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ENHANCING MEDICAL TERMINOLOGY ACQUISITION THROUGH COURSERA'S ENGLISH FOR MEDICAL PURPOSES (EMP) COURSES

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Abstract: This study investigates the efficacy of Coursera's English for Medical Purposes (EMP) courses in enhancing medical terminology acquisition among second-year students at the Faculty of Medicine, Farhat Abbas Setif 1 University, Algeria. Employing a mixed-methods approach with a pretest-posttest control group design, the research commenced with qualitative inquiries, including classroom observations and focus group discussions, to identify the specific challenges students face in mastering medical terminology. Informed by these insights, selected Coursera Medical Terminology courses were implemented as an intervention. The study involved 280 randomly assigned students, with the experimental group completing the EMP courses while the control group received traditional instruction. Data collection encompassed pre- and post-tests to assess medical terminology knowledge, as well as a satisfaction scale to evaluate participants' attitudes toward the online learning experience. Statistical analysis using SPSS 20 revealed a significantly greater improvement in terminology acquisition among the experimental group compared to the control group. Furthermore, participants reported high satisfaction levels with the online EMP courses. This research contributes to the growing body of literature on the effectiveness of online language learning within specialized contexts, suggesting that integrating EMP courses into medical curricula can substantially enhance students' proficiency in medical English. Future investigations could explore the long-term retention of acquired terminology and its impact on clinical communication competencies. The findings have significant implications for medical education and international healthcare communication, underscoring the potential of technology-enabled learning solutions to address language barriers and improve patient-provider interactions.

Keywords: Algeria, Coursera, English for Medical Purposes (EMP), medical terminology acquisition, online language learning

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1. Introduction

The prominence of the English language has become increasingly pronounced across various professional domains, including the critical field of healthcare. As Gylys and Wedding (1983) emphasized, English has emerged as a crucial communication medium within the medical sector. While traditional English instruction remains valuable, its rigid scheduling often poses significant challenges for medical students grappling with intensive academic workloads. The advent of Massive Open Online Courses (MOOCs), such as the pioneering platform Coursera, offers a flexible and accessible alternative for language acquisition (Stepan, 2013). Coursera's medical terminology courses provide students with essential vocabulary development while cultivating adaptable skill sets vital for modern medical professionals.

Recognizing the potential of these online learning opportunities, this study examines the effectiveness of Coursera's EMP courses at Farhat Abbas Setif 1 University in Algeria, representing an important step toward meaningful educational reform. Preliminary investigations, including a focus group discussion with second-year medical students and complementary classroom observations, revealed significant challenges in English language acquisition. Students demonstrated limited proficiency in medical terminology and struggled with the existing English module, which focused on general language skills rather than specialized medical vocabulary. This misalignment between curricular content and professional requirements impairs students' ability to comprehend and apply medical knowledge, particularly when engaging with scientific literature. The absence of a dedicated EMP curriculum fails to address the specialized linguistic demands of medical education, hindering students' development of essential terminology crucial for their future medical practice.

To address these pressing concerns, the present study aims to evaluate the effectiveness of Coursera's EMP courses in enhancing medical terminology acquisition among second-year medical students at Farhat Abbas Setif 1 University. Additionally, it seeks to assess students' attitudes toward this online learning approach as an alternative to traditional instruction. The research questions guiding this investigation are:

1. What impact do Coursera EMP courses have on medical students' acquisition of medical terminology?

2. How do medical students perceive and respond to online EMP courses?

The significance of this study extends across multiple domains. In the field of medical education, it provides empirical evidence to inform pedagogical practices and enhance student engagement strategies. For curriculum development, the findings offer valuable insights for aligning educational programs with contemporary healthcare requirements and student needs. Moreover, the study addresses the crucial aspect of international medical communication, supporting effective collaboration among healthcare professionals globally. These multifaceted contributions position the research to influence both medical education practices and healthcare communication standards worldwide.

2. Literature Review

The existing body of research on EMP and online language learning provides a robust foundation for understanding the importance of specialized language instruction in medical education. This literature review explores the scope and significance of EMP, the challenges and strategies involved in medical terminology acquisition, the evolution of online language learning platforms, and the emerging applications of MOOCs in medical and health sciences education. By synthesizing these interconnected themes, the literature review establishes a comprehensive context for the current study's examination of the effectiveness of Coursera-based EMP courses in enhancing medical students' acquisition of specialized terminology.

2.1. Defining English for Medical Purposes (EMP)

EMP encompasses specialized language instruction and research designed specifically for medical professionals and students. Ferguson (2013, p.243) conceptualizes EMP as a comprehensive pedagogical and research framework aimed at enhancing the English language competencies of non-Anglophone healthcare practitioners. Building on this foundation, Maher (1986, p.112) elaborates on EMP's broad scope, which extends to various healthcare personnel, including physicians, nurses, and allied medical staff. The fundamental objective is to facilitate effective communication and mastery of medical terminology, thereby improving both workplace performance and the quality of medical training.

2.2.The Importance of Medical Terminology Proficiency

The pervasive dominance of English in medical literature and international discourse underscores the critical importance of EMP. Maher's (1986) seminal research revealed that in 1980, a staggering 72% of biomedical articles were published in English. Notably, this linguistic prevalence extended well beyond Anglophone nations, with 33% of Japanese medical publications and 45% of German medical literature appearing in English. The trend was even more pronounced in India (99.6%), Pakistan, and Singapore (both 100%). Furthermore, an analysis of 373 international medical conferences found that all but one designated English as either the primary or official language. This widespread adoption of English in medical communication is further substantiated by Giba and Ribes (2011, p. vii), who assert that English's role as the definitive language of science and medicine is particularly evident in international medical gatherings. Ferguson (2013, p. 246) attributes the emergence of EMP largely to English's ascendance as the preeminent language of scientific and medical discourse during the late twentieth century.

2.3 Contemporary Approaches to EMP Instruction

Effective EMP instruction requires careful consideration of vocabulary selection, focusing on terms that offer long-term utility and retention potential for students. Contemporary pedagogical approaches emphasize context-based learning for vocabulary acquisition, particularly through the development of inferential comprehension strategies. Word formation instruction benefits from creating associative networks that connect related medical concepts. Thornbury (2002) advocates for the use of visual aids, including diagrams and mnemonics, to reinforce word pronunciation and spelling patterns. Instructors employ diverse methodologies, incorporating translation, visual representations, authentic examples, definitions, and various semantic, situational, and metaphorical frameworks to introduce new terminology.

