PROGRAMME DESCRIPTION

Digital gaming in class: English medical terminology for pharmacy students

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Abstract

Objective: Knowledge of medical terminology is crucial for pharmacy students since they will be working as frontline healthcare professionals. Today's younger generation enjoys using digital tools for self-study purposes. This study aimed to investigate the impact of in-class digital game-based activities on pharmacy students' medical terminology learning performance and explore their perceptions. **Method:** The experiment was conducted with two classes of second-year pharmacy students over a period of 15 weeks in an English for Professional Purposes course. Data were collected using two medical word tests and a post-treatment perception questionnaire. **Results:** Students who learned the medical words through in-class digital gaming gained more words. This group of students also found the digital tool to be more effective and easier to use. **Conclusion:** In-class digital gaming is a more beneficial approach to teaching medical terminology. Integrating digital games into teaching practices would improve the acquisition and retention of medical terms among pharmacy students.

Introduction

Over the past two decades, the conventional dispenser role of pharmacists has transformed into a patient-centred profession that entails both the provision of care and guidance and even more clinical roles in some cases (George, 2010). The World Health Organisation (WHO) defines the mission of the pharmacy practice as "contributing the health improvement and helping patients with health problems to make the best use of their medicines" (WHO, 2011). This role necessitates good communication between patients and healthcare professionals. Understanding medical terminology is essential for effective communication between healthcare professionals. Medical terminology helps create a standardised language for health professionals, allowing them to communicate more efficiently. As frontline health practitioners, pharmacists are required to have good communication skills to interact effectively with healthcare professionals and patients about medicines and healthcare needs (Donging, 2019; Shooter, 2004).

Pharmacists around the world are also expected to deliver new and expanded services to support patients with chronic conditions. For example, medication therapy management (MTM) services are provided by health professionals, including pharmacists, to ensure that patients receive the best treatment (Ferreri, 2020). For this purpose, pharmacists use Medicine Use Reviews (MURs), consisting of an appointment with patients to discuss how they are getting on with their medicines (MHRA, 2021). These services require effective communication across various pharmacy practice settings, including outpatient settings, hospital settings, and other clinical environments (Austin, 2003; Brown, 2008). In the UK, the lack of proficiency in communication was recorded in 11 out of 24 studies among internationally trained pharmacists whose first language was not English (Ziaei, 2011).

Medical language is comprised of very complicated long terms, most of which are derived from Greco-Latin technical vocabulary (Seidlein, 2020). Knowledge of medical terminology is particularly vital for students to pursue careers in pharmacy since they will be working as

frontline healthcare professionals; however, learning and remembering medical terms presents a challenge to those whose first language is not English (Ziaei, 2015; Brahler, 2008). Some pharmacy schools have initiated "Medical Terminology" courses at the undergraduate level to help pharmacy students develop and improve their proficiency in medical terminology (Dean, 1998; Martin, 2015; Galkina, 2019; AlRuthia, 2002), while many others have left the responsibility of medical terminology learning to the students.

Although medical terms can be learned implicitly through repeated exposure, students, especially those who study English as a foreign language, may benefit from explicit teaching and learning of the medical terminology (Laufer, 2000). Today's young generation enjoys using digital tools and regularly utilises online resources, smartphones, and mobile applications for self-study purposes (Gutmann, 2015; Golenhofen, 2020). Linking technology and teaching practices may be an alternative to increase students' motivation and support their learning efforts (Koehler, 2012). Previous studies have shown that the use of technology increases student engagement and results in improved learning outcomes (Li and Lerner, 2011; Wang, 2011). It was hypothesised that integrating digital game-based activities into the classroom may provide learners with a positive learning experience that can increase their learning of medical terms.

This study aims to investigate the impact of in-class digital game-based activities on the learning performance of pharmacy students of medical terminology and explore their perceptions of these in-class activities. The following research questions guided the study:

1. What is the impact of in-class digital gaming on the learning performance of pharmacy students of medical terminology?

2. Is there a difference in the perceptions of the digital platform between the experimental group (EG) and the control group (CG)?

Methods

Participants

The study was conducted with two classes of second-year pharmacy students over a period of 15 weeks in a 2-credit English for Professional Purposes course. All experimental procedure was accepted by the Institutional Ethical Committee.

The course is intended to introduce basic medical terminology used in the field of pharmacy and improve students' reading comprehension skills. Participants in the present study had no prior experience with in-class digital gaming.

