ORIGINAL ARTICLE

The Impact of Micro-Learning Enriched Environment on Learning and Achievement Motivation of Medical Students in Gastrointestinal Anatomy

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Background: This study was designed to evaluate the effect of a micro-learning enriched environment on general medical students' learning and achievement motivation in gastrointestinal anatomy.

Method: In this quasi-experimental study, the control and the intervention groups consisted of 69 and 66 students of the basic sciences curriculum phase of general medicine, respectively, who had the gastrointestinal anatomy course in the first and second semesters of the academic year 2019-2020. The intervention group's learning environment was enriched using the micro-learning approach, and the control group's teaching method was conventional. Formative and summative assessments were used to evaluate the students' learning, and the Hermans questionnaire was used to determine achievement motivation.

Results: The findings indicated that there was a statistically significant difference between the two intervention and control groups in terms of learning outcomes ($P<0.001$) and achievement motivation ($P=0.042$). In addition, there is no significant relationship between gender and grade point average (GPA) factors with achievement motivation ($P=0.41, F_{(3,4)}=1.234$) and also between gender and GPA factors with learning ($P=0.67, F_{(3,4)}=0.662$).

Conclusion: The environment enriched with micro-learning can enhance medical students' learning and achievement motivation.

Keywords: Micro-Learning, Gastrointestinal Anatomy, Achievement Motivation, Medical Education, Medical Student, Hermans Achievement Motivation Questionnaire (HAMQ)

تأثير بيئة التعلم الجزئي الغنية على التعلم ودوافع الإنجاز لدى طلاب الطب في تشريح الجهاز الهضمي

الخلفية: صممت هذه الدراسة لتقييم تأثير البيئة الغنية بالتعلم الجزئي على تعلم طلاب الطب العام ودوافع الإنجاز في تشريح الجهاز الهضمي.

الطريقة: في هذه الدراسة شبه التجريبية ، تكون مجموعتي الضبط والتدخل من ٦٩ و ٦٦ طالبًا من طلاب مرحلة مناهج العلوم الأساسية للطب العام، على التوالي ، والذين حصلوا على مقرر تشريح الجهاز الهضمي في الفصلين الأول والثاني من العام الدراسي ٢٠١٩. -٢٠٢٠. تم إثراء البيئة التعليمية لمجموعة التدخل باستخدام نهج التعلم الجزئي ، وكانت طريقة التدريس للمجموعة الضابطة تقليدية. تم استخدام التقييمات التكوينية والختامية لتقييم تعلم الطلاب ، واستخدم استبيان هيرمان لتحديد دوافع الإنجاز.

النتائج: أشارت النتائج إلى وجود فرق معتد به إحصائياً بين مجموعتي التدخل والضابطة من حيث نتائج التعلم (P <٠,٠٠١) ودوافع الإنجاز (P = 0.042). بالإضافة إلى ذلك ، لا توجد علاقة ذات دلالة إحصائية بين عوامل الجنس ومتوسط الدرجات (GPA) مع دافع الإنجاز (P = 0.41، 3) F = 1.234 (4) وأيضًا بين الجنس وعوامل المعدل التراكمي مع التعلم (P = 0.67، 3) F = 0.662 (4).

الخلاصة: يمكن للبيئة المخصبة بالتعلم الجزئي أن تعزز تعلم طلاب الطب وتحفيزهم على الإنجاز.

الكلمات المفتاحية: التعلم الجزئي ، تشريح الجهاز الهضمي ، تحفيز الإنجاز ، التعليم الطبي ، طالب الطب ، استبيان تحفيز الإنجاز هيرمانس (HAMQ)

معدے کی اناٹومی میں میڈیکل طلباء کے سیکھنے اور حصولیاب ہونے کی تحریک پر مائیکرو لرننگ کے افزودہ ماحول کا اثر

پس منظر: یہ مطالعہ عام طبی طلباء کے سیکھنے اور معدے کی اناٹومی میں کامیابی کے محرک پر مائیکرو لرننگ افزودہ ماحول کے اثر کا جائزہ لینے کے لیے ڈیزائن کیا گیا تھا۔