While translation into students' native language provides an efficient means of conveying meaning, it requires careful implementation. Jezo (2014) notes that certain medical English phrases, such as 'The patient exhibits symptoms of...' or 'The patient presents...,' may not translate directly into other languages while maintaining their professional connotation. Therefore, teaching these expressions as complete lexical units rather than isolated words proves more effective. Practitioners often employ substitution exercises using these phrases as templates, allowing students to practice with various medical terms within authentic contexts.

Despite these pedagogical innovations, medical students continue to face substantial challenges in acquiring medical terminology, with obstacles arising from multiple sources. The fundamental complexity stems from the etymological foundations of medical terms, predominantly rooted in Greek and Latin origins. These classical language underpinnings create intricate linguistic structures that present considerable hurdles in pronunciation, spelling, and comprehension. Another significant challenge lies in the nature of medical vocabulary itself, which comprises numerous low-frequency words and newly coined terms.

This characteristic makes traditional word-by-word teaching approaches inefficient, necessitating the development of contextual inference skills and understanding of term components instead.

2.4 Enhancing Professional Competence through Medical Terminology Acquisition

Successful acquisition of medical terminology requires a systematic approach incorporating multiple learning strategies. This comprehensive framework enhances both understanding and retention, ultimately facilitating more efficient learning outcomes. Morphological analysis serves as a foundational strategy, involving the decomposition of complex terms into their constituent elements - root words, prefixes, and suffixes (Taie, 2015). Systematic review and practice form another crucial element, with research supporting the implementation of varied learning tools, including digital flashcards, interactive assessments, and educational games. Visual learning aids constitute a particularly effective component, with the integration of anatomical diagrams, medical charts, and clinical images enhancing retention and comprehension (Galmarini, Marciano & Schulz, 2024).

The mastery of these acquisition strategies directly translates into enhanced professional competence, particularly in English-speaking healthcare environments. This knowledge facilitates precise communication across various contexts, including medical documentation, shift handovers, and interdisciplinary collaboration, ensuring coherent patient care approaches (Zhang, Zhang, Wang & Yan, 2023). A comprehensive grasp of medical terminology serves as a crucial safeguard against medical errors, as accurate terminology comprehension significantly reduces the risk of misunderstandings in medication administration and treatment protocols (D'Angelo, Humphreys, Li & Young, 2017). Moreover, fluency in medical terminology enhances operational efficiency within healthcare settings, streamlining communication processes and documentation and allowing greater focus on direct patient care (Awaysheh, Wilcke, Elvinger, Rees, Fan & Zimmerman, 2017).

2.5 The Rise of Online Language Learning

The emergence of information and communication technology (ICT) has revolutionized education by introducing open online learning opportunities, particularly through MOOCs (Barclay & Logan, 2013). The concept of MOOCs, first coined in 2008, describes online courses offering free registration and featuring a publicly shared curriculum with open-ended learning outcomes (Cormier, 2008; McAulay, Stewart, Siemens & Cormier, 2010). Canadian researchers Siemens and Downes pioneered this initiative by developing high-quality online courses that were open, massive, and freely accessible to anyone seeking top-tier education. Following their lead, American universities began offering similar opportunities to the public, providing comprehensive courses that include lessons, assessments, and tests across diverse subjects.

The rapid growth of MOOCs is evident in Coursera's remarkable achievement of enrolling two million students in their online courses by 2012 (Pappano, 2012). Participants in these courses not only master the material but also have the opportunity to earn statements of participation or specialized degrees from prestigious British universities.

2.6 Integration of MOOCs in Medical Education: The Coursera Paradigm

Established in 2012 by Stanford University Computer Science Professors Daphne Kollar and Andrew Ng, Coursera has emerged as a preeminent global online education platform. The organization's core mission emphasizes the democratization of education as a fundamental human right through collaborative programming. The platform's exponential growth is evidenced by its current portfolio: 7,000 courses delivered through partnerships with more than 300 institutions across 190 countries, reaching an extensive network of over 129 million registered learners. A pivotal development in Coursera's evolution was its attainment of B Corp certification in February 2021, underscoring its commitment not merely

to shareholder value but to generating positive societal impact through the elimination of barriers to premium educational resources.

Within its extensive catalog, Coursera's EMP offerings present diverse learning opportunities for healthcare professionals and students alike. Notable among these is Stanford University's 'Writing in the Sciences,' which cultivates advanced scientific communication competencies. Yale University's innovative course, 'Understanding Medical Research: Your Facebook Friend is Wrong,' strengthens participants' statistical literacy in medical research interpretation. For those seeking to enhance their medical vocabulary, the University of Pittsburgh's 'Clinical Terminology for International and U.S. Students' delivers comprehensive training in medical communication protocols. Furthermore, Rice University's 'Medical Terminology' course, under the expert guidance of Professor Laura Kabiri, specifically addresses the linguistic needs of non-native English speakers in medical contexts. The platform's robust medical education portfolio encompasses approximately 338 specialized courses, ensuring thorough coverage across various healthcare disciplines.

Recent empirical investigations into MOOC effectiveness have yielded compelling insights into their pedagogical value. Utilizing sophisticated SortSite software, comparative analyses of major platforms including Coursera, EdX, Udacity, Udemy, and Miriada X have consistently positioned Coursera as the superior platform across multiple metrics, including accessibility, browser compatibility, and user interface design. These findings receive further validation through innovative research employing 'emotient analytics' to analyze user facial expressions, confirming Coursera's exceptional user-friendliness. Additionally, comparative efficiency studies have demonstrated superior task completion rates on Coursera compared to its competitors.

While specific research examining the efficacy of Coursera's EMP courses in medical education remains nascent, studies investigating English for Specific Purposes (ESP) (Hadj Djelloul, 2019; Selama, 2021) or MOOCs in ESP provide valuable insights. A landmark study conducted at the National Research University Higher School of Economics in Russia explored the integration of MOOCs into ESP curriculum, focusing on advanced English proficiency students (B2-C1 level). The research demonstrated that incorporating MOOCs into university ESP courses effectively synthesized specialized subject matter with language acquisition. These findings align with a comprehensive experiment at Tomsk Polytechnic University, involving 84 students and 10 professors, which revealed MOOCs' particular effectiveness in blended learning environments and their capacity to address specific academic challenges. This growing body of evidence underscores the significant potential of platforms like Coursera to enhance learning outcomes and address the evolving educational needs of healthcare professionals and students, while suggesting promising avenues for future research into the long-term impacts and optimal integration strategies of MOOCs in medical curricula.