Forty-seven students were randomised into two groups: Control (CG, n=26) and Experimental (EG, n=21). The program is open to both national and international students, and English is used as the medium of instruction. For this reason, all incoming students take a proficiency test, and only the students who score at least B1 on the English proficiency test can start their undergraduate studies.

Medical word list

A list of medical words was developed in the previous study by the authors (Yüksel, Mercanoğlu & Yılmaz 2020).

Medical words were determined from a recommended textbook for Pharmacology I-III courses on a frequency-based using the Concordance 3.2 computer program (Katzung, 2011). A total of 400 words were selected by one of the researchers, an expert in the field of pharmacology. A second independent qualified pharmacologist performed the inter-rater reliability check on a blinded basis (Chung & Nation, 2003). The words to be studied were shared as digital flashcards weekly through the Quizlet class created for the study. In the first week, the researchers introduced the Quizlet to the students, explained its features, and ensured that every student enrolled on the created class. During class hours, the same texts were utilised, and an identical instructional procedure was followed in both groups. In the EG, however, digital games from the Quizlet App were used as in-class practise activities during each class hour. The same activities were provided as paper-printed games in the CG.

Data collection

Data were collected using two medical word tests (MWT) and a post-treatment questionnaire. The tests were designed to assess the development of vocabulary knowledge and determine the effect of in-class gaming on this development among students. Each test consisted of 50 multiple-choice questions. The words for the tests were chosen at random. Tests were administered at weeks 8 and 15. Students were given 60 minutes to complete each test.

Following the completion of the experiment, data on student perceptions were collected using a 10-item Likert type questionnaire developed by Dizon based on Davis Technology Acceptance Model (TAM) (Davis 1989; Dizon 2016). It measures learner behavioural intention (BI) to use the Quizlet based on two factors: perceived usefulness (PU) and perceived ease of use (PEU). The respondents were asked to rate their

perceptions on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). In this study, the reliability coefficient (Cronbach's alpha) was 0.899, as

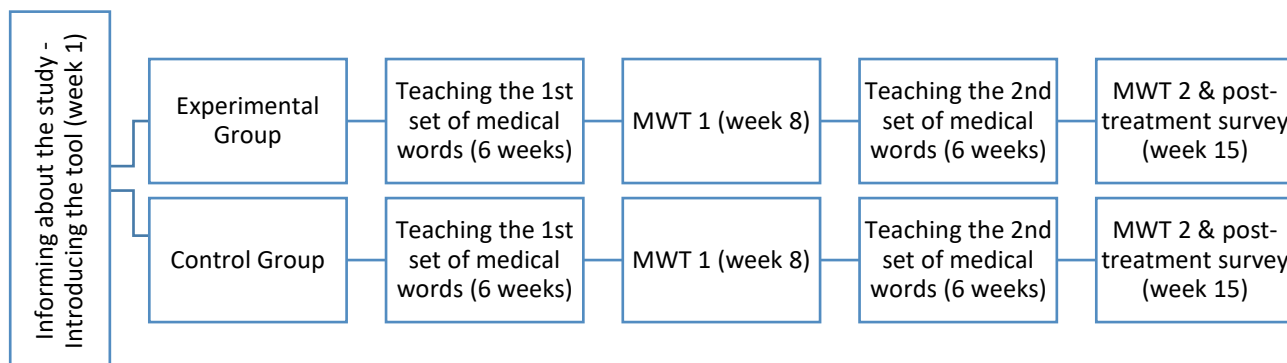measured by Yüksel and colleagues (2020). Figure 1 displays the experimental procedure.

Figure 1: The experimental process

Statistical analysis

All variables were expressed as mean ± SD. A value of $p<0.05$ in a two-tailed distribution was considered statistically significant. The assumptions of normality were checked (histogram, coefficient of variation, skewness/kurtosis, stranded plot, and test for normality). Differences between groups were assessed using the independent samples t-test or its non-parametric alternative Mann-Whitney U test. Student development was evaluated with MANOVA using Pillai's Trace.

