CIRTL Planning Project for Basics of Online Learning & Teaching (BOLT) Course

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Contents

Assignment Overview

The goal of this assignment is to leave the course with draft asynchronous or synchronous materials for the online course you have been planning. We have provided a project template document which is designed to help you conceptually develop those materials. During the synchronous sessions of the course in August we would like you to lead us through your course unit with a brief online presentation in Blackboard Collaborate. The table below shows the components of the project, and how they align with the units in the course.

Learning objectives

Our learning objectives are for you to:

- Experience presenting synchronously in Blackboard Collaborate
- Engage your peers in learning about your course design
- Create content to illustrate your unit design
- Describe the pedagogical concepts from our class that are supporting your development of content

Planning Project Section	Units/Weeks of CIRTL course that correspond
A. Course Information	Unit 1
B. Learner Profile	Unit 2, Unit 3
C. Content Planning	Unit 3, Unit 4
D. Feedback and Assessment	Unit 5
E. Activity Planning	Unit 3, Unit 4, Unit 5, Unit 6

Guidelines for completing the project:

- You can choose to plan out one module, and entire course, or anything in between, according to your personal goals
- You can also choose to work individually or in a pair. Working in pairs is encouraged so that students can get experience with collaborative course design.
- We also recommend adding ideas to **this document** in draft form as you develop them while working through weeks 3, 4 and 5 of the BOLT course, rather than waiting until the end of the course to complete the whole project.
- There is no designated or required page length for this project. Write as much as you need in order to provide the relevant information and answer the questions effectively.

Sharing your draft content

We will create space in Moodle for you to share your draft content. Please plan to post what you have to receive feedback. Plan to provide feedback to other students on their work as well. A **rough draft** of content, activity and assessment are all that is required here.

Online presentation

You will have ~10 minutes to present your project design. We would like you to create a series of PowerPoint slides that follow the basic outline of this document. (e.g., Course Information, Learner Profile, Content, Feedback and Assessment, Activity Planning). Be sure to describe the pedagogical concepts from our class that are supporting your development of content, activities, and assessments.

Be creative. You could, for example, have us review a summary of your project in advance of class and lead us through an activity in Blackboard Collaborate during your presentation.

By Sunday of the week you present, submit any materials that you would like the class to review before your presentation (e.g., example pre-class assignments). We will make sure that they are available to all students.

No later than Monday, the day before you present, please submit your PowerPoint slides for instructors to load into Blackboard Collaborate. Animations will not work in BBC, so your slides will be static. At this time, be sure all course materials you are presenting are loaded to a public course wiki for peer feedback. (Instructions will be sent closer to the time.)

-----END OF INSTRUCTIONS-----

A. Course Information

In this section, please enter information about the course that will form the basis of your CIRTL Course Planning Project. Replace the [brackets and text] with the relevant information. (BOLT course Unit 1)

Title

Introduction to Carbohydrate Synthesis and Glycobiology

Description

Level: Advanced undergraduate

Topics: Synthesis of complex carbohydrates in the lab and their biological roles

Activities: Primary Literature analysis, discussions, problem-sets

Format: Blended

Stage: New

Course-level Learning Objectives

1. Identify the general roles carbohydrates play in biology at a cellular level (ex. Cell-Cell Signaling, protein modification, etc.)
2. Describe the structural differences of the common sugars (ex. Gal, Glu, Man, Fuc, GlcNAc, GalNAc, Rha, Neu5Ac, Xyl, etc.)
3. Compare and contrast the open chain and cyclic forms of sugar monomers
4. Discuss how the mechanism for converting between the open chain and cyclic form gives rise to alpha/beta isomers
5. Differentiate between the two main glycolysis pathways in cells including cellular location, structures, etc.
6. Based on the nature of carbohydrate biosynthesis explain the difficulty in isolating and studying biologically relevant carbohydrates including comparisons to protein, DNA, and RNA synthesis
7. Explain the basic mechanism of glycosidic bond formation and the factors affecting whether it is S_N2-like or S_N1-like and which isomer will be predominately be formed (alpha vs. beta)
8. Discuss the pros and cons of common types of glycosidic donors from a synthetic standpoint