3. Methodology

3.1 Research Design

3.1.1 Mixed-Methods Approach

This study employed a mixed-methods research design, integrating both quantitative and qualitative methodologies to provide a comprehensive understanding of the effects of Coursera EMP courses on second-year medical students' acquisition of medical terminology. While quantitative methods focused on measuring attitudes and documenting observable behaviors, qualitative approaches sought to uncover the perspectives and lived experiences of participants (Hammersley, 1992). The integration of these methodologies enables researchers to develop deeper insights and broader findings than would not be possible with a single approach (Wasti, Simkhada, Teijlingan, Sathian & Banerjee, 2022).

The selection of a mixed-methods approach was particularly informed by its demonstrated success in language acquisition research. For instance, Salman's (2017) comprehensive study employed a convergent parallel mixed-methods design to investigate language learning outcomes, effectively combining quantitative performance metrics with qualitative insights from instructor interviews. Similarly, recent research by Anggoro and Khasanah (2024) successfully integrated pre- and post-test assessments with qualitative questionnaires to evaluate both learning outcomes and student experiences in technology-enhanced language instruction.

This methodological framework offers substantial advantages through triangulation, where multiple data sources converge to support research conclusions (Sandelowski, 2000). In the current study, this approach combines quantitative data from pre-post tests and questionnaires with qualitative insights from observation checklists and focus group interviews. This integration allowed for a nuanced understanding of both the measurable impacts of Coursera EMP courses and the subjective experiences of medical students engaging with the platform.

While acknowledging the inherent challenges of mixed-methods research—such as data integration complexity and increased resource demands—careful planning and strategic implementation ensure research integrity while maximizing the benefits of this comprehensive approach. The combination of quantitative precision and qualitative depth provides a robust framework for investigating the effectiveness of online EMP instruction in medical terminology acquisition.

3.1.2 Pretest-Posttest Control Group Design

The study's experimental design adopts a pretest-posttest control group framework, chosen for its strength in establishing causal relationships between the independent variable, Coursera EMP courses, and the dependent variable, learners' acquisition of medical vocabulary. This design enabled a systematic evaluation of participants' baseline medical vocabulary knowledge through a pretest, followed by a posttest to assess vocabulary gains after the intervention. The structure of this design also controls for internal threats to validity, as the inclusion of both random assignment and a control group helps isolate the intervention's effects from other variables. By comparing pre- and post-intervention outcomes, the study provides an evidence-based understanding of the intervention's effectiveness in achieving its intended goals.

3.2 Participants

3.2.1 Sample Size and Demographics

The study sample consists of 280 second-year medical students from Farhat Abbas Setif 1 University, comprising 91 males and 189 females aged 19 to 34. All participants have been learning English as a foreign language since middle school but have not been exposed to medical English. The researchers selected those participants specifically because they are studying an English module but have limited medical English vocabulary. The sample was divided into two groups of 140 students each, with the students and their teacher voluntarily consenting to participate.

3.2.2 Inclusion and Exclusion Criteria

To ensure relevance to the study's objectives, participants were required to have completed their first year of medical studies, possessing foundational medical knowledge but having failed their English exam at the start of their second year.

3.2.3 Sampling Method and Group Assignment

A cluster sampling technique was used to represent the broader student population accurately. Out of twelve groups of seventy students each, four groups were randomly selected to form the study sample, providing a balanced representation of the entire cohort.

3.3 Instruments

3.3.1 Qualitative Tools

3.3.1.1 Classroom Observations

Observation checklists (OCs) played a key role in capturing qualitative data in this study. Specifically designed to meet the study's needs, the checklist included 12 items focused on teacher and learner attitudes during general English classes, spanning four sessions. The high reliability and validity of this checklist were ensured by tailoring it to the study's context, allowing for systematic data collection on classroom interactions.

3.3.1.2 Focus Group Discussions

Focus Group Discussions (FGDs) provided an additional qualitative data source, offering deeper insights into learners' perspectives on the importance of EMP. Six medical students from the research population participated in a 20-minute, in-person FGD, conducted with the necessary permissions and recorded for accuracy (see Appendix D). The FGD covered topics such as the perceived importance of EMP, participants' prior experiences with medical English, and the challenges encountered in acquiring medical terminology. Though FGDs enable rich, comparative insights, a potential limitation is that some participants may feel reluctant to share openly in group settings.

3.3.2 Quantitative Tools

3.3.2.1 Pretest and Posttest of Medical Terminology Knowledge

Pre- and posttests were integral in measuring the intervention's impact on medical vocabulary acquisition. To ensure consistency, the same test was administered as both the pretest and posttest, with careful attention to reliability and validity through pilot testing. The tests, comprising 20 multiple-choice questions (see Appendix B), focused on selecting the correct answer from multiple options, including two incorrect choices and a closely related option designed to test focus and comprehension. Written tests were selected over oral ones, aligning with the formal examination style in Algeria and accommodating students' English proficiency, which generally does not exceed B1. Each test allowed for a maximum score of 20 points, providing a clear quantitative measure of vocabulary acquisition.

3.3.2.2 Satisfaction Scale for Online Courses

Following the intervention, a satisfaction scale was administered to the experimental group to assess the impact of Coursera EMP courses and gauge participants' overall satisfaction with the course content and delivery. This scale, developed specifically for the study, allowed the researcher to collect structured feedback on the learners' experiences and the intervention's perceived value (see Appendix C).

3.4. Procedures

3.4.1 Phase 1: Problem Identification Using Qualitative Tools

To identify the central issues related to the acquisition of medical English terminology among second-year medical students, a face-to-face FGD was conducted with six students from the study's population. The careful selection of participants from within the study sample ensured that the discussion's findings were both relevant and aligned with the research objectives. The focus group was structured to allow students to share their prior experiences with medical English, any perceived challenges, and their attitudes toward learning medical terminology.

