Impact of Mnemonics and Analogies in a Biochemistry Course on Students' Knowledge Retention and Application

Prema Iyer[1], PhD, and Shankar Munusamy[2], MS (Pharm), PhD

[1]University of Pittsburgh, School of Pharmacy, Pittsburgh, PA

[2] Drake University College of Pharmacy and Health Sciences, Des Moines, IA

BACKGROUND

- Mnemonics are memory aids that help encode, retain, and recall information effectively.
- Analogies use known metaphors or examples to explain new concepts, enhancing memory recall.
- In educational settings, purposeful application of mnemonics and analogies eases the cognitive burden in learning and aids students in retaining vital information and concepts[1].
- Literature provides evidence that mnemonics enhance students' knowledge retention and exam performance [1,2].
- This study investigated the effectiveness of using an evidence-based pedagogical approach in a biochemistry course taught in the pharmacy curricula.

OBJECTIVE

- To assess students' perceptions of using mnemonics and analogies on knowledge retention, retrieval, and application in a biochemistry course offered to P1 students.

METHODS

- Mnemonics (12) and Analogies (4) were developed tailored to specific topics in the biochemistry course for the P1 year.
- An anonymous survey was administered at the end of the semester to collect student perceptions of mnemonics and analogies (Table 1 to 3)
- For mnemonics, students were asked to rate (on a Likert scale) the impact of mnemonics use on the following:
  - ❖ Knowledge retention
  - ❖ Recollection, recall, and application of information
  - ❖ Reduction in anxiety while learning
  - ❖ Increased confidence while answering exam questions
- For analogies, students were asked to rate (on a Likert scale) the impact of analogies use on the following:
  - ❖ Understanding and recall of information
  - ❖ Understanding and assimilating to master the concepts
- The study (# 23120014) was reviewed and approved by the University of Pittsburgh Human Research Protection Office.

RESULTS

Table 1: Students' perception of mnemonics use on knowledge retention, recall, application of information, reduction in anxiety while learning, and increased confidence while answering exam questions.

#	Students' Perceptions of Mnemonics	Percentage of students' Agreement (n)	
		2022-23 Response Rate = 79.28% (88/111)	2023-24 Response Rate = 89.52% (94/105)
1	The mnemonics (memory aids) taught by the instructor helped me retain some of the important concepts taught in this course.	**79.55%** (70)	**69.15%** (65)
2	The mnemonics (memory aids) taught by the instructor made it easy for me to recollect, recall and apply the information while answering some of the questions on the exam.	**76.14%** (67)	**70.21%** (66)
3	The mnemonics (memory aids) helped reduce my anxiety in learning some of the concepts in this course.	**64.77%** (57)	**60.64%** (57)
4	The mnemonics (memory aids) helped increase my confidence when answering some questions in this course.	**75.00%** (66)	**68.09%** (64)

Table 2: Students' perception of mnemonic use on the reason for remembering mnemonics.

5	What was the main reason you remembered some of the Mnemonics?	Percentage of students' Agreement (n)	
		2022-23 Response Rate = 78.38% (87/111)	2023-24 Response Rate = 89.52% (94/105)
a	Mnemonic was well connected to the concept	**13.79%** (12)	**10.64%** (10)
b	Mnemonic was rhyming or funny	**44.83%** (39)	**32.98%** (31)
c	Mnemonic made sense and helped to organize my thoughts	**41.38%** (36)	**38.30%** (36)
d	NA, I did not remember the mnemonic	Not used	**18.09%** (17)

Table 3: Students' perception of the use of analogies in understanding, recalling, and assimilating concepts.

#	Students' Perceptions of Analogies	Percentage of students' Agreement (n)	
		2022-23 Response Rate = 79.28% (88/111)	2023-24 Response Rate = 89.52% (94/105)
1	The analogies discussed in class helped me understand and recall information for answering questions in the practice quiz/test/exam. Examples: Hemoglobin (truck transporter), Myoglobin (temporary storage, pantry)	**78.41%** (69)	**84.04%** (79)
2	The analogies discussed in class made it easy for me to understand and assimilate master the important concepts.	**78.41%** (69)	**86.17%** (81)

EXAMPLES OF MNEMONICS AND ANALOGIES

Mnemonics related to glucose homeostasis

- "Glucagon is released when glucose is gone."
- Glycolysis – Glucose breakdown (splitting glucose)
- Glycogenesis – Glycogen synthesis (from glucose)

Analogy to explain the function of globins

Image from: clipground.com/pics/getsecond

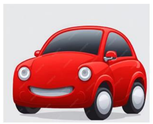

Image from: (freepik.com)

Image from: Free Vector | Collection of flat pantry with different foods (freepik.com)

Analogy: Shopping for groceries and stocking them at home

- Grocery Store – Lungs (Rich in O_2)
- Car – Hemoglobin (Carries O_2)
- Pantry – Myoglobin (Temporary storage site for O_2)

CONCLUSIONS & FUTURE DIRECTIONS

- Students positively perceive that learning biochemistry concepts using mnemonics and analogies improves comprehension and knowledge retention and facilitates retrieval and application during test-taking.
- Future studies will investigate the effectiveness of mnemonics and analogies on students' exam performance in the course.

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