University Information (Optional)

I don't have a specific university in mind for this course. I currently attend Michigan State University but am hoping to teach at a smaller primarily undergraduate university (PUI)

Student Information (Optional)

This is a course for junior or senior undergraduates in chemistry or biology majors. A pre-requisite is a full year of Organic Chemistry. Ideally students should have some experience with biochemistry and molecular biology but not all chemistry departments require chemistry majors to take those courses.

B. Profile of Learners

Answer the summary questions about the learners that you anticipate having in your CIRTL Network course. Consider the ideas from Unit 2 about providing supports and scaffolds, and also consider the process and results of the Week 2 exercise in which you produced a learner profile, addressing your students' characteristics such as:

- Culture/language
- Online learning experience
- Academic background/needs
- Motivation/other responsibilities
- Learning/computer skills
- Computer/technology skills access

(BOLT course Units 2, 3)

Summary questions:

1. Considering what you learned about your students during the week 2 exercise, how diverse or homogeneous are your students, i.e., what characteristics are your students likely to share and not share?

   They are more likely to be digitally literate than I am but to varying degrees. They are also likely to have varying access to technology and experience with online learning. Because chemistry courses are generally linked to a lab online course exposure is likely to be minimal, but some students might have experience from general education courses. Related to course content they should all be familiar with the basics of organic chemistry to the same extent as most PUIs don't contain multiple organic chemistry course levels. Their biological knowledge may be vastly different. Upper-level biology majors have been exposed repeatedly to the central dogma of biology and have familiarity with the complex pathways in biological systems. Socio-economically there is likely to be a wide range in ability to afford technology/materials for the course and access to reliable internet.

2. In what ways are the collective learner characteristics most likely to affect how you plan and teach your online course?

   Previous experience with organic chemistry will make it possible to cover the synthesis portion faster while the glycobiology will require balancing introducing students to the material without boring students who have previous experience with biology basics. The

other way is choice of technology. I am more likely to utilize free software or software where the university pays for the licensing even if it is not the ideal technology as I want to minimize the financial burden on my students

3. What challenges or opportunities come to mind for this group when you think about them taking your online or blended course?

    Because there are two different majors taking the course this is an excellent time to enforce the interdisciplinary nature of science through a real-world example. By identifying student backgrounds in a pre-course survey, groups can be designed that contain chemical and biological expertise that will be combined over a semester long project to propose a research project that requires synthesis of carbohydrates to study a biological phenomenom.

4. What kinds of learner supports are available at your institution to support your online course students?

    Most institutions have an IT department for students they can remotely or in person help with software installation and updates.

5. List two or three course design elements or instructional strategies that could address the challenges or opportunities you identified.

    To overcome the need to balance introductory vs review of basic biological principles I will create optional modules that are basic reviews of important biological principles for the class. That way if students need to learn about them, they can and students who have previous experience don't lose motivation reviewing topics covered multiple times in other classes.

    To mitigate unfamiliarity with distance learning the course website will have a FAQ page that will be updated throughout the course and include an anonymous suggestion/question box.

-----END OF LEARNER PROFILE-----

C. Content Planning

In this section, you will plan the content of one unit/chapter/module for online delivery. Pick a unit that will lend itself to the planning of one engaging activity in later stages of this course planning project. Replace the [brackets and text] with the relevant information. (BOLT course Units 3, 4)