3.4.2 Phase 2: Selection and Implementation of Coursera EMP Courses

For the experimental intervention, three Coursera courses, Medical Terminology I, II, and III, designed by Professor Laura S. Kabiri from Rice University, were chosen due to their relevance and effectiveness in medical English learning (see Appendix A). The researchers led the intervention, as challenges in recruiting additional instructors arose. The experimental group participated in these courses from April 24 to May 24, while the control group received no intervention. Although participants completed the Coursera courses independently, they maintained contact with the researcher, providing progress updates, sharing screenshots, and requesting support as needed. The researchers actively monitored their progress, offering guidance and supplementary resources to address individual challenges.

3.4.3 Phase 3: Pretest Administration

Due to intermittent internet connectivity issues faced by several students, coupled with some participants' limited access to digital devices and technical difficulties in navigating the Moodle platform, the online pretest initially distributed via Google Forms to assess participants' medical vocabulary knowledge yielded insufficient responses. To overcome these technological barriers and ensure comprehensive participation, the pretest was subsequently administered in traditional written format on April 22, 2024, enabling all participants to complete the assessment without technical constraints.

3.4.4 Phase 4: Intervention Period and Posttest Administration

Following the one-month course period, a post-test was administered on May 27, 2024, to evaluate changes in medical terminology knowledge. Due to time constraints, the course materials, including Medical Terminology I, II, and III, were shared with participants through a Messenger group and on the Moodle platform by the English teacher. This setup enabled all participants to complete the required modules despite scheduling limitations.

3.5 Data Analysis

3.5.1 Qualitative Data Analysis Methods

To explore participants' experiences and attitudes, qualitative data were collected through classroom observation checklists and an FGD with selected students. Each FGD session was audio-recorded, transcribed, and thematically analysed. These data helped shape the research questions and hypotheses by highlighting relevant themes, such as participants' challenges in medical terminology acquisition, their perceived importance of English in medical fields, and the effectiveness of various learning strategies.

3.5.2 Quantitative Data Analysis Using SPSS

Quantitative data from the pretest, posttest, and satisfaction scale were analysed using the Statistical Package for the Social Sciences (SPSS version 20). This analysis focused on assessing the difference in medical vocabulary knowledge between the experimental and control groups and identifying the overall satisfaction level with the Coursera EMP courses. Statistical tests were performed to determine whether the intervention significantly impacted medical vocabulary acquisition.

3.5.3 Integration of Qualitative and Quantitative Findings

By employing a mixed-methods approach, this study integrated findings from focus group discussions, classroom observations, pre-/post-tests, and a satisfaction scale. This triangulation enabled a comprehensive understanding of the effects of Coursera EMP courses on medical terminology acquisition. The convergence of qualitative and quantitative data provided nuanced insights, enriching the analysis and allowing for an in-depth interpretation of the results. The holistic perspective gained through this integration offers valuable implications for future research and educational practices in medical English acquisition.

4. Results

4.1 Qualitative Findings

4.1.1 Themes Emerging from Classroom Observations

The classroom observations aimed to gather concrete evidence to either support or refute participants' reported challenges with English in medical studies, ensuring a balanced perspective by comparing participants' claims with real classroom dynamics. To this end, the researchers conducted four English sessions with randomly selected groups of second-year medical students at Farhat Abbas Setif 1 University, aiming to observe common behaviour patterns and the prevalence of language-related issues.

The students exhibited natural behaviours from the start of these observations, unaffected by the researchers' presence. Across all four sessions, it was evident that students were primarily silent and passive. The instructor was the sole knowledge source, while students mainly absorbed information without active engagement. When prompted with questions, students often displayed anxiety, showing minimal engagement in discussions or interactions with the teacher. Their English proficiency appeared limited; they struggled with vocabulary, could not easily construct coherent sentences, and showed no note-taking or writing activity, underscoring the challenges in English language engagement observed in class.

4.1.2 Insights from Focus Group Discussions

The focus group discussion, comprising six medical students, revealed significant insights into language-related challenges encountered during their medical studies. Through structured questioning, the discussion illuminated several critical areas of concern regarding English language proficiency and its impact on medical education.

A fundamental challenge emerged regarding the comprehension of English medical terminology and concepts. Despite English not being the official language of instruction, participants unanimously highlighted that their required academic readings predominantly consist of English-language articles, creating substantial comprehension barriers. This linguistic obstacle extends beyond classroom materials to affect students' ability to access and utilize online educational resources. Participants expressed particular frustration regarding their limited access to contemporary medical videos and courses, which are primarily available in English, effectively constraining their learning to classroom-provided materials.

The discussion further revealed significant concerns regarding classroom participation and academic engagement. Students emphasized that their curriculum offers only General English courses, which prove insufficient for medical contexts. This limitation, coupled with apprehension about grade implications, creates considerable hesitation in classroom participation and English language usage. The absence of specialized English language exposure within their medical curriculum appears to compound these challenges.

When discussing research comprehension, participants unanimously expressed a lack of confidence in their ability to effectively engage with English medical literature. One participant's experience of attempting to watch the medical series ‘Doctor House’ but struggling with the medical terminology exemplifies the broader challenges students face in engaging with English-language medical content, even in more casual contexts.

The impact of limited English proficiency extends beyond immediate academic concerns to affect future professional opportunities. Participants acknowledged that their current language skills act as a deterrent to pursuing international medical education opportunities, expressing particular concern about simultaneously managing both basic and specialized medical terminology acquisition. This limitation has significant implications for their professional development, as they recognized that major international conferences and medical programs predominantly operate in English.

The discussion culminated in a collective acknowledgment of English proficiency's critical role in medical careers. Students emphasized that pursuing education at prestigious international universities and securing positions at renowned hospitals typically requires advanced English language skills. This recognition underscores the urgent need for enhanced English language support within medical education programs, particularly focusing on medical terminology and professional communication skills.

4.2 Quantitative Results

4.2.1 Descriptive Statistics

To evaluate the research hypotheses, a paired sample t-test was conducted to compare the pre-test and post-test scores. The analysis revealed a statistically significant difference between the two tests ($p = 0.003$), which is well below the threshold value of 0.05. This low p-value indicates strong evidence against the null hypothesis, supporting its rejection and suggesting that the observed improvement in test scores was not due to chance. This statistical finding strengthens the conclusion that the intervention had a meaningful impact on participants' performance.

