Content Reinforcement of Cell and Membrane Transport between Kinesiology and Arts & Science Students

Robin Ma[1], Paul Chahal[2], and Raj Narnaware[3]

1. Faculty of Arts & Science, MacEwan University, Edmonton, Alberta, Canada, T5J 4S2
2. Faculty of Health and Community Studies, MacEwan University, Edmonton, Alberta, Canada, T5J 4S2
3. Faculty of Nursing, MacEwan University, Edmonton, Alberta, Canada, T5J 4S2

Introduction

- Student engagement has evolved to interactive active learning. The educators must be at ease with technology use to enhance learning. Interactive web-based instructions have been applied to Human Physiology classes and has been supplemental aid that positively influences student's learning outcomes (Bice et al., 2016).
- One of these technologies is Kahoot using smartphones and portable tablets.
- Human Physiology is a foundational course in Kinesiology, and Arts and Science programs. There is growing concern that students are not retaining the essential bioscience knowledge in this course over time (McVicar et al., 2015).
- There is a lack of knowledge retention in the kinesiology student for cell membrane transport in the kinesiology students (Chahal and Narnaware, 2023). The current study compares the findings for kinesiology students to arts and science students taking exact same Kahoot assessment quizzes.

Purpose of the Study

- **The main purpose is to improve the acquisition and retention of human physiological knowledge of Kinesiology and Arts and Science students. The present study aims to compare the effects of a retrieval practice interventional strategy that includes the content reinforcement (repeated knowledge testing) of the cell membrane transport over eight weeks for Kinesiology and Arts and Science students.**
- **Retrieval practice is known be an efficient method for enhancing the knowledge retention of physiology (Dobson, 2013).**

Methods

- The current study was conducted in the Fall 2023 semester with a Kinesiology physiology section of 48 students and an Arts and Science physiology section of 40 students. Kahoot (Kahoot Inc., Oslo, Norway) quizzes were created using an online quizzing platform to assess and compare content reinforcement of the cell membrane transport over eight weeks. The students were not informed about the quizzes in advance.
- Between nine and ten multiple-choice questions were given for each quiz. Quizzes were given for week 1, 2, 3, 4, 6, and 8. New sets of questions were used for each week's Kahoot quiz.
- Data were statistically analyzed using SPSS II, and means were compared using 2-sample t-tests. The scores are described as the mean and standard deviation (SD) and are presented in Table 1 and Figure 1. Statistical significance was set at $P < 0.05$ for all tests.

Results

- One week after the coverage of the cell membrane transport unit (week 1), Kinesiology students scored 58.9% (Chahal and Narnaware, 2023) and Arts and Science students scored 40.7 (Table 1). Kinesiology students had a significantly higher performance for week 1 and 3 comparison to Arts and Science students.
- For other weeks the performance was similar for both groups (Figure 1). Comparison to week 1, there was a significant decline in the performance for every week (except week 3) after week 1 for Kinesiology students but not for the Arts and Science students.
- The highest content retention was at week 2 and 3 for the Arts and Science students and week 3 for the Kinesiology students. Week 3 was the midterm exam week.
- The content retention for both groups was lowest in week 4, a week after the midterm exam, and stabilized between an approximate percentage of 41 to 44% for both groups for week 6 and 8 (Figure 1).

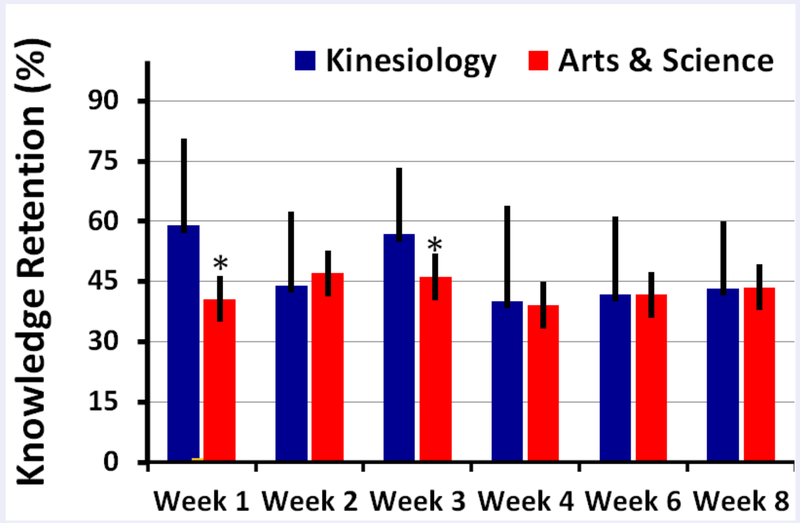

Figure 1. Knowledge Retention of the Cell Membrane Transport by Kinesiology and Arts & Science Students Over Eight Weeks. Comparison Between Two Groups ; * P<0.05

Table 1. Percent Change in Knowledge Retention of the Cell Membrane Transport Over Eight Weeks for Kinesiology and Arts & Science Students

Organ System	Percent (%) Change in Knowledge Retention					
	Week 1	Week 2	Week 3	Week 4	Week 6	Week 8
Cell Membrane Transport (Kinesiology)	100	74.5	86.3	67.9	69.3	73.3
Cell Membrane Transport (Arts & Science)	100+	115.5	113.3++	96.1	102.5	107.1

+ $p < 0.02$, ++ $p < 0.003$

Discussion & Conclusion

- For both groups the knowledge retention was observed to be week-specific, highest in weeks one and three for the Kinesiology student and week 2 and 3 for the Arts and Science Students. Week 3 was a midterm exam week; this is one of the reasons both groups had a better score for this week and lower scores for week 4 to 8.
- Content retention gradually improved toward week 8 for both groups. The content retention for both groups was less than the results reported by Narnaware for the nursing students. The difference could be due to the different teaching strategies used in both programs, the time of the day of the course, and the background preparation of the students.
- College students enjoy using smart technology and report that the use of cell phones enhances their learning. Interactive technology enhances student engagement and increase test performance (Bice et al., 2016).
- Retrieval practice is an efficient method for knowledge retention of physiology (Narnaware, 2021; Dobson, 2013). Kahoot is one of the effective technologies that could be used for content assessment and reinforcement for Kinesiology and Arts and Science students.

Acknowledgment

- Funding for this project was provided by the Faculty of Health and Community Studies, MacEwan University, Edmonton, Canada

References

- Bice, MR, Carey J, Brown GA, Adkins M, and Ball JW (2016). The use of mobile application to enhance learning of the skeletal system in introductory anatomy & physiology students. NAKHE, Vol. 27, Number 1, 16 - 22.
- Chahal P., and Narnaware R. (2023). Content Retention of Cell and Membrane Transport for Physical Education Students. Human Anatomy & Physiology Society, 37th Annual Conference, Albuquerque, New Mexico, USA.
- Dobson, JL (2013). Retrieval practice is an efficient method of enhancing the retention of anatomy and physiology information. Adv Physiol Educ 37: 184-191.
- McVicar A, Andrew S, and Kemble R (2014). Biosciences within the pre-registration (pre-requisite) curriculum: An integrative literature review of curriculum interventions 1990 – 2012.
- Narnaware, Y. (2021). Never Heard That Before! Bioscience Knowledge Retention in Undergraduate Nursing Education- Current Topics. Human Anatomy and Physiology Society Educator, HAPS Educator Journal, 25 (2), 77-83.