طریقہ: اس نیم تجرباتی مطالعہ میں، کنٹرول اور مداخلتی گروپس میں بالترتیب جنرل میڈیسن کے بنیادی سائنس کے نصاب کے مرحلے کے ۶۹ اور ٦٦ طلباء شامل تھے، جنہوں نے تعلیمی سال ۲۰۱۹ کے پہلے اور دوسرے سمسٹر میں معدے کی اناٹومی کا کورس کیا تھا۔ -۲۰۲۰۔ مداخلت گروپ کے سیکھنے کے ماحول کو مائیکرو لرننگ اپروچ کا استعمال کرتے ہوئے افزودہ کیا گیا تھا، اور کنٹرول گروپ کا تدریسی طریقہ روایتی تھا۔ طلباء کے سیکھنے کا اندازہ لگانے کے لیے تشکیلاتی اور خلاصہ کے جائزوں کا استعمال کیا گیا تھا، اور ہرمن کے سوالنامے کا استعمال کامیابی کے محرک کا تعین کرنے کے لیے کیا گیا تھا۔

نتائج: نتائج نے اشارہ کیا کہ سیکھنے کے نتائج (P ‹٠٫٠٠١) اور کامیابی کی ترغیب (P = 0.042) کے لحاظ سے دو مداخلت اور کنٹرول گروپوں کے درمیان اعدادوشمار کے لحاظ سے اہم فرق تھا۔ اس کے علاوہ، کامیابی کی ترغیب (P=0.41, F(3,4)=1.234) کے ساتھ صنف اور گریڈ پوائنٹ اوسط (GPA) عوامل کے درمیان اور سیکھنے کے ساتھ صنف اور GPA عوامل (P=0.67, F) کے درمیان کوئی خاص تعلق نہیں ہے۔ (۳، ۳)=٦٦٢٫٠)۔

نتیجہ: مائیکرو لرننگ سے بھرپور ماحول میڈیکل طلباء کے سیکھنے اور کامیابی کی تحریک کو بڑھا سکتا ہے۔

کلیدی الفاظ: مائیکرو لرننگ، معدے کی اناٹومی، اچیومنٹ موٹیویشن، میڈیکل ایجوکیشن، میڈیکل اسٹوڈنٹ، ہرمنز اچیومنٹ موٹیویشن سوالنامہ (HAMQ)

تأثیر محیط غنی شده با یادگیری خرد بر میزان یادگیری و انگیزش پیشرفت دانشجویان پزشکی در آناتومی گوارش

هدف: این مطالعه با هدف ارزیابی تاثیر محیط غنی شده با یادگیری خرد بر میزان یادگیری و انگیزش پیشرفت دانشجویان پزشکی عمومی در درس آناتومی دستگاه گوارش طراحی شد.

روش: در این مطالعه نیمه تجربی، گروه کنترل و مداخله به ترتیب متشکل از ۶۹ و ۶۶ دانشجوی مرحله علوم پایه پزشکی عمومی بودند که در نیمسال‌های اول و دوم سال تحصیلی ۹۹-۱۳۹۸ درس علوم تشریح دستگاه گوارش را سپری نمودند. برای گروه مداخله، محیط آموزشی با استفاده از رویکرد یادگیری خرد غنی سازی گردید و دوره آموزشی گروه کنترل به شیوه مرسوم برگزار شد. در راستای بررسی میزان یادگیری از آزمون‌های تکوینی و تراکمی در طول نیمسال تحصیلی و جهت تعیین انگیزش پیشرفت، پرسشنامه انگیزش پیشرفت هرمنس مورد استفاده قرار گرفت.

یافته ها: نتایج حاکی از آن بود که بین دو گروه مداخله و کنترل از نظر پیامدهای یادگیری ($P<0.001$) و انگیزش پیشرفت ($P=0.042$) از نظر آماری تفاوت معنادار وجود داشت. علاوه بر این، رابطه معناداری بین عامل های جنسیت و معدل کل شرکت کنندگان با انگیزش پیشرفت ($P=0.41, F_{(3,4)}=1.234$) و همچنین با یادگیری ($P=0.67, F_{(3,4)}=0.662$) مشاهده نگردید.

نتیجه گیری: با توجه به نتایج به دست آمده، محیط غنی شده با یادگیری خرد می تواند یادگیری و انگیزش پیشرفت دانشجویان پزشکی را افزایش دهد.

INTRODUCTION

Anatomy is known as an incomprehensible course that is difficult to memorize and easy to forget. Therefore, this course should be taught to efficiently understand anatomy to be applied in clinical practice. Developing and implementing effective programs to facilitate anatomy learning, reduce cognitive load, and consolidate the learned materials are essential in anatomy education (1).