Results

To answer the first research question, the mean scores obtained from MWT1 and MWT2 were compared using the independent samples t-test. The experimental group which had in-class digital gaming experience showed better performance in both tests compared to the control group (M = 91.90±6.71 and M = 78.85±12.8 in MWT1, and M = 89.52±5.74 and M = 84.38±7.55 in

MWT2, respectively). As displayed in Table I, the independent samples t-test revealed that there were statistically significant differences between the EG and CG in MWT1 (t(45)=4.20, p=0.0008) and in MWT2 (t(45)=2.58, p=0.013). This analysis showed that EG students outperformed CG students on both the first and the second vocabulary tests. Cohen's d was calculated to measure how large the effect in-class digital gaming had on student medical word knowledge performances. The effect sizes were calculated for MWT1 (Cohen's d=1.28) and MWT2 (Cohen's d=0.76). The effect sizes indicated that in-class digital gaming had a large to medium effect on the learners' technical vocabulary gains (Figure 2).

Students who learned the medical words through in-class digital gaming gained more words than CG students. When the mean MWT1 and MWT2 scores of the same group were compared, no statistically significant difference within the group was found (with the Pillai's Trace model, p=0.260). This finding indicated that the effect of in-class gaming remained consistent over a 16-week period (Figure 2).

Table I: Comparison of group performances in the medical word tests

Variable	Group	n	Mean	SD	t	df	p*
MWT1	EG	21	91.90	6.71	4.20	45	0.0008
	CG	26	78.85	12.8			
MWT2	EG	21	89.52	5.74	2.58	45	0.013
	CG	26	84.38	7.55			

*p<0.05   MWT: Medical word test; SD: Standard deviation
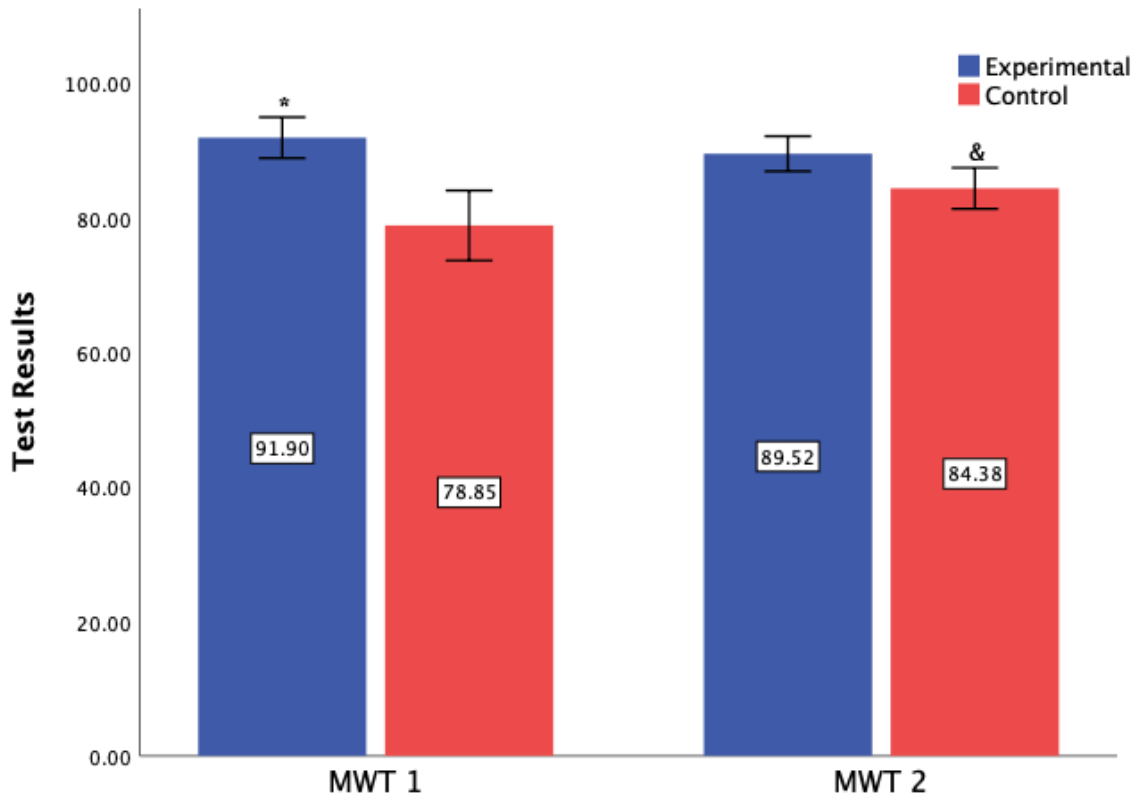
Note: *p*<0.05 *compared to the control and to repeated measurement in the same group

Figure 2: MWT 1 and MWT 2 means of the EG and CG

Regarding the second research question, exploring student perceptions of the digital software, means and standard deviations of the three TAM variables were calculated. The mean scores indicated that both EG and CG students found the app useful (M = 4.74±0.87 and M=4.21±0.15, respectively) and easy to use (M=4.24±0.12 and M=4.57±0.12, respectively). The BI mean of the EG, on the other hand, was higher than that of the CG (M=4.40±0.17 and M=4.00±0.21, respectively) (Table II).