4.2.2 Analysis of Group Performance

Paired sample t-tests revealed significant improvements in language proficiency for both groups. The control group showed progress from pretest ($t = 32.557$) to posttest ($t = 36.296$), while the experimental group demonstrated more substantial gains (pretest $t = 33.693$; posttest $t = 48.644$). Both results were statistically significant ($p < 0.001$).

Table 1

Comparison of Pre-test and Post-test Scores between Groups

Group	**Pre-test**		**Post-test**		**Gain Score**	**p-value**
	Mean	t-value	Mean	t-value	t-value difference	
Control	--	32.557	--	36.296	3.739	< 0.001
Experimental	--	33.693	--	48.644	14.951	< 0.001
Correlation (r)	Control: 0.820, Experimental: 0.782					
Reliability (Cronbach's α)	Control: 0.901, Experimental: 0.871					

Note: The gain in t-scores for the experimental group (14.951) was approximately four times higher than the control group (3.739), indicating a substantially greater improvement in medical terminology acquisition among students who completed the Coursera EMP courses.

The statistical analysis reveals not only significant improvements in both groups but also a substantial difference in the magnitude of these gains. The experimental group's improvement (increase in t-score of 14.951) was approximately four times greater than that of the control group (3.739). This pronounced difference suggests that while traditional instructional methods do produce measurable learning outcomes, the structured Coursera EMP courses provide a significantly more effective framework for medical terminology acquisition.

The higher correlation coefficient in the control group ($r = 0.820$) compared to the experimental group ($r = 0.782$) may indicate that the intervention introduced more variability in learning outcomes, possibly reflecting differences in how individual students engage with and benefit from online learning platforms. This observation aligns with previous research

suggesting that online learning effectiveness can vary based on individual learning styles, technological proficiency, and self-regulation abilities.

4.2.3 Analysis of Satisfaction Scale Data

A large majority of students, 70.71%, indicated that they either 'Agree' or 'Strongly Agree' with the statement regarding the ease of use of the Coursera platform, while only 4.29% disagreed.

A significant majority of students, 85.71%, either strongly agreed or agreed that their medical vocabulary increased. However, there were still small proportions of students with neutral (9.29%), disagreeing, or strongly disagreeing views. These results suggest that the program or intervention likely had a positive impact on increasing medical vocabulary among the surveyed students, although individual experiences and perceptions varied. Furthermore, 83.58% of students either strongly agreed or agreed that the content on Coursera was relevant. However, small proportions of students were neutral (11.43%), disagreed (2.86%), or strongly disagreed (2.14%). These results indicate that most participants perceived the content provided on Coursera as relevant, highlighting the platform's effectiveness in delivering meaningful educational material.

Additionally, most students, 87.14%, either strongly agreed or agreed that they achieved the learning objectives. Only a small number of students expressed neutral, disagreeing, or strongly disagreeing views. These results indicate that the majority of surveyed students felt successful in meeting the intended learning outcomes, demonstrating the effectiveness of the intervention in achieving its objectives.

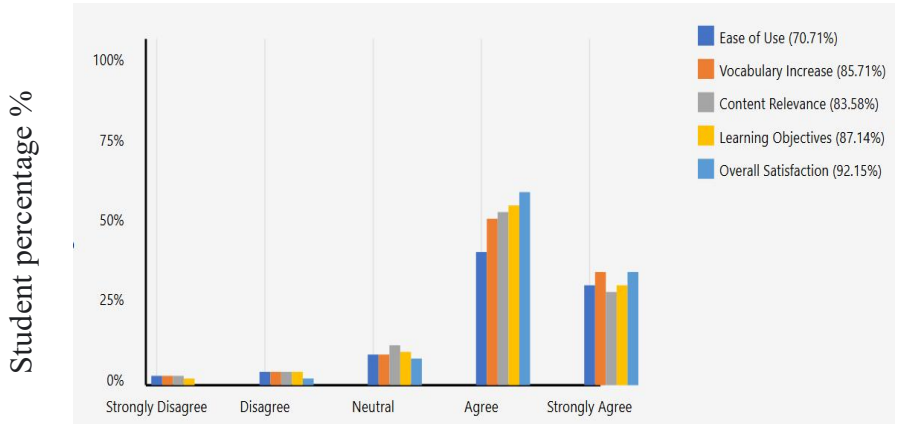
Lastly, a vast majority of students, 92.15%, either strongly agreed or agreed that they were satisfied with the Coursera platform. A small proportion of students held neutral (6.43%) or disagreed (1.43%) views, and importantly, no students strongly disagreed. This indicates a high level of overall satisfaction. These results suggest that the Coursera platform was well-received and met the satisfaction of most students, highlighting its effectiveness in providing a positive learning experience.

4.2.4 Visual Analysis of Satisfaction Data

To better understand the patterns in student satisfaction, Figure 1 provides a comprehensive visual presentation of responses across five key dimensions of the Coursera EMP experience.

Figure 1

Student Satisfaction with Coursera EMP Courses



Level of Agreement with Course Features

The visualization reveals several important patterns in student responses. First, there is a clear positive skew across all metrics, with the majority of responses falling into the 'Agree' and 'Strongly Agree' categories. The most favourable ratings were observed for overall satisfaction (92.15%), followed by achievement of learning objectives (87.14%), vocabulary increase (85.71%), and content relevance (83.58%).

Notably, while ease of use received positive ratings from 70.71% of participants, it showed the highest proportion of neutral responses (approximately 10%) among all dimensions evaluated. This suggests that while most students found the platform accessible, a meaningful minority experienced some challenges navigating the online learning environment. This finding aligns with the technical difficulties reported during implementation and highlights an area for potential improvement through enhanced orientation or technical support.

The visualization also reveals that the 'Strongly Disagree' category consistently received minimal responses across all dimensions (≤2%), with no students strongly disagreeing with the statement regarding overall satisfaction. This pattern suggests that even students who experienced challenges with specific aspects of the courses still found value in the overall learning experience.

These findings, visualized comprehensively, provide strong evidence for both the educational effectiveness and positive reception of Coursera EMP courses among medical students at Farhat Abbas Sétif 1 University, while also highlighting specific areas where implementation support could further enhance the learning experience.

5. Discussion

This study examined the effectiveness of Coursera EMP courses through a combination of quantitative and qualitative analyses. The findings addressed two key research questions, with post-experimental data validating the intervention outcomes.

