



# Assessing First-Year (M1) Medical Students' Understanding of Blood Glucose Control Using a "Backward Design" Asynchronous Physiology Lecture

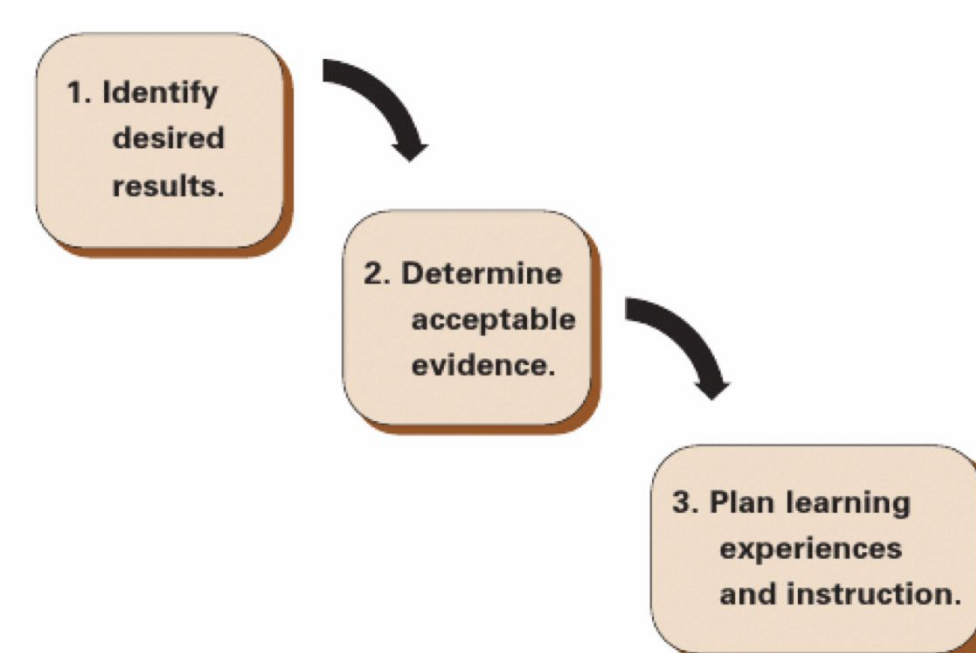
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## Introduction

- **Backward design**, an instructional model outlined by Wiggins and McTighe, emphasizes identifying key learning objectives (LOs) that students must be able to perform after learning about a topic<sup>1</sup>
- Requires educators to first develop assessments aligned with the key LOs, which form the basis of course content and activities<sup>1</sup>
- The majority of medical students across the United States encounter lecture-based learning in their first two years of basic sciences curriculum with little opportunity for clinical application<sup>2</sup>
- Compared to traditional lecturing, a backward-designed session with planned activities may better develop medical students' critical thinking and problem-solving skills

