

Teaching of medical science using mother language with bi-lingual approach, an experimental cross over trial

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Abstract

Background: Using the mother-tongue language in educational programs increases the students' comprehension and facilitates the communication with their teachers and instructors. It also prevents linguistic dualism. However, teaching medical sciences in a language other than English remains controversial. The bi-lingual method is using important English terms in context beside the Arabic main text. This study examines the efficiency of using the bi-lingual approach as an alternative educational method that provides the advantages of using the native language and avoids the linguistic barriers when dealing with a foreign environment.

Methods: Third-year medical students of the faculty of Medicine of Damascus University were included in a three-week comparative study. They were divided into three groups. Each group attended a 20 minutes' neuroanatomy lecture in three topics using three linguistic methods: Arabic, English or bi-nomenclature. Each lecture with one topic and one linguistic method. Two tests were performed in each lecture (pre- and post-lecture test) with six points as the total score of each test. The participating students had the same pre- and post-lecture test regardless of the used linguistic method. The same professor presented all lectures.

Results: A total number of (277) students participated in the study. After excluding all participants who failed to attend the three lectures, the final participants were (147) students. The bi-nomenclature method had the highest mean of points: [3.70/6], while the Arabic only method had a mean of [3.19/6] and the English-only method's mean was [2.76/6]. These results were statistically significant (p-value less than 0.001). It was significant that Arabic questions were answered correctly regardless of the used linguistic method (p-value <0.001).

Conclusion: The bi-lingual pedagogic method which combines mother language in the main text and providing of medical terms in both mother language and English could present suitable medical education strategy in non-English speaking countries.

Introduction

Mother language-based education increases the student's comprehension and facilitates communication with their teachers [1]. It can also prevent the linguistic dualism, which means studying in a language and thinking in another. This teaching strategy is mainly used in basic and secondary education schools. While higher education faculties and institutions usually use English as the main teaching language. Therefore, this linguistic disparity often impairs students' learning abilities and generates low self-image if they are not fluent in English [2]. Besides, some studies have shown that students tend to stress when they study in a foreign language [3].

Despite these aspects, teaching medical science in mother language is still a controversial point, especially in developing countries. Supporters of English based education present many highlighted points; English is the international language used in medical science and research [4], in which the

majority of publications and the most accessible and cited articles are written [5, 6]. The English language is widely used for international communication and scientific conferences [1]. Medical students who seek practice abroad or fellowships need to be proficient in the English language [7].

On the other hand, the arguments in favor of teaching medical science in mother language are based on the difficulty of comprehension and teaching in a foreign language for both students and teachers.

On the other hand, the use of the mother language resolves the issue of linguistic dualism, and physicians reading in their mother tongue had better comprehension than those reading in English [8], while the use of mother language can enhance the communication skills and the ability of medical students to deal with patients in their own communities and tongue [9-11].

Medical schools in Arab countries vary in their methods of teaching; most of them have taught using English or French languages. Syria may be the only Arabic-language speaking country in which the universities adopted systematically Arabic-based medical curricula in medical schools. Arabization of medical education in Syria was established one century ago [12]. Even though numbers of individuals have demanded teaching medical sciences in English to make Syrian students more updated with the latest medical innovation, teaching medical sciences in Arabic language did not handicap the Syrian students [13].

Many researches were designed to assess the feasibility of teaching medical science in Arabic. Their methodologies were based on responding to a written survey [14], interviewing with decision-makers [15], a questionnaire survey of medical students [16] or medical students and staff members [17]. To our best of knowledge, the experimental studies treating with this critical subject are rare.

The bi-lingual method uses important English terms in context in addition to the Arabic main text. This approach presents a pedagogic method combining the advantages of teaching in mother-tongue language and helping in resolving linguistic barriers as well.

In our previous study [18], we proposed that simplified mother tongue combined with English terminology may present a viable alternative method for medical-educational-written texts in Arabic-speaking population. We, through the current research, intend to expand our conclusions in order to include visual and verbal communications.

Methods

Data collection:

An experimental cross over trial regarding the efficiency of using the bi-nomenclature approach in teaching was conducted among third-year medical students in the faculty of Medicine, Damascus University (Damascus, Syria). The study took place during the first semester of the 2018-2019 academic year. Neuroscience was chosen as the subject of the course .Three groups of students were randomly

selected; the students were voluntarily asked to join the trial for three weeks. They had to attend one 20 minutes' lecture every week. Each lecture about one title in one linguistic method.

On the first week of the study, each of these three groups was selected for one out of three linguistic methods: Arabic, English or bi-nomenclature (Arabic-based with essential terms in Arabic and English). A pre-lecture test with six questions (three in Arabic and three in English) was performed to evaluate the student's background knowledge before the lectures were presented.