Statistical analysis revealed a significant improvement in students' medical terminology knowledge, as demonstrated by the marked difference between pretest ($t = 33.693$) and posttest ($t = 48.644$) scores ($p < 0.001$). These results strongly support the rejection of the null hypothesis (H0) and confirm the alternative hypothesis (H1), establishing that Coursera EMP courses effectively enhance learners' acquisition of medical terminology.

5.1 Interpretation of Results

5.1.1 Impact of Coursera EMP Courses on Medical Terminology Acquisition

The quantitative analysis yields compelling evidence regarding the effectiveness of Coursera EMP courses in enhancing second-year medical students' acquisition of medical terminology. Statistical examination of pre- and post-test scores reveals substantial improvements in the experimental group's performance, with post-test results demonstrating marked advancement compared to baseline measurements. These findings strongly indicate that Coursera EMP courses serve as effective tools for expanding participants' medical vocabulary knowledge.

5.1.2 Students' Attitudes towards Online EMP Courses

The qualitative data derived from the satisfaction scale provides valuable insights into the second research question. Analysis reveals a strong preference for Coursera among experimental group participants, who demonstrated notably positive attitudes toward acquiring medical terminology through its EMP courses. This favourable reception manifests across multiple dimensions of the learning experience, with the majority of participants expressing satisfaction with the platform's educational approach. These qualitative findings substantiate the quantitative results, offering a holistic understanding of the intervention's effectiveness.

5.2 Alignment with Previous Research

The findings of the study, especially the notable improvements seen in pre- and post-test analyses, closely align with existing literature. This includes foundational research by Nickolaevna Stognieva at the National Research University Higher School of Economics in Russia in 2019, as well as studies conducted at Tomsk Polytechnic University in 2016. This alignment with previous research enhances the evidence supporting the effectiveness of online EMP courses in improving language acquisition and proficiency. The consistency between the current findings and established research further reinforces the positive impact of Coursera's EMP courses on mastering medical terminology.

5.3 Pedagogical and Institutional Implications

The study's findings carry substantial implications for the integration of EMP courses into Algerian medical education, particularly through platforms like Coursera. The demonstrated effectiveness of these courses in enhancing medical terminology acquisition suggests a viable pathway for addressing language barriers in medical studies. To maximize educational outcomes, institutions should consider several key recommendations.

First, the customization of course content to align with students' English proficiency levels and specific learning needs emerges as crucial. Second, medical schools should prioritize the integration of specialized EMP instruction over general English courses, better preparing students for international opportunities. Finally, successful implementation requires robust administrative support, encouraging active student engagement with EMP resources like Coursera to enhance their professional development and career prospects.

5.4 Limitations of the Study

Despite efforts to establish a robust methodological foundation, this study faced several notable limitations. The researchers did not administer an independent placement test, as participants had already taken one through their faculty. This reliance on existing assessments may have affected the baseline measurement of students' abilities. Additionally, since English instruction did not commence until April 2024, opportunities for classroom observation were limited, potentially affecting the depth of qualitative insights gathered. The study's focus on students who did not pass the English exam (810 out of 828 students) also meant that successful learners' experiences were not captured in the analysis.

The brevity of the experimental phase may have limited the potential to observe more significant, enduring effects on language acquisition. Internet accessibility issues created barriers for some students' full participation in the study's intervention. Furthermore, the unpredictable nature of human behaviour presented challenges, as external factors such as academic stress and anxiety about failing the English course could have impacted participants' engagement and focus, thereby affecting the validity of the results.

5.5 Critical Analysis of MOOC Limitations and Long-term Effectiveness

While this study demonstrates the significant potential of Coursera EMP courses in enhancing medical terminology acquisition, several important limitations of MOOCs must be acknowledged for a comprehensive understanding of their educational value.

First, the effectiveness of MOOCs heavily depends on student autonomy and self-regulation. Previous research by Kizilcec et al. (2017) suggests that students with strong self-directed learning skills benefit significantly more from online courses than those requiring more structured guidance. In the medical education context, where students already face substantial academic demands, the additional requirement for self-regulation may create an uneven distribution of benefits among learners. Our satisfaction scale results support this concern, as approximately 15% of students did not report vocabulary improvement, suggesting potential variability in engagement or learning outcomes.

Second, the long-term retention of terminology acquired through MOOCs remains an open question. While our study demonstrates immediate post-intervention improvement, the durability of this knowledge—critical for medical professionals—requires longitudinal assessment. The four-week intervention timeframe, while practical for experimental purposes, may not reflect the sustained engagement necessary for long-term professional language competence. Future research should incorporate delayed post-tests (3-6 months post-intervention) to evaluate retention patterns.

Third, the technological barriers observed during this study highlight infrastructure challenges that may limit MOOC implementation in resource-constrained settings. The necessity to shift from online to paper-based testing due to connectivity issues illustrates potential equity concerns in digital learning access, particularly relevant in developing regions.

5.6 Specific Pedagogical Limitations for Integration

Based on this study's findings and identified limitations, we propose the following specific recommendations for medical educators seeking to integrate Coursera EMP courses into structured curricula:

1. Blended Learning Implementation**:** Rather than viewing MOOCs as standalone solutions, medical programs should adopt a blended learning approach that combines Coursera EMP courses with instructor-guided sessions. These complementary sessions should focus on practical application of acquired terminology through simulated clinical scenarios and case-based discussions.
2. Strategic Course Selection and Sequencing**:** Medical curricula should adopt a progressive approach to EMP integration, beginning with foundational terminology courses in early years and advancing to specialized discourse in clinical contexts. Our findings suggest that Rice University's Medical Terminology series provides an appropriate starting point, but should be supplemented with discipline-specific modules as students progress.
3. Assessment Alignment and Integration**:** Formal assessment structures should incorporate medical terminology evaluation through both traditional testing and authentic application tasks. Creating explicit connections between Coursera course completion and course credit may enhance motivation and completion rates.
4. Support Infrastructure Development**:** Institutions should establish dedicated language resource centres with reliable internet connectivity, scheduled access times, and technical support personnel to address the technological barriers identified in this study.
5. Peer Learning Communities**:** Establishing formal or informal study groups among students completing the same Coursera courses can enhance engagement and provide mutual support, addressing the autonomy challenges inherent in online learning.
6. Faculty Development**:** Training programs should be developed to equip medical educators with the skills to effectively integrate, supplement, and assess learning from Coursera EMP courses, fostering institutional capacity for sustainable implementation.

