1. What goal do you want to address for an assignment or myDalite question?

Our nursing students need to interpret test results to best identify patient needs. Many of the assignments I write revolve around the use of case studies and patient charts. I typically find patient information with the help from my colleagues in the nursing department, and I get much of it online. I work on standardizing the presentation of patient data, so it looks the same from assignment to assignment (although patient charts differ between hospitals). The use of case studies can be implemented for authentic or applicable experiences with the content we teach. For example, in nursing, we present patients with names, histories, and pathologies to mimic not only what they see in the hospital but also on their licensing exam. In a biology course for science students, the context will be a little different, and I'll typically use scientific articles as context for case studies. That is, scientific articles provide background for their experiments, and I use that to introduce the assignment (ex.: I can create a case study that examines early onset of the spring season to study community interactions).

2. When considering the goals of an assignment or case study question, consider the program competencies and course objectives.

For example, the Government of Quebec website includes a list of competencies set out for the nursing program (180.A0). The courses in the nursing program include objectives that aim to establish the acquisition of these competencies. The competencies our department is most interested in are "To develop an integrated perception of the human body and its functions" (01Q1) and "To interpret a clinical situation by referring to health problems and other problems related to the field of nursing" (01Q8). However, an additional competency that can be addressed with the use of case studies is "To deal with a client's reactions and behaviours" (01Q2). Our course outlines explain how we aim to evaluate the acquisition of these competencies by describing performance criteria, "Appropriate use of concepts and terminology" and "Application of concepts to medical and surgical nursing practice." We further break down competencies into elements of competence and provide more specific performance criteria, which includes the interpretation of test results.

3. Once you've established your goals and the objectives you want to address, consider how to organize the progression of your assignments.

Some questions you want to ask yourself during the development process include: what skills are you evaluating, how many times do you want to evaluate these skills, and how will you increase the difficulty within and between assignments? We typically start with the development of a single question and work our way from this point. Here are some examples of skills I want my students to learn: identifying impertinent information, understanding patients charts, and interpreting charts and graphs. If I want my students to learn how to identify pertinent information, the details included in the question stem can address this. Concerning the other skills, the interpretation of tables and graphs also need to be developed. Given the nature of myDalite, another skills that needs to be addressed is how to write a good rationale. This should be the goal of the first assignment (more on this later).

4. Upon choosing the context for your case study, consider the anatomy of your question.

A multiple choice question includes a stem, set of alternatives, and a key. The stem is the introduction to your question, and for my case studies, it typically includes patient information and history. It's important to assess and characterize the information placed in the stem along a pertinence scale, as many pedagogical specialists mention that the inclusion of unnecessary information in the stem is misleading and distracting. If the information in the stem is included in the set of alternatives, this may justify including it in the stem, especially if

the information makes a plausible distractor. The key is the correct or best answer to the question in the stem. You should use similar grammar and vocabulary in the alternatives and key as in the stem, and your alternatives and key should all be the same length to make alternatives appealing and plausible. The number of alternatives is up to you, but should reflect similar questions as on their in-class assessments (i.e. unit tests and final exams).

Once you've started writing your questions, consider organizing them within an assignment. With case studies, I typically include three multiple choice questions in order to limit the time spent on the assignment and adhere to the ponderations set out in the course outline (limiting weekly homework to 3 hours). *We will find out how much time they spend on the assignment according to Sameer but also by survey at the end of the semester.*

5. How should your assignments progress throughout the semester?

For example, how can you increase the difficulty with subsequent assignments or simply pivot and begin assessing a new skill? These are two different decisions, and I will address increasing difficulty first. It comes down to your set of alternatives. A valid and appealing distractor is worth its weight in gold and relies heavily on identifying students' misconceptions about a topic. A question becomes more difficult as you address other misconceptions in other distractors to increase the number of alternatives that seem plausible, while students who have mastered the material will still choose the key. For example, you can start with a set of 2 alternatives and the key (total of three answers), and increase the number of alternatives with subsequent questions. As students progress, you can also increase the number of plausible distractors that include student misconceptions. In order to assess new skills, it's important to consider how to introduce it, how to master it, and how it connects with previous skills. Here's an example of three skills I want my nursing students to learn: analyzing information in a case study, interpreting patient data in a table, and writing a good rationale. How I introduce these skills is just as important as how to help my students master them. Since writing a good rationale is the crux of myDalite questions, this skill must be established first before introducing the concept of a case study. Once I've communicated the criteria for a good rationale and provided opportunities for practice, I introduce the concept of a case study without patient data, while the third assignment in the series will be based around case study questions with patient data. This is why it's important to consider the goals you want to set out for your myDalite questions, as it will help you establish a series of assignments that teach students separate skills, while building and reinforces past skills as students progress throughout the semester.

