Version: May 2023

Teaching Notes Template

Save this template document and complete the sections below the ===== line to include requested details about the molecular case study. Instructions for completing that section are included in italics. Where appropriate, examples of how to complete the section are included in yellow highlighted text. Remove all the instructions (in italics) and examples (highlighted in yellow) from the document before finalizing it for submission. The completed document should be submitted along with the case study materials to assist educators in selecting and implementing the case study.

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Teaching Notes_INCLUDE A SHORT FORM OF CASE NAME HERE

1. **About the Author(s)**

a. **Name**: *Include the names of all the authors of the molecular case study, as you would like to see in the published case.*
b. **Affiliation**: *Include affiliations of all the authors listed.*
c. **Contact information**: *Include email address for the corresponding author here*

2. **About the Molecular Case Study:**

a. **Case Title**: *This should be unique, engaging, and a maximum of 255 characters long.*
b. **Discipline(s):** *This should list the discipline for which this case is written*.
e.g., Biology, Chemistry, Biochemistry, Genetics, Microbiology
c. **Keywords**: *Include words and phrases relevant to the molecular case study but do not appear in the title. These can help educators select the case study for use.*
e.g., Sleep, insulin resistance
d. **Abstract**: *Provide a brief abstract for your case study (maximum 7 sentences). This abstract will be published on BioQuest/QUBES and Molecular CaseNet websites, visible to both students and faculty. In writing the abstract, focus more on the big picture of the case theme, biological process, or subdiscipline and less on specific details of the case study.*
Example: Abstract for the Happy Blue Baby molecular case study is provided below:
"This case explores the reasons for why an otherwise healthy infant turned blue, soon after birth. All tests done in the neonatal intensive care unit were unable to diagnose possible reasons for the cyanosis, so the infant was taken to a specialist. The case begins with reading a local newspaper report and an abstract of the scientific report describing how doctors were able to make a diagnosis. Molecular explorations in the case focus on understanding the structural basis of the cause, heredity, and long-term impact of the rare mutation identified in the infant."
e. **Molecules explored**: *Write the name(s) of molecule(s) explored in the case study. You can include 1–2 sentences describing what about the molecules will be explored in the case. DO NOT provide specific PDB or other structure identifiers (IDs) here.*

Example: from the Happy Blue Baby case study: “The primary molecule studied in this case is hemoglobin. Visualization and explorations of various hemoglobin structures include those of native, mutant, and variant proteins.”

3. **About the Course:**
This section will be available to teachers and can help teachers in planning the implementation of this molecular case study.

a. **Department**: *List the department for which this case study is designed*
e.g., Cell Biology
b. **Course Name**: *List the course name for which this case study was designed*
e.g., Essentials of Cell Biology and Neuroscience, Immunology
c. **Audience** (*select one*): **High School / Undergraduate / Graduate / Faculty**
d. **Level** (*select one*): **Intro level / Upper Division**
Non-STEM major / Majors
e. **How does this case study and molecular visualization fit into the course curriculum?**

4. Societal Relevance:
Briefly describe (in 1-2 sentences) how the case study has societal relevance.
e.g., it uses inclusive language. The main character in the case study is a scientist and a woman of color. It addresses a social justice issue.

A. LEARNING GOALS

*The case study will be reviewed both by the MCN editorial committee and discipline specific experts. To help educators select the case study to meet their curricular needs and to ensure that appropriate reviewers are identified for the case study, please include major learning goals relevant to the case study. For each of the * marked sections listed below, the Learning Goals should be selected from the community standards indicated. Include additional Learning Goals from other community standards, as appropriate.*

***A1. Main biology-related learning goals (1–3 major goals) related to:** refer to the ASBMB Foundational concepts and Biocore Guide

- Learning Goal 1: e.g., ASBMB; Energy and Metabolism; 2. Catalysis; Students should be able to explain what a substrate is in terms of being a reactant.
- Learning Goal 2:
- Add more as needed

***A2. Main chemistry-related learning goals (1–3 major goals):** refer to the Macromolecular, Supramolecular, and Nanoscale (MSN) Systems in the Curriculum

- Learning Goal 1: MSN; Biochemistry; Describe natural, modified natural and synthetic macromolecules used for bioactive applications
- Learning Goal 2:
- Add more as needed

