# ORIGINAL ARTICLE

## Evaluating the Effect of the Time of Holding Classes on Educational Outcome in the Theoretical Health Course

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**Background:** The quality of an educational program is an important issue in medical educational system. Among the affecting factors, the time of education is the less notified one. In this research, we evaluated the role of time of education on the success rate of theoretical health course.

**Methods:** This cross-sectional study was conducted on medical students at Babol University of Medical Sciences, classified in two different groups: morning class and afternoon class. Three different examination tools, including a) pre and post-test, b) midterm and c) final exam were used to compare the success rate between the two groups. Descriptive parameter and independent T-test were used for data analysis using SPSS-16.

**Results:** Findings of the three examinations of the total 118 students showed that the mean score of pre and post-test in students educated in the afternoon classes were significantly higher than their counterparts, but the mean score of the final exam was not significantly different.

**Conclusion:** As a conclusion no significant differences were observed between the morning and evening medical students in the health course lecture.

**Keywords:** Medical education, theoretical course, the time of holding classes, educational outcome.

تقييم أثر الزمني للتعليم على مستوى التحصيل التعليم النظري في مادة الصحة

التمهيد و الهدف: إن مستوى كيفية البرنامج التعليمي من الموضوعات المهمة في النظام التعليمي الطبي. من جملة العوامل المؤثرة و هو العامل الذي لم يعط حقه من الأهمية، تحديد الوقت الأنسب لإجراء الصف التعليمي. إن الهدف من هذه الدراسة هو متابعة أثر التوقيت الزمني للصف على مستوى التحصيل التعليم النظري في مادة الصحة.

الأسلوب: إن هذه الدراسة المقطعية تمت على فريقين بشكل متوالي من طلاب الطب في السنوات ٨٨ و ٨٩ في جامعة بابل للعلوم الطبية، كان دوام الطلاب مقسم في حصص دراسية بشكل صباحي و مسائي. لتحقيق الهدف تم استخدام معدات متفاوتة منها الأسئلة ما قبل الإختبار و ما بعد الإختبار و الأسئلة الوسطيه و الإختبار النهائي. تم إستخدام برنامج Spss بالإضافة إلى معابير إحصائية توصيفية و الإختبار الإحصائي T المستقل .

النتائج : أشارت المعطيات المرتبطة بالإختبارات الثلاثة في المجموعتين الطلابيتين الطبية (المجموع ١١٨ شخص ) إلى أن علامات أسئلة ما قبل الإختبار و ما بعد الإختبار عند الطلاب المساء و الإختبارات الوسطية عند طلاب الصباح كانت ذو إختلاف معتبر اكثر من الفريق الآخر (P<0.05) أما معدل العلامات النهائية للفصل لم تكن ذو إختلاف واضح

الإستنتاج: لم يكن هناك إختلاف معتبر في مجال التحصيل التعليمي للدروس النظرية عند طلاب الطب في مادة الصحة بين دروس الصباح و المساء .

الكلمات المفتاح: التعليم الطبي – الدروس النظريه – زمان التعليم – التحصيل العلمي.

ارزیابی اثر موقعیت زمانی آموزش بر بازده آموزش تئوری درس بهداشت

سابقه و هدف: کیفیت یک برنامه آموزشی از جمله موضوعات بسیار حائز اهمیت بویژه در نظام آموزش پزشکی است. از میان انواع عوامل اثرگذار، عاملی که کمتر مورد توجه بوده زمان برگزاری کلاس درسی است. هدف از این پژوهش، بررسی اثر موقعیت زمانی کلاس درس بر بازده آموزش تئوری در درس بهداشت یک بوده است

مواد و روش ها: این مطالعه مقطعی روی دو گروه متوالی از دانشجویان پزشکی ورودی سال های ٨٨ و ٨٩ دانشگاه علوم پزشکی بابل که میتوان آنها را تحت عنوان دانشجویان کلاس صبح و عصر طبقه بندی نمود به اجرا در آمد. جهت بررسی اثر موقعیت زمانی کلاس بر بازده آموزش سه ابزار متفاوت شامل بهره گیری از سوالات پیش آزمون و پس آزمون، آزمون های میان دوره، و آزمون پایان ترم مورد استفاده قرار گرفت. در پردازش داده ها به کمک نرم افزار spss16 علاوه بر شاخص های آمار توصیفی از آزمون های آماری تی مستقل استفاده شد.

یافته ها: داده های مربوط به آزمون ها سه گانه در دو