The post-lecture test also consisted of six questions (three in Arabic and three in English questions). The pre- and Post-lecture tests had a total point of six for each (one point by question). Different types of questions were used: multiple choice and filling in the space's questions.

Some multiple-choice questions had more than one correct answer. All students were also asked whether they prefer Arabic as medium of instruction in medical sciences or not.

On week 2 and 3, every group had to experience a different approach in delivering medical education (Arabic, English, hybrid), so at the end of the three weeks every group of students had to try and to be evaluated in the three methods (table1) .

Three main topics in neuroanatomy were chosen (Aphasia, basal ganglia and brain blood supply). Each topic was provided in the aforementioned linguistic methods so a cross over between the groups could be applied on the second and third week of the study (table1). The same professor introduced all the lectures.

The lectures were prepared using Microsoft power point 2013®. Oral presentation and discussion during each lecture were compatible with the slides' language, for example, during the English lecture, discussions and information explanations were communicated in English for the whole 20 minutes. Questions were presented on a projector's screen, while participants' information and answers were collected on a hardcopy paper.

Data Processing:

The student's information and answers were collected using serial numbered hard copy papers. The data then were extracted to a secured Microsoft Excel 2013® file for Repeated Measures ANOVA models and Paired Samples t-Test statistical analysis.

Unanswered questions were excluded.

Each correct answer was given one point and the total score was six.

Statistical analysis:

The data have been subjected to statistical analysis with SPSS version 20® (IBM).

Ethical considerations:

Participation in this study was voluntary. Written consent was obtained from each participant at the beginning of the study. The privacy of the participant was achieved by removing any information that might identify any of the responders before sending the data to analysis. Each participant was provided with a serial number and no names were asked to be provided.

Furthermore, blinded processing of information was used to insure the anonymity of participation. Participants' privacy and voluntary participation were guaranteed and rigorously considered throughout the study course. According to these conditions, responses from participants who refused to participate or withdrew at any stage of the study were excluded. All included participants were 18 years or older.

Results

Participants' characteristics:

A Total number of (277) students participated throughout the three weeks. After excluding all participants who did not attend the three lectures, the final participants' number was (147).

Information regarding each student's High school English average, first and second college English average and previous anatomy courses average were collected. Total Averages were (294.3/300, 85.91/100, and 81.98/100, respectively). Participants' characteristics are summarized in (Table2).

Tests' results:

The bi-nomenclature method had the highest points' mean: [3.70/6]. While the Arabic based method had a mean of [3.19/6] and the mean of the English based method was [2.76/6]. These results were statistically significant with a p-value of (<0.001).

Using repeated measures models, it was significant that Arabic questions were answered more correctly no matter what the linguistic method was (p-value <0.001), with the higher points recorded using the bi-nomenclature method (2.24). No significance was detected using any of the three methods regarding the English questions.

Mother Language preference:

All the participants were asked whether they prefer Arabic as the instructional language for medical sciences. Sixty-one percent of them in total answered "Yes".

Test results and language preference for each group are shown in (Table 3)

Discussion

English has a leading role as the international language of science, the majority of medical textbooks and publications are written in English. The use of English as the medium of medical education is adopted by many non-English speaking countries. Medical students and practitioners need to learn English to follow up the development of science and enhance communication with other colleagues worldwide. Additionally, mastering writing and speaking skills in the English language will influence the socio-economic status of physicians [19].

However, the “Language bias” is a phenomenon reported as a result of the tendency to publish important findings in English language journals [20]. Non-English articles are neither cited nor accessed as much as articles written in English [5], non-English-speaking physicians could face a barrier when practicing Evidence-based Health Care (EBHC) [7, 21]. Learning English is mandatory since the majority of physicians and researchers need to keep up with the latest scientific innovations and wish to deliver their work to the largest population possible.

Teaching medicine in mother tongue or in English has been discussed. The various difficulties for both students and teachers were noted [22], learning medical sciences in mother tongue was proposed to resolve the linguistic dualism and to facilitate communication with patients [23].

An Indian questionnaire results showed that importance of English as a medium of instruction equals the importance of regional/national language to enhance attending to patients [1]. In another study, Scandinavian physicians who read a review article in their mother tongue had the best comprehension and retention of medical information [8].

In Serbia, an investigation with a questionnaire was carried out among 312 Medical students, [19] the results showed that writing and speaking skills in the mother tongue and in English were associated with students’ satisfaction of their social and economic status, while their ability of verbal expression in the mother tongue was associated with achievements at the Faculty.

Proficiency in the English language can pose serious problems for discussion in Problem-based Learning tutorials, this problem required a novel approach allowing students to engage in discussions using the native language and English [24].