Unit: Structural features and visualization of carbohydrates

Unit-level Learning Objectives

1. Describe the structural differences of the common sugars (ex. Gal, Glu, Man, Fuc, GlcNAc, GalNAc, Rha, Neu5Ac, Xyl, etc.)
    1.1. Draw a Fischer projection, Haworth projection, or chair conformation given the name of a common sugar monomer.
    1.2. Name a sugar based on its Fischer projection, Haworth projection, or chair conformation.
2. Compare and contrast the open chain and cyclic forms of sugar monomers
    2.1. Classify the functional groups present in the open chain and cyclical monomers
    2.2. Draw the mechanism for carbohydrate cyclization using the curved arrow formalism.
    2.3. Predict the distribution between open and cyclic forms using ideas about chemical stability
3. Discuss how the mechanism for converting between the open chain and cyclic form gives rise to alpha/beta isomers
    3.1. Outline the rules for determining which isomer is depicted.
    3.2. Identify which isomer is depicted by a given structure.
    3.3. Draw the mechanism for carbohydrate cyclization using the curved arrow formalism.
    3.4. Using molecular orbital theories explain the energy differences that give rise to the anomeric effect.

Unit Content / Activities Overview

This section introduces students to the common monomers found in biologically relevant carbohydrates. Students also learn about the different structural forms sugars take in solution and how the structures affect their functions. Conventionally this unit is taught by lecture with students expected to take time outside of class on their own to master the material. Sometimes worksheets are used to give students practice.

Content Checklist

Where applicable, mark an X in one of the columns for any content item that will be used in the planned lesson.

Types of Content	Already have	Need to find or develop
1. Syllabus or unit introduction		X
2. Textbook	X	
3. Print readings or documents		
4. Lecture notes		X
5. PowerPoint slides		X
6. Graphics (pictures, diagrams, images, etc.)		X
7. Tables, charts, spreadsheets	X	
8. Glossary		
9. Audio and/or video files		
10. Animations		X
11. Simulations		
12. Online articles or websites		
13. Student-generated content (describe)		
14. Other (describe)		
Add any relevant notes about any of the above-mentioned items, if applicable:		

Content Planning

Answer the following six questions to the best of your ability at this point.

1. Which types of media will be used for the online content and what considerations are involved in content delivery, if any?
   Students will watch a series of short online lectures each targeted to a specific learning objective. There will be a short-written supplement to the textbook that digs deeper where the textbook is lacking

2. How does this content tap into students' motivation? Does the content need to be modified in any way to boost its ability to engage students?
   For chemistry students the relation between structure and function should motivate them as this is a key idea from every discipline in chemistry. For biology students dealing with minute structural details may be less common and motivating as carbohydrates are usually depicted as colorful shapes (triangles, squares, circles, etc.) It may require reframing the importance of scale.

3. Which, if any, of the sources may require permission to use? Do you have permission or know how to secure it? Graphics may require permission but most journals have a well documented process for requesting permission

4. How ready is this content for online delivery, e.g., chunked, formatted, and web-ready (if applicable)?
   It is not ready for online delivery

5. Who, if anyone, is available at your institution to help with content production, editing, formatting, etc.? Investigate if you do not know. Will you require help from this person/service unit?
   The departmental IT staff can help with web design and the online formatting. Unfortunately, they don't provide help with video editing and formatting. There is also a college wide IT department that specializes in the learning software we use.

6. If you are using student-generated content, how will you gain access to it? Will the students send it to you somehow? Distribute it to each other? Post it somewhere? Will you need to edit or prepare the content before distributing it to students?

Besocratic.com can de-identify student answers so that it can be easily shared.

Content Development

We want you to leave the course having assembled at least a rough draft of the unit you are planning. Begin to assemble your content. Outline what information you will use to cover your topic. Begin to assemble/write the text that you want to use. Think about how it will be delivered online. Begin to format it appropriately (e.g., chunked). If you have visuals you want to include, begin to gather those. Put this information together in draft format (e.g., a Word document, or PowerPoint slides).

-----END OF CONTENT PLANNING -----

D. Feedback and Assessment

Using what you have learned in Unit 5, you should reflect on your learning outcomes and course content to tie them to how you will assess whether or not these goals have been achieved.

1. Will there be a formal assessment of this activity? If so, what kind? What are the criteria for assessment (proof of learning)?