These targeted recommendations provide concrete pathways for medical educators to leverage the demonstrated benefits of Coursera EMP courses while mitigating their limitations through thoughtful curriculum design and institutional support structures.

6. Conclusion

The findings of this study definitively demonstrate the critical impact of EMP courses delivered through the Coursera platform on medical students' acquisition of specialized terminology. At Farhat Abbas Setif 1 University, where second-year medical students previously lacked formal EMP instruction, the implementation of online courses yielded remarkable results. The quantitative analysis of 280 participants, divided into control and

experimental groups, revealed statistically significant improvements in medical terminology acquisition among students who completed the four-week Coursera intervention.

Beyond mere terminology acquisition, the study illuminated a broader pattern of positive engagement with online learning platforms. Student satisfaction metrics indicated strong acceptance of and enthusiasm for the Coursera-based approach, suggesting that digital learning environments can effectively address the motivational challenges traditionally associated with medical English instruction. This acceptance proves particularly valuable given the increasing digitalization of medical education and the growing importance of English proficiency in global healthcare contexts.

These findings carry substantial implications for medical education curricula. The integration of EMP courses should begin early in medical training, establishing a robust foundation for specialized language acquisition. To optimize learning outcomes, institutions should consider implementing a hybrid approach that combines online platforms with traditional instruction methods. This could include dedicated language laboratories, virtual clinical simulations, and international exchange opportunities, all designed to provide immersive, practical applications of medical English.

Furthermore, the success of the Coursera intervention underscores the transformative potential of online platforms in specialized language instruction. These digital environments offer unprecedented flexibility and accessibility, allowing students to engage with authentic medical content at their own pace. The incorporation of interactive exercises, real-world case studies, and multimedia resources creates a comprehensive learning experience that addresses the diverse needs of medical students.

To ensure sustained progress, institutions should establish regular assessment protocols that evaluate both language proficiency and practical application skills. These assessments should align with international healthcare communication standards, preparing students for global medical collaboration. Additionally, continuous feedback mechanisms can help refine course content and delivery methods, ensuring that the curriculum remains responsive to evolving medical communication needs.

In conclusion, this research not only validates the effectiveness of online EMP courses but also provides a blueprint for their systematic integration into medical education. As healthcare becomes increasingly globalized, the ability to communicate effectively in English represents not just an academic requirement but a professional necessity. Through thoughtful implementation of online learning platforms like Coursera, medical institutions can equip their students with the linguistic tools essential for success in the international medical community, ultimately contributing to improved global healthcare outcomes.

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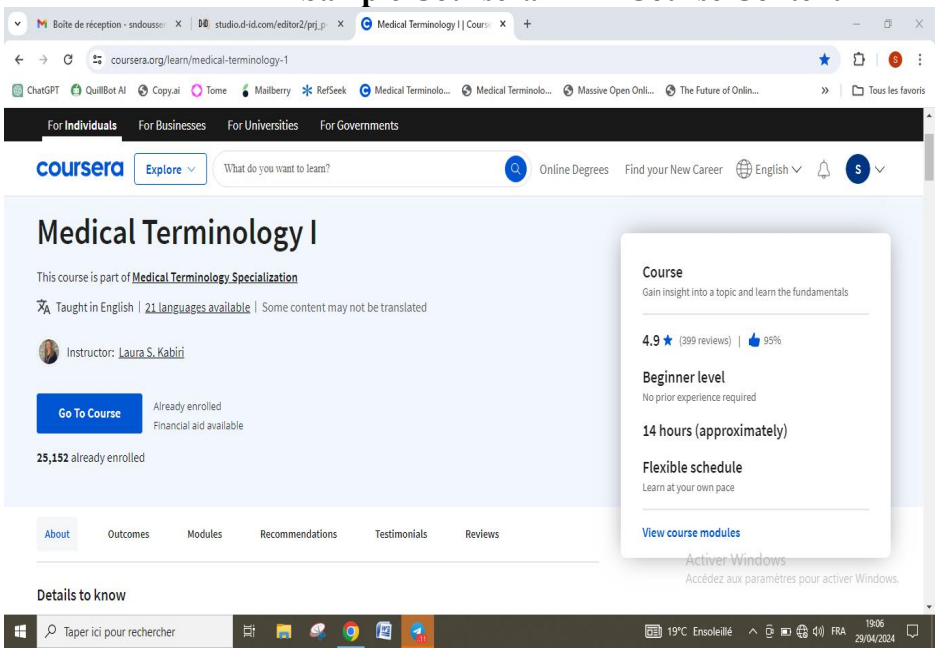
Appendices
Appendix I
Sample Coursera EMP Course Content



Appendix II
Pretest Instrument

Pre-Test

Thank you for taking the time to consider participating in our research study. We great
appreciate your willingness to help us investigate important topics. Please rest assured
your responses will be kept strictly confidential, and your participation is entirely volu
The data collected will be used for research purposes only and will be kept secure. You
cooperation and honesty are highly valued and will provide valuable insights for our st

Once again, thank you for your time and participation.

First Name : Last name :

Choose the right answer.