The Arabic language is one of the widely used languages in the world. It is one of the six official languages of the United Nations, and it is the official language of 25 countries in two continents (14). During the Middle Ages, textbooks in medical sciences were written in Arabic such as the works of the Persian Avicenna (Ibn Sina), the Damascene Ibn al-Nafis and the Andalusian Avenzoar (Ibn Zahr).

The Ottoman Empire occupied Arab countries for four centuries in which the dominant of Arabic as a language of science was retracted.

In the last two centuries, early experiments in teaching medical science using Arabic were performed. The first one was at the beginning of the nineteenth century during Muhammad 'Ali period in Egypt. Teaching in Abu Za’abal School of medicine and pharmacy was conducted in Arabic. This school was established

in 1826 and transfer to al-Kaser al-Ini in Cairo in 1837. The Arabic language was used in teaching medical science until 1882 when the British entered Egypt replaced it with English. The second experience took place in Lebanon in 1866 at the Syrian Protestant College. This college taught medicine in Arabic. In 1873, the college moved to Beirut and was renamed the American University of Beirut (AUB) [12]. Medical staff mastered Arabic and made important contributions to Arabization. Teaching in Arabic did not last long, after the fall of the Ottoman Empire and the arrival of French to the region.

The third experience is still ongoing in Syria, where the Arabic College of Medicine opened in 1919 in Damascus. The experience of Damascus University in the field of teaching medical sciences in Arabic is a pilot experience [25]. Since the university's inception until now, the language of instruction was Arabic.

In other Arabic countries, the colonizers' languages replaced Arabic as the language of teaching. For example, French was used in Algeria, Tunisia, and Morocco [26], while English was used in Egypt, Iraq, and Gulf countries [15, 17].

In a questionnaire study designed in Saudi Arabia, the advantage of using Arabic language in teaching Arab speaking students was summarized, the use of Arabic avoids communication barrier and thoughts ideas clearly in a non-mastered foreign language [15]. Teaching science subjects in English could increase the difficulty of the topics for the students and thus creates educational barriers. Additionally, Students will spend time to translate information into Arabic. In addition, they do not gain a deep understanding of science subjects because they tend to concentrate on memorizing English terms and their spelling and pronunciation. English and Arabic belong to different language families and have different structures, and this may create problems of comprehension for Arab students [3]. Instructors also felt that using English to teach science subjects for Arab students promotes the hegemony of English. As students may fail to appreciate their mother language. Students found it is easier to concentrate and to understand when they used Arabic rather than English. The student is likely to be stressed when mother-tongue language is not similar to the school education language and has difficulties to understand the subject completely to participate in discussions.

Simultaneously, it is difficult to find enough science resources in Arabic regarding the lack of Arabic translations of science textbooks. Lack of proficiency in English also creates a barrier for Arab science students when participating in international conferences or continuing studies overseas. English allows them to study and in due course work almost anywhere in the world [20].

In all Arab countries except Syria, English or French have been the medium of instruction universities. Some uncompleted efforts to Arabization were attempted in Sudan for teaching medical science [27]. A gap in clinical communication may develop in Arab countries where the native language is different from the language of medical education, and the confidence problem was posed in history-taking skills in native language [16]. Teaching medicine in a foreign language did not bring leadership for Arab medicine. Moreover, it could be an indicator of Arab underdevelopment [28].

In Morocco, the use of the mother tongue in teaching medicine was considered as an educational necessity [26], some efforts were made to introduce bilingual programs [2].

In a questionnaire survey of 400 medical students in Egypt [17], 44.8% of students translated English terms to Arabic to facilitate studying and 70.6% of students in their clinical study years would prefer learning to register patient history in Arabic.

Teaching medical sciences in the Arabic language did not handicap the Syrian students, as Damascus University medical school was ranked seventh regarding the number of actively licensed physicians in the United States (US), the rank contains ten universities all of which teach medical science in English [13]. Based on physician practice data, the contribution of Arab-trained physicians to the US healthcare workforce was explored [29], results of medical students and graduates from 15 Arab countries were revised. The performances (1st attempt pass rates) of individuals on the United States Medical Licensing Examination (USMLE) Step 1, Step 2CK (clinical knowledge), and a combination of Step 2CS (clinical skills) and ECFMG CSA (clinical skills assessment) were scaled and compared by country. This study had shown that Syrian students were in the fifth position in USMLE Step 1 attempt, with pass rate reach 85.98%, and in the first position regarding the approximate US workforce retention rate (73.6%), comparing with students from other Arab countries where English is the language of medical school instruction medical education.

Students fluent in the foreign language or the mother tongue should be able to be better in acquiring the scientific language [25].