Figure 1.1  
UbD: Stages of Backward Design



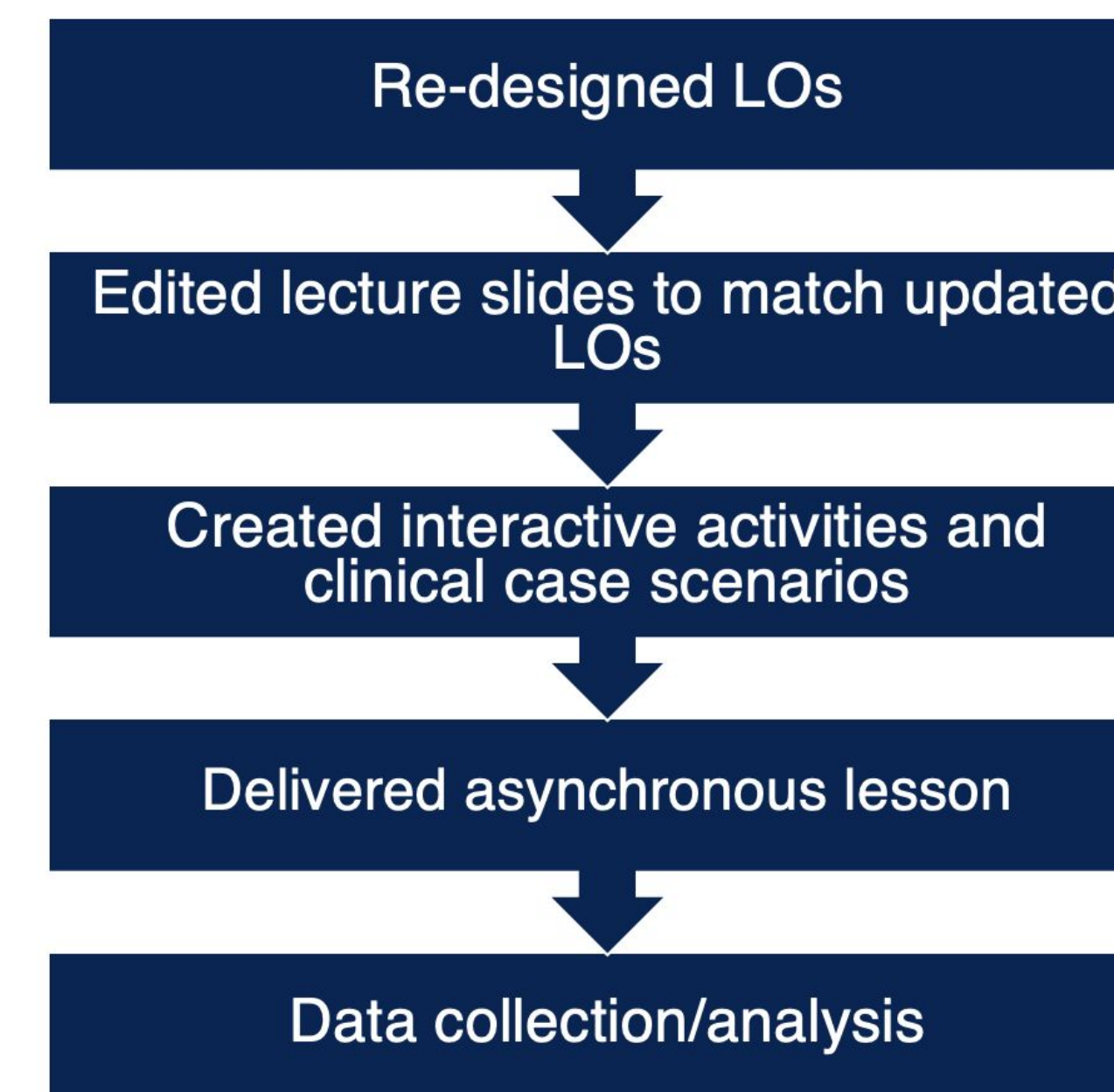
Stages of Backward Design<sup>3</sup>

## Aims and Objectives

- To redesign a traditional first-year medical school lecture using the backward design model
- To compare students' performance on assessments and understanding of key concepts
- To compare students' perceptions on the lecture formats