According to some reports in the UK, about 33% of people's complaints and demands after surgery are due to damages adjacent to the surgical site. Therefore, the country's medical education system officials have shifted their attention to proper training in anatomy (2). One of the leading causes of students' despair and frustration with the curriculum is the contradiction between the content of learning and teaching methods (3). In recent years, anatomy education has developed in most countries, such as the invention of new teaching methods to foster higher motivation and facilitate learning (4, 5). Adopting new teaching methods enables medical teachers to balance the materials and the specified time. Moreover, it will encourage students' active participation (6) and promote deeper learning (1).

Micro-learning is an educational strategy that breaks complex topics into short-form, stand-alone units of study that can be viewed as many times as necessary, whenever and wherever the learner needs. The materials can be provided in various formats, such as text, images (infographics, charts, etc.), videos, podcasts, animations, dialogue simulations, and quizzes. Micro-learning is one of the most creative teaching methods that add entertainment and reduces boredom in the routine, monotonous teaching-learning process (7). Moreover, the reduction of unnecessary cognitive load is essential. This teaching method has eliminated the need for the physical presence of teachers and students in the classroom and opened up the possibility of learning in informal environments (8, 9). Wong et al. (2019) indicated that using instructional videos helped oral hygiene students broaden their learning experiences and acquire mental and motor skills (10).

Applying teaching strategies that involve students' active participation is an effective method of increasing learning and motivation. In addition, even the best educational programs will not be helpful without learners' motivation (11, 12). It needs creativity, besides the tools and methods that engage students in basic skills (both traditional and digital) and enhance their motivation (13). According to Dehghanzadeh et al. (2016), developing a framework for computer games improved students' motivation and learning. Therefore, the micro-learning approach and its various products, such as games, puzzles, and podcasts, can enhance students' achievement and motivation (14). This study was designed to evaluate the effect of a micro-learning enriched environment on medical students' learning outcomes and achievement motivation in gastrointestinal anatomy.

METHODS

In this quasi-experimental study, the control and the intervention groups consisted of 69 and 66 medical students of the basic sciences curriculum phase of general medicine, respectively, who had the gastrointestinal anatomy course in the first and second semesters of the academic year 2019-2020. The intervention group's learning environment was enriched using the micro-learning approach, and the control group's teaching method was conventional. The steps to conducting research are shown in Figure 1. Formative and summative assessments were used to evaluate the students' learning outcomes, and the Hermans Achievement Motivation Questionnaire (HAMQ) was used to determine achievement motivation. The instrument's validity and reliability, including the knowledge tests and HAMQ were examined and confirmed.

The inclusion criteria entailed taking the course of gastrointestinal anatomy in the Medical School of Mashhad University of Medical Sciences (MUMS) and students' informed consent to participate in the research. An incomplete answer to the HAMQ led to exclude the participant from the progress achievement motivation study.

The micro-learning modules were designed and created under the supervision of a subject expert and with the cooperation of the electronic content development team. In the control group, the teaching process was done using interactive lectures. It is noteworthy that the two groups did not interact during the study, and the instructor was the same in both groups. The study results were reported with 95% confidence, regarding $P \leq 0/05$ as statistically significant.

RESULTS

Of 135 medical students participating in the study, 69 were in the control group and 66 in the intervention group (Table 1).

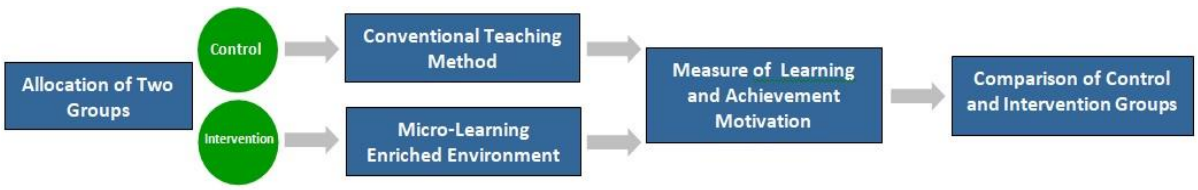

Figure 1. Steps to conduct this research

Table 1. Descriptive statistics for control and intervention groups

Group	N	Gender		Learning Outcomes (Mean± SD)	GPA (Mean± SD)	Achievement Motivation (Mean± SD)
Control	69	Female	29	15.86±3.07	16.36±1.79	81.32±7.60
		Male	40			
Intervention	66	Female	34	18.17±2.22	16.07±1.47	84.09±7.35
		Male	32			

The results of the Mann-Whitney test to determine the impact of the micro-learning approach on medical students' learning outcomes demonstrated that the student's learning in the intervention group was significantly ($P<0.001$) higher than that in the control group (Table 2). The mean rank scores were reported as 83.86 and 54.78 in the intervention and control groups, respectively.