1. disease of the kidney :
   - nephroptosis
   - renal failure
   - hemodialysis, kidney dialysis
   - nephropathy
2. graphospasm
   - pain in the bone
   - bonnet
   - muscle weakness
   - writer's cramp
3. patches of itchy, red, scaly skin
   - onychomycosis
   - atopic dermatitis
   - psoriasis
   - acne vulgaris
4. poor coordination
   - arthralgia, arthrodynia
   - dystaxia, ataxia
   - hypotonia
   - myalgia, myodynia
5. hem/o
   - good
   - death
   - fungus
   - blood
6. blood in the urine
   - hematuria
   - dysuria
   - incontinence
   - nocturnal enuresis
7. cancer of melancytes
   - psoriasis
   - seborrheic dermatitis
   - squamous cell carcinoma
   - malignant melanoma
8. dermis
   - dryness
   - name used for skin with abrasion
   - the middle layer of skin
   - hardness
9. brach/o
   - ankle
   - neck
   - wrist
   - arm
10. study of human movement
    - biomechanics
    - osteology
    - physiology
    - kinesiology
11. ostalgia, ostealgia, osteodniya
    - pain in the bone
    - fractured bone
    - a disease of the bone
    - temporal and parietal bone
12. over development of muscle
    - hyperplasia
    - hypertrophy
    - hypotonia
    - myasthenia
13. unusual inflammation of the skin
    - atopic dermatitis
    - psoriasis
    - acne vulgaris
    - fungus
14. gen/o
    - change
    - formation
    - disease, suffering
    - creation, cause
15. bed sore
    - tinea pedis
    - decubitus ulcer
    - basal cell carcinoma
    - psoriasis
16. morph/o
    - straight
    - change
    - beyond
    - wonder
17. angi/o
    - fungus
    - formation
    - water
    - vessel
18. hydr/o
    - money
    - under
    - water
    - change
19. hair follicle
    - the outmost, visible layer of the skin
    - the middle layer of skin
    - sac within which each hair grows
    - the part of the hair located below the surface of the epidermis
20. gland
    - a group of cells that release sweat
    - a group of cells that release fluid
    - the middle layer of skin
    - the outmost, visible layer of the skin

Appendix III
Posttest Instrument

Post-Test

Thank you for taking the time to consider participating in our research study. We greatly appreciate your willingness to help us investigate important topics. Please rest assured that your responses will be kept strictly confidential, and your participation is entirely voluntary. The data collected will be used for research purposes only and will be kept secure. Your cooperation and honesty are highly valued and will provide valuable insights for our study.

Once again, thank you for your time and participation.

First Name : Last name :

Choose the right answer.

1. graphospasm
   - pain in the bone
   - bonnet
   - muscle weakness
   - writer's cramp
2. blood in the urine
   - hematuria
   - dysuria
   - incontinence
   - nocturnal enuresis
3. dermis
   - dryness
   - name used for skin with abrasion
   - the middle layer of skin
   - hardness
4. study of human movement
   - biomechanics
   - osteology
   - physiology
   - kinesiology
5. ostalgia, ostealgia, osteodniya
   - pain in the bone
   - fractured bone
   - a disease of the bone
   - temporal and parietal bone
6. over development of muscle
   - hyperplasia
   - hypertrophy
   - hypotonia
   - myasthenia
7. unusual inflammation of the skin
   - atopic dermatitis
   - psoriasis
   - acne vulgaris
   - fungus
8. poor coordination
   - arthralgia, arthrodynia
   - dystaxia, ataxia
   - hypotonia
   - myalgia, myodynia
9. gen/o
   - change
   - formation
   - disease, suffering
   - creation, cause
10. patches of itchy, red, scaly skin
    - onychomycosis
    - atopic dermatitis
    - psoriasis
    - acne vulgaris
11. bed sore
    - tinea pedis
    - decubitus ulcer
    - basal cell carcinoma
    - psoriasis
12. morph/o
    - straight
    - change
    - beyond
    - wonder
13. angi/o
    - fungus
    - formation
    - water
    - vessel
14. hair follicle
    - the outmost, visible layer of the skin
    - the middle layer of skin
    - sac within which each hair grows
    - the part of the hair located below the surface of the epidermis
15. gland
    - a group of cells that release sweat
    - a group of cells that release fluid
    - the middle layer of skin
    - the outmost, visible layer of the skin
16. disease of the kidney
    - nephroptosis
    - renal failure
    - hemodialysis, kidney dialysis
    - nephropathy
17. hem/o
    - good
    - death
    - fungus
    - blood
18. cancer of melanocytes
    - psoriasis
    - seborrheic dermatitis
    - squamous cell carcinoma
    - malignant melanoma
19. brach/o
    - ankle
    - neck
    - wrist
    - arm
20. hydr/o
    - money
    - under
    - water
    - change

Appendix IV Satisfaction Scale Instrument

Coursera Platform Satisfaction Scale

Thank you for considering participating in our research study. Your responses will be kept confidential, and your participation is voluntary. The data collected will be used for research purposes only. Your cooperation and honesty are appreciated.

Age : Gender :

Please indicate with a ✔ in the column that you find most convenient.

	Strongly Agree موافق بشدة	Agree موافق	Neutral محايد	Disagree معارض	Strongly Disagree معارض بشدة
The Coursera platform was easy to use. منصة كورسيرا كانت سهلة الاستخدام.					
Taking the Medical Terminology course in Coursera increased my medical vocabulary. أخذ دورة المصطلحات الطبية من منصة كورسيرا زاد من من مفرداتي الطبية.					
The content of the Medical Terminology course in Coursera was very relevant and useful. كان محتوى دورة المصطلحات الطبية في كورسيرا مناسبًا ومفيدًا للغاية.					
The course provided the necessary support and resources to help me achieve my learning objectives very well. قدمت الدورة الدعم والموارد اللازمة لمساعدتي في تحقيق أهدافي التعليمية بشكل جيد للغاية.					
I am satisfied with the use of the Coursera platform. أنا راضٍ عن استخدام منصة كورسيرا.					

Appendix III Focus Group Discussion Instrument

Investigating the Impact of Coursera EMP Courses on Learners' Acquisition: Case of Second Year Medical Students at Ferhat Abbas Setif 1 University

Focus Group Discussion

Esteemed respondents,

We, ANGAL Nour El Houda and NASRI Sndousse, are Master 2 students at Mohamed Lamine Debaghine Setif 2 University. We are conducting a research study that involves your participation, and we would behonored if youcould spare some time to contribute to our study. Please rest assured that your personal information will remain confidential and anonymous. The focus group discussion setting is designed to prioritize a secure and respectful environment conducive to open dialogue and intellectual exchange. Confidentiality and professionalism are of utmost importance to us, ensuring that all information shared during this focus group discussion remains confidential unless explicit consent is provided otherwise.

Questions:

1. Do you have difficulty understanding medical terminology or concepts presented in English during your studies?
2. Can you provide any examples of times when your English skills interfered with your learning in medical courses?
3. Do you feel comfortable asking questions or participating in class discussions when using English ? Why or why not ?
4. How confident are you in your ability to understand medical research articles witten in English for your studies ??

5. Would your current English proficiency limit you from enrolling in medical education or training programs offered in English?
6. What is the importance of strong English language skills for a successful career in medicine?