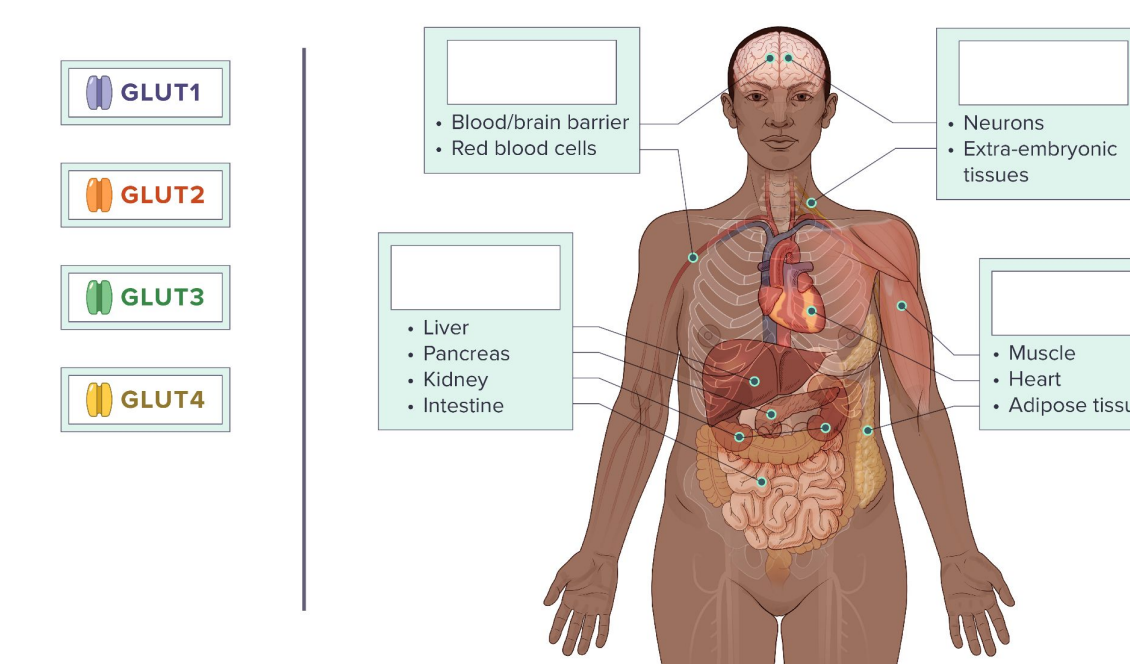
## Methods

- Using the backward design framework, we redesigned a traditional lecture on "Hormonal Control of Blood Glucose" from Fall 2022, and delivered it in Fall 2023
- We re-evaluated our LOs, and ensured that they aligned with our four assessment questions
- The updated LOs were also used to create session content and interactive activities
  - drag-and-drop activity (see below)
  - clinical case branching scenario
- In both years, the lecture, four assessment questions, and survey were delivered asynchronously to 125 M1 students in their Biomedical Foundations of Clinical Practice 2 (BFCP 2) course