The activity itself will be graded for completeness and effort but questions will appear on their online homework (graded for effort) and a couple questions will occur on the either a mid-term or final. Criteria will be the ability to select the right depiction of the named sugar or structure on multiple choice/fill in the blank questions and providing chemical explanations on short answer questions.

2. Will students receive feedback about their work along the way? If so, on which part or parts of the activity will the students receive feedback?

The activity will be gone over as a class so students will get non-specific feedback there, but they will get more personalized feedback on homework with related content on it.

3. What kind of feedback will they receive, and at what stage(s) of the activity? Is there a rubric for evaluation of these criteria and has it been communicated to the students? From whom will they receive it, and how?

Students will be working in small groups with the ability to ask questions and receive feedback while they are working on the activity from the teacher. Once the activity is completed the class will go over the activity together with the instructor leading the discussion. Finally, feedback

from homework will come in the form of a recap session at the beginning of a lecture session using de-identified answers from the besocratic software highlighting common answers/themes.

4. Is each learning outcome aligned with the assessments you have selected? Keep this alignment in mind as you develop activities in the next section.

Yes. The activity provides guided practice while the homework and short answer test questions allow for probing of the student's ability to explain the phenomenon, while the multiple choice/fill in the blank questions allow for the testing of the students ability to perform the transformations/switch between depictions.

Content Development

Consider how you will include your assessment in the development of the draft of the unit you are planning. Will it be an assignment coupled to the activity you will develop in the next part of this document? Will it be an online quiz? Indicate in your draft where the assessment will fit in.

-----END OF FEEDBACK & ASSESSMENT -----

E. Activity Planning

In this section, you will plan one learning activity that fits into the unit/chapter/module you have been working on. Replace the [brackets and text] with the relevant information and/or answers to the questions. (BOLT course Units 3, 4, 5, and 6)

Name and Learning Objectives

[Name of activity and numbered list of activity-level learning objectives]

Rationale and Description

Overview: [1-2 sentences of what students do in this activity from start to finish (tasks, key question or problem to be addressed, etc.)]

Product or results: [if applicable, what is the finished product or concrete result of the work (*e.g.,* essay, presentation, discussion, etc.)]

Rationale: [why the activity is beneficial for student learning, how it supports the learning objectives]

Detailed Description: [Describe in greater detail each part, segment or component of your activity. You might consider using the three-part "Preparatory, Focal, Follow-Up" structure described in Unit 5, Ideas for Using Online Activities, if applicable, or another way of structuring the activity.]

Structure

Type: [In this activity, will students work individually, collaboratively, or both?]

Format

[Is this activity asynchronous or synchronous or a combination of the two?]

Time required and timing:

[Approximate number of **hours** of engagement to do activity from start to finish]

[How will those hours be scheduled, and in which segments? *Example*, for a seven (7) hour activity: 2 hours on Monday, 3 hours between Monday night and Thursday night, 2 hours on Friday = 7 hours]

Required resources: [All content items, technologies, tools, and/or resources that are required to complete all parts of the activity]

Teaching

<u>Active learning</u>: [Explain how the activity reflects principles of active learning, constructivism, learner-centeredness, and other key principles of effective online learning.]

<u>Instructor's role</u>: [Explain the role(s) and responsibilities of the instructor in this activity.]

<u>Anticipated challenges</u>: [Explain any roles that might be challenging for you as the instructor, and any ideas you have about how to plan ahead to address these challenges.]

Reflection

As you review your work on Content, Assessment, and Activities, reflect on the process that you used to create this session and how the various pieces fit into your course design process. Is there a clear progression and flow as you moved through the steps of backward design? Is there clear alignment between your objectives, assessments and activities?

Be prepared to discuss your reflections and observations during our upcoming synchronous sessions.

Content Development

What will your activity look like? Include it in the development of your draft unit. Does it align with your learning objectives and planned assessment?

-----END OF ACTIVITY PLANNING -----