A Mann-Whitney U test was conducted to examine if there was a difference between the perceptions of the groups. As Table III shows, there were statistically significant differences between the groups in the PU U(NEG=21, NCG=26)=159.00, z=-2.547, p=0.011 and PEU U(NEG=21, NCG=26)=181.00, z=-2.005, p=0.045. The perceived usefulness (Mdn=5) and the ease of use (Mdn=4.75) scores of the experimental group were higher than those of the control group (Mdn=4.38 and Mdn=4.25, respectively).

Table II: Mean scores of students' perceptions of digital software

Group	N	Perception		
		PU	PEU	BI
CG	21	4.21±0.15	4.24±0.12	4.40±0.17
EG	26	4.74±0.87	4.57±0.12	4.00±0.21

PU: Perceived usefulness, **PEU**: Perceived ease of use; **BI:** Behavioural intention

Table III: Comparison of students' perceptions of digital software

	PU	PEU	BI
Mann-Whitney U	159.00	181.00	209.50
Wilcoxon W	510.00	532.00	560.50
Z	-2.547	-2.005	-1.410
p	0.011	0.045	0.158

***p<0.05; PU: P**erceived usefulness, **PEU**: Perceived ease of use; **BI:** Behavioural intention
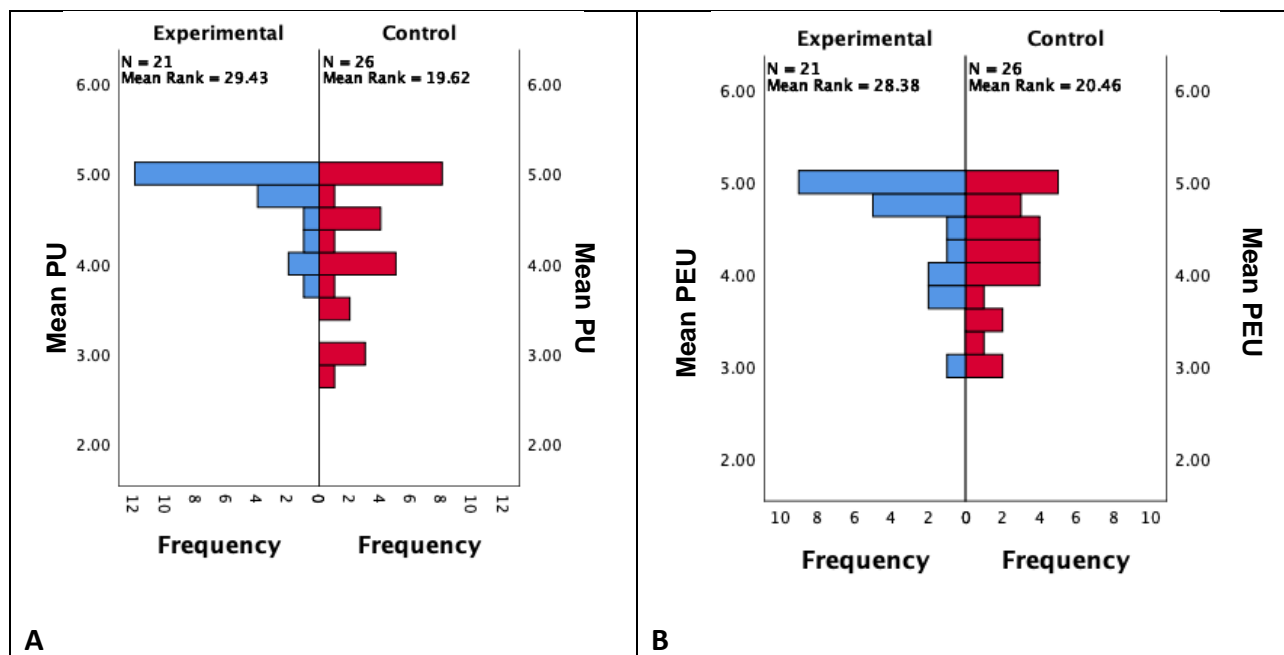
Figure 3: Comparison of PU and PEU in EG and CG

These findings suggest that the in-class use of the digital tool offered the students in the experimental group a hands-on experience, which, in turn, enhanced their perception of its usefulness (Figure 3).

