed about the mapping process?	
What gets mapped	
Course outcomes to PLOs, teaching and learning activities, student assessments (required)	
Will student assessments/teaching and learning activities be mapped at the course level, or at the level of course outcomes?	
Other aspects of the course? For example, high-impact practices, labs, faculty or institutional initiatives?	
Which courses? Required, fulfill a requirement, all?	
All sections or one?	
Timeline and Deadlines	
How much time will we need to pilot/revise the mapping process?	
How much time will instructors need to map their courses? Will it be done in a retreat or on their own time?	
Recommendation: build in a second deadline to complete the courses that have not been mapped	
Support for Instructors	
How will tech support be provided?	
Who else will support the process (i.e., curriculum terms, due dates)?	
What to do if an instructor does not map his/ her course?	
Who is responsible for aggregating the data?	
How will data be presented?	
Who analyzes the data?	

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