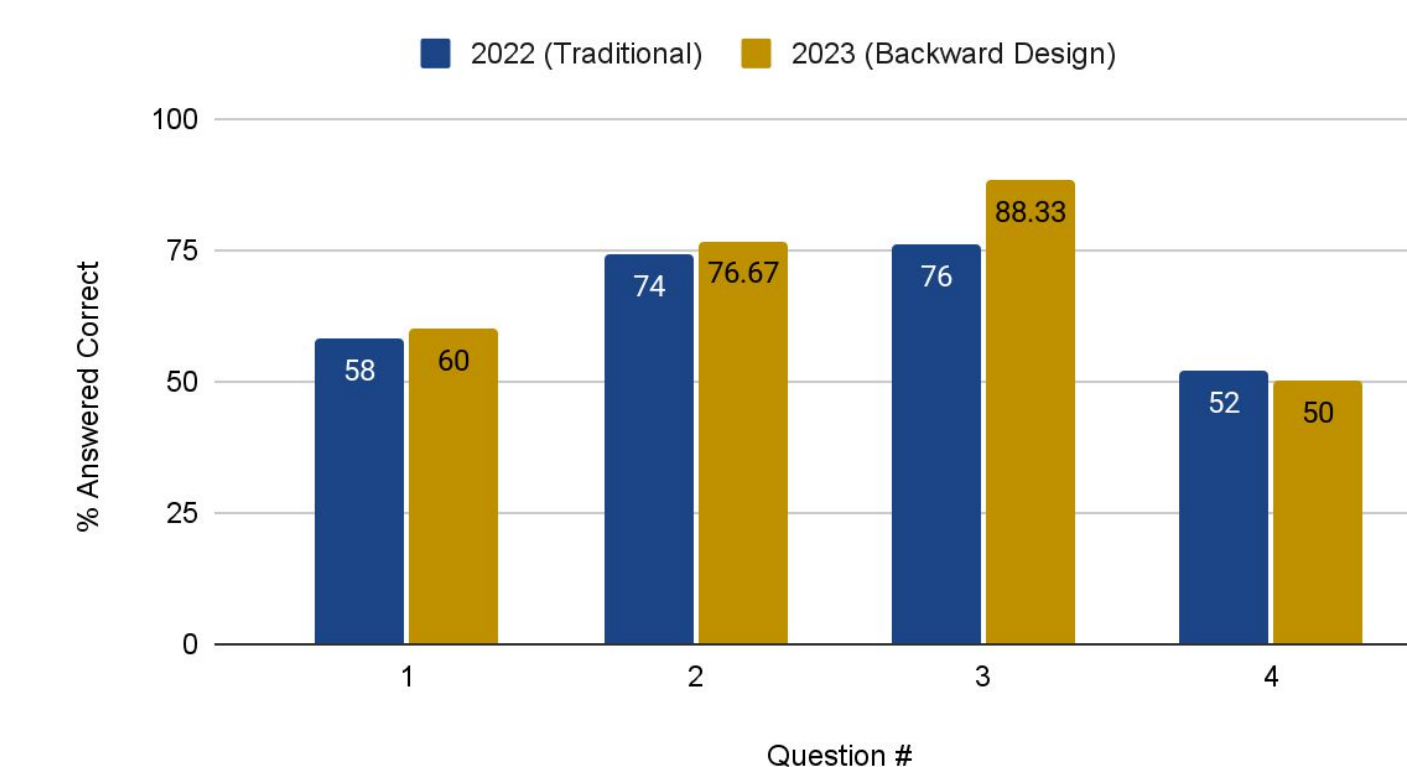
## Results

- The 4 assessment questions were completed by 50 students in 2022, and 60 students in 2023
- Average score in 2022: 65% (2.6/4)
- Average score in 2023: 70% (2.8/4)
- 5 students in 2022 and 26 students in 2023 completed the survey
- In response to, "The session content prepared me to answer the concept check questions," 84% of 2023 students answered "strongly agree" vs 60% of 2022 students



Drag-and-Drop activity added to 2023 lecture

Assessment Question Performance



### Learning Objectives

- Explain the significance of blood glucose regulation
- Identify the major hormones which maintain glucose homeostasis
- Describe the nature, source, and target organs of these hormones
- Distinguish the action of hormones among various target organs
- Integrate physiology of blood glucose homeostasis with prior knowledge of biochemistry pathways
- Develop a differential diagnosis based on foundational concepts learnt in this session

LOs from 2022 lecture (traditional)

### Learning Objectives

- Explain the significance of blood glucose regulation
- Identify the major hormones of glucose homeostasis, and cell types that secrete them
- Describe the nature and target organs of these major hormones
- Distinguish hormone action and GLUT transporters on target organs
- Integrate physiology of blood glucose homeostasis with prior biochemistry knowledge
- Develop a differential diagnosis based on foundational concepts learnt in this session

LOs from 2023 lecture (backward-designed)

## Conclusions

- Although not statistically significant, our results demonstrate an upward movement of the average score among students from Fall 2023 who received a backward-designed lecture, compared to students who received the traditional lecture
- Furthermore, a higher percentage of 2023 students answered assessment question #3 (related to GLUT receptors) correctly, after the drag-and-drop activity was added to the lesson

## Discussion

- Main limitation was small sample size and low number of survey responses
- However, our results demonstrate how backward design and the addition of interactive activities into lectures can benefit medical student learning
- Future directions include correlating the percent of lesson completion with average scores

## Acknowledgements

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## References