The intention to use the digital app scores were equal (Mdn=4.5) for both groups. The Mann-Whitney U test confirmed that there was no significant difference between the groups U(NEG=21, NCG=26)=209.50, z=-1.410, p=0.158.

Discussion

There is no doubt that the role of pharmacists has changed dramatically around the world over the past few decades. In recent years, pharmacists have become an integral part of patient care, far beyond compounding and dispensing. Today, pharmacists have more professional functions, such as participating in drug use decisions, appropriate dosage form selection, dose regimen determination, drug preparation for patient use, and providing drug information to patients. All these require not only content knowledge but also subjective perception of patient needs. Changes in practice inevitably necessitate changes in pharmacy education (Pongcharoensuk, 2012). Nowadays, pharmacy education is being redesigned in many countries, including Turkey, so that pharmacists can provide patient-centred care, work in collaboration with other healthcare professionals, and communicate effectively.

One essential component of effective communication is knowing and understanding medical terminology. Medical terminology is a specialised language used by medical students, specialists, and professionals practising in the field of healthcare (Abdullah, 2013). As in many European countries, because medical terminology competence level is not specified in the National Pharmacy Core Education Program, pharmacy faculties in Turkey have been using a variety of pedagogical approaches for medical terminology teaching. While a few faculty of pharmacy offer courses in Latin medical terminology, in some faculties, such as the authors' faculty, medical terminology is taught in the Professional English courses, while in many others, medical terminology learning is the responsibility of students.

Growing research on the effect of digital gaming in higher education has yielded promising results. The present study tested the impact of in-class digital gaming on pharmacy students' medical terminology learning performance compared to physical gaming. Both tests were administered at a six-week interval, and the mean performance scores were significantly higher for the experimental group compared with the control group. The large effect size found in MWT1 may be attributed to the novelty effect. None of the participants had experience using the Quizlet tool before the study. Despite a slight decrease, the medium effect size found in MWT2 demonstrates that the use of in-class digital gaming regularly facilitated the acquisition of medical terminology. These findings, taken together, indicated that in-class digital gaming

had contributed to the students' learning performance. Congruently, studies conducted in different healthcare disciplines, such as medicine and nursing, reported that the use of digital games improved academic performance (Cowen, 2002; O'Leary, 2005; Selby, 2007; Kanthan, 2011). Müller described a digital game used to help nursing students with confusing medical terminology (Müller, 2013). The results showed that the game significantly improved the recognition of medical words and word forms, which led the researcher to conclude that gaming has a high potential for promoting active learning. Similarly, Cain & Piascik (2015) reported that increased student-student interaction is one of the strengths of digital gaming in class. In compliance with past research, the results of this study could demonstrate that in-class digital gaming is even more effective than physical gaming in learning medical terminology.

Regarding student perceptions of the tool, statistically significant differences indicated that EG students found the digital tool to be more effective and easier to use. This finding is in line with past research (Altıner, 2011; Chien, 2015; Dizon, 2016; Yüksel, 2020). This finding, along with the results of the first research question, might suggest that collaborative in-class gaming experiences affected learners' perceptions. However, there was no significant difference between the groups in terms of behavioural intentions. The fact that both groups used the tool for self-study purposes can explain this result.

Limitation of the study

This study has two primary limitations that inform the interpretation of the results of this study. First, the small sample size should be taken into consideration when interpreting the findings and limits the generalisability of the findings. Second, long-term retention of the medical words learnt was not tested. Further studies are needed to evaluate the impact of digital gaming in different courses and measure retention in a larger sample.

Conclusion

This study shows significant differences in the vocabulary test scores between the experimental and control groups, indicating that in-class digital gaming is a more beneficial approach to teaching medical terminology. Equally important is the finding that perceived usefulness and ease of use levels were higher in the experimental group, suggesting that in-class experience influences technology acceptance and use behaviours in tertiary level learners. Integrating digital

games into teaching practices would improve the acquisition and retention of medical terms among pharmacy students.

Conflict of interest

The authors declare no conflict of interest.

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