The question is how to benefit from the advantage of teaching in mother language, and to provide the student with the English medical terms, which are necessary to follow the scientific development? The recommended system is bilingual. This system depends on the mother tongue as the main medium of instruction while an international second language is gradually introduced using the mother tongue, in which the proportion of bilingual terms should be about 30 %, because, when the proportion of English was raised to 50%, student's satisfaction rates declined significantly [30, 31]. Another study also found that using a bilingual method in learning doesn't harm the educational process and carries similar outcomes to those of the monolingual methods [32].

In Germany, bilingual approaches in dental terminology resources were discussed, a new semi-bilingual language guide was issued to help German-speaking dental professionals to develop their language skills [33].

One of the trials explored medical students' perceptions of supporting pharmacology learning in English by focused materials prepared in Arabic. The study was conducted in Bahrain, slides containing endocrine and metabolism information were presented in Arabic preceded detailed English ones. Most participants reported a better comprehension and memorization of the ensued subject. Most respondents thought that this method would help them during the clinical phase of their study and in communicating drug therapy to patients in Arabic [34].

After a century of experience, the University of Damascus is the leading university in the field of teaching medical sciences in Arabic. It has also paid attention to empowering its students in the medical English language that students must pass four English courses and medical terms in curricula were demanded in both Arabic and English.

We have previously designed a study using one-step-interactive-experimental-online test to assess participants' scientific comprehension of three distinct medical written paragraphs; in Arabic, in English, and in bi-lingual, our previous results propose that simplified Arabic combined with English terminology may present a viable method for medical-educational written texts in Arabic-speaking population [18]. To the best of our knowledge, our current study is the first experimental trial study that evaluates the influence of three different pedagogic methods experimentally during students' courses.

Use of the bi-lingual method presents a pedagogic method combining the advantage of mother language-based education and encourage students to enrich their information from English resources. In which the main context was presented in Arabic with the use of essential English terms beside medical Arabic terms.

Although, our study has limitations; the relatively small size of participants, the selection of only three topics and the fact that the curricula of Faculty are in Arabic. Our results indicate the importance of bi-lingual method in teaching medical science, further studies are demanded with larger number of participants from other countries to determine the best pedagogic method.

Conclusion

The bi-lingual pedagogic method, which combines using the mother language in the main text and providing of medical terms in both mother language and English, could be suitable medical education strategy for non-English speaking countries.

Declarations

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Authors' contributions

B.A is the first author of the manuscript. M.A., T.N, L. A and T.A co-authored the manuscript.

B.A and T.A. designed this study.

B.A, M.A and L.A prepared and approved the scientific materials, B.A presented the lectures. B.A, M.A, T.N collected the data.

T.A and L.A processed the data, performed the Statistical analysis and interpreted its results.

All authors read and approved the final manuscript and they are accountable for all aspects of the work.

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Availability of data and materials

The datasets used and/or analyses during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Participation in this questionnaire was voluntary. Written informed consent was obtained from each respondent on the first participating. Blinded processing of information insured the anonymity of participation. No medical information was collected and no medical intervention was performed and so ethical approval was not applicable.

Consent for publication

Not Applicable

Competing interests

The authors declare that they have no competing interests

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Tables

Table 1: Group of students

Week	1	2	3
Method			
Arabic	<u>Group A</u>	<u>Group C</u>	<u>Group B</u>
English	<u>Group C</u>	<u>Group B</u>	<u>Group A</u>
Bi-nomenclature	<u>Group B</u>	<u>Group A</u>	<u>Group C</u>

Table 2: Participants' characteristics.

Group	Participants				Bachelorette English exam mean score (Out of 300)	Collage English exam mean score (out of 100)	Anatomy Exam mean score (out of 100)
	All members	males	females	Non-declared			
A	54	22	21	11	293	84.94	81.25
B	46	37	9	0	295.64	86.14	84.85
C	47	18	28	1	294.28	86.67	79.84
Total	147	77	58	12	294.3	85.91	81.98
Exam Results Average							

Table 3: Results of the pre- and post-tests (the points' mean) and language preference for the three participant groups. Each test was composed of six questions (three in Arabic and three in English) with a total score of six points.

Method	Arabic		English		Hybrid		Arabic Preference?		
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Yes	No	NA
Group A	0.296	2.4	0.2	2.11	0.166	4.4	41 (76%)	13 (24%)	0
Group B	0.34	2.97	0.54	3.73	0.43	3.08	24 (52.2%)	20 (43.5%)	2 (4.3%)
Group C	0.148	4.25	0.66	2.55	0.106	3.49	25 (53.2%)	22 (46.8%)	0
Total mean/ answers (%)	0.26	3.2	0.46	2.79	0.23	3.7	90 (61.2%)	55 (37.4%)	2 (1.4%)