Table 2. Comparison of students' learning outcomes in control and intervention groups

Group	N	Z	*P*-value
Control	69	-4.308	<0.001
Intervention	66		

The results of an independent *t*-test to assess the effect of the micro-learning approach on students' achievement motivation showed that the mean score of students' motivation in the intervention group was significantly ($P=0.042$) higher than that in the control group. The mean achievement motivation scores were obtained at 84.09±7.34 and 81.31±7.54 in the intervention and control groups, respectively (Table 3).

In addition, there is no significant relationship between gender and GPA factors with achievement motivation ($P=0.41$, $F_{(3,4)}=1.234$) and also between gender and GPA factors with learning ($P=0.67$, $F_{(3,\ 4)}=0.662$).

DISCUSSION

The present study aimed to determine the impact of a micro-learning enriched environment on medical students' learning and achievement motivation in gastrointestinal anatomy education.

The results demonstrated that the environment enriched with micro-learning could increase medical students' learning. This finding is consistent with the results of some previous studies (10, 15-18). Furthermore, in line with the present study, Hassanzadeh et al. (2013) showed that multiple repetitions of anatomy exposure and educational moulage and videos significantly impact anatomy learning (19). These results can be justified that students' participation facilitated by various products in a micro-learning enriched environment can enhance learning. Taghavi et al. (2011) concluded that although the combined method (including drawing, videos, and other educational materials) took more time, it greatly impacted students' learning (6). The simultaneous teaching of theoretical and practical anatomy contents, using teaching aids and even various radiographs, leads to a better understanding of anatomy and more sustainable learning. Moreover, this method promotes student-centered learning and raises learners' awareness of the importance of anatomy knowledge in medicine (20).

Regarding achievement motivation, the micro-learning approach significantly increased students' achievement motivation. These results are consistent with some previous studies (18, 21). Motivation plays a peculiar role in student preparation for learning and keeps them alert during educational activities; therefore, it is of utmost importance in the management of learning in the class.

Every teacher's success depends on learners' motivation; therefore, medical instructors should be aware and use new methods to motivate students to engage in the class and learn efficiently (22). Micro-learning can direct the educational needs of the society to a centralized knowledge where the successful performance of individuals or groups relies heavily on the acquisition and the use of appropriate information and communication tools to achieve educational goals (23).

Giurgiu (2017) concluded that micro-learning is one of the most popular methods of transforming the learning environment into learning management operating systems, allowing students to quickly learn and maintain information provided in the course and more controllable activities (24).

Table 3. Comparison of students' achievement motivation in control and intervention groups

Group	N	(Mean± standard deviation)	T	*P*-value
Control	64	81.31±7.54	2.054	0.042
Intervention	58	84.09±7.34		

Since the micro-learning approach appeal to almost all learners, a marked improvement is expected in students' learning outcomes and motivation. Students with high achievement motivation display perseverance in their assignments and outperform their counterparts with low achievement motivation in various academic exams (25). Researchers justify this mechanism on the ground that students with high academic motivation accept more educational activities, do more homework, and ultimately achieve tremendous success (26). Using enriched learning environments in anatomy and traditional cadaver-based education can design technology interventions as educational supplements and increase learning motivation (27).

Gender is one of the determinants of achievement motivation; however, in the present study, the main effect of gender was not significant, which contradicted the results of the studies performed by Bahrami (2008) (28) and Yousefi et al. (2015) (29).

Among the limitations of this study, the present authors can refer to the small sample size and non-random sampling; therefore, the obtained results should be generalized cautiously. In addition, some confounding variables can exist in the context of students' achievement motivation, which is suggested to be explored in future studies.

Ethical Considerations: Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors. The ethical committee approved this project of Mashhad University of Medical Sciences (IR.MUMS.MEDICAL.REC.1399.354 code).

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