6. How can you ensure students are writing good rationales?

Another part of writing myDalite questions is instructing students on how to write a strong rationale for their choice of answer. A resource I used to teach students how to write an appropriate rationale (or justification) is from "Scientific Argumentation in Biology". What does a good rationale look like? How should you consider grading a rationale? I've included a detailed rubric to teach students how to write a good rationale and a shorter rubric (as students progress in their ability to write rationales). Check the different rubrics at the end of this document, and consider the following:

Substance of the rationale
- A. State the claim you are trying to support
- B. Include genuine evidence (data, analysis, and interpretation) largely based on the information in the lecture notes
- C. Provide a justification of your evidence that explains why the evidence is relevant and why it provides adequate for the option chosen in the question

<u>Quality of the rationale</u>
  A. Organize your argument in a way that enhances readability
  B. Use a broad range of words including vocabulary pertaining to the content you're discussing
  C. Correct grammar, punctuation, and spelling errors
  D. There needs to be a limit to the length of the rationale, possibly limiting each of the points in the "substance" list to 1 sentence per point

7. Your students may understand the anatomy of a rationale, but how can you, as the author of the question, elicit a stronger rationale?

In order to elicit good rationales, the mechanics of the multiple choice key and alternatives need to be considered: length, content, and format. Eliciting a good rationale requires proper instruction (hence a rubric) and writing appropriate multiple choice alternatives. The latter is important as providing too much detail in the alternatives undermines the necessity for a rationale, especially if the alternative itself includes an explanation. This is the case in fields of study where students need to understand terminology and mechanisms (biology and chemistry), and less so in fields that rely heavily on calculations (physics and math). Writing a multiple choice question that doesn't require a rationale is very different from writing one that does. Here's an example: I've written a question that considers ketoacidosis in a diabetic patients and asks the student to consider the effects of ketoacidosis on oxygen saturation. Here's the correct key: **"According to the Bohr Effect, a blood pH that is lower than average can lower oxygen saturation as oxygen cannot load as easily onto hemoglobin, causing the stimulation of respiratory and cardiac reflex centers."** This type of key may not elicit a good rationale because it goes into too much detail, leaving the student less grounds for justifying their choice of answer. Consider a shorter version of the key: **"An acidic blood pH will decrease oxygen loading onto hemoglobin"**. This key is more ambiguous and provides a greater opportunity for the student to link their choice of statement with the course content. This means the student can bring up the Bohr effect, oxygen saturation levels, respiratory rates, and heart rate in their rationale. More concise multiple choice alternatives can also help identify student misconceptions because they're forced to explain and justify their answers, and in the process, exposing their difficulties with the material.

Rubrics:

Long:

Aspect of argument	Point value		Comments or suggestions
	0	**1**	
The claim			
The claim is accurate			
The evidence			
Includes an interpretation and application of lecture content			
The justification of the evidence			
Explains why the evidence is important or why it is relevant			
Links the evidence to the chosen answer			
Language of science			
Appropriate use of scientific terms			
Mechanics			
The claim is sufficient (includes the parts of the rationale)			
The order and arrangement of ideas, use of complete and appropriate sentences, spelling, and punctuation (*details below).			
Total score (/7)			

* The order and arrangement of the sentences enhances the development of the main idea and complete sentences and proper subject-verb agreement and tense, appropriate spelling, punctuation, and capitalization were used.

Short:

Aspect of argument	Point value		Comments or suggestions
	0	**1**	
The claim is correct			
The evidence justifies and links with the choice of answer			
Mechanics (scientific language, length, and prose)			
Total (/3)			

Sources used so far:

1. U of Waterloo MCQ guide: link
2. Nursing program competencies: link
3. Scientific argumentation in biology: 30 classroom activities