***A3. Molecular Modeling/Visualization Learning Goals**: refer to the BioMolViz Framework

- Learning Goal 1: BioMolViz; MI1.03 Students can predict whether a functional group (region) would be a hydrogen bond donor or acceptor. (Amateur)
- Learning Goal 2:

***A4. Bioinformatics Learning Goals and Skills used in the case**: refer to NIBLSE Bioinformatics Core Competencies

- Learning Goal/Skill 1: NIBLSE; C5. Find, retrieve, and organize various types of biological data; Retrieve data from protein and genome databases (e.g., PDB, UniProt, NCBI).
- Learning Goal/Skill 2:
- Add more as needed

A5. Other sub-disciplinary learning goals: *Please specify the sub-discipline and specific learning goals framework, if any.*

- Subdiscipline: e.g., ecology, microbiology, cell biology
- Learning Goal 1: e.g., ACSB; Cell Biology Learning Objectives; Cell Communication; How do cells send, receive, and respond to signals from their environment, including other cells? (https://qubeshub.org/community/groups/coursesource/courses/cell-biology)
- Learning Goal 2:
- Other Learning Goals:

B. BACKGROUND MATERIALS

This section lists all discipline specific background materials included in the MCS to learn about key concepts and vocabulary needed to complete the case study. To facilitate review, complete the following table to provide information about the background materials. Please add as many rows to the table as you need.

Type of Background Material	**Link to the Material**
Review article(s)	
Book Chapter(s)	e.g., from the NCBI Books
Video(s) or other educational resource(s)	
Reliable web-site(s)	e.g., CDC, NCBI, HHMI etc.
Other	

C. BIOINFORMATICS RESOURCES AND TOOLS USED

This section lists all bioinformatics resources and tools used in the MCS and the information they add to the MCS. This information can help educators select the case study or sections of the case study for implementation in their course. Please add as many rows to the table as you need.

Bioinformatics Resource	Used (mark with x)	Task accomplished in the MCS
UniProt	x	e.g., learn about Function, domains, common mutations
KEGG		
Binding DB		
DrugBank	x	e.g., target and side effects of the drug used
Gene Ontology		
Other:		

Name of Bioinformatics or Molecular Visualization Tool	Used	Task accomplished in the MCS
BLAST		e.g., to compare the sequences of human and parasitic enzymes
CLUSTALW		
Pairwise Structure Alignment tool		
Mol*		e.g., to visualize and analyze 3D structures available in the PDB
iCn3D		
PyMol		
UCSF Chimera		
JSmol		
Other		

D. SUGGESTED IMPLEMENTATION

This section can help teachers select, prepare, and implement the case study.

D1. Prerequisites (if any) – *list any prerequisite for the case study including skills, concepts and resources that instructors and students should know about here.*

e.g., familiarity with Mol*,

D2.a. Suggested Instructor Preparation - *these could include training in a specific molecular visualization program, reading a specific review article on the topic, preparing a lecture on topic/theme discussed in the case* - e.g., hemoglobin structure and function in general when discussing a case about sickle cell disease:

- Instructor preparation Step 1:
- Instructor preparation Step 2:

D2.b. Suggested time for instructor preparations:

D3.a. Suggested Student Preparation - *these could include providing basic experience with molecular visualization, reviewing background knowledge about the case theme and molecule(s)* (e.g., hemoglobin) *and/or process* (e.g., enzyme inhibition) *discussed in the case study*:

- Student preparation Step 1:
- Student preparation Step 2:

D3.b. Suggested time for student preparation:

D4. Suggested implementation details

- Resources
    - Include resources here (*list lecture content, supplemental videos, prerequisite reading - review articles, theme based web-resource*)
    - Add links to “Box of Lessons” learning materials and worksheets as appropriate.
- Implementation timeline suggestions
    - Time required for students to read/view the case related material prior to start of the molecular case study:
    - Minimum in-class time required:
    - Time outside class needed to complete the case:
- If the case study needs to be implemented in multiple sessions, suggest in-class activities for each session
    - Session 1:
    - Session 2:
    - Session 3:

D5. Provide suggestions for how this case study may be used in other courses/settings: *list if any of the sections of the case study need to be modified for a different course setting* (e.g., for lower/higher level course, larger or smaller classes, include these individual and/or group activities)

- Other course/settings 1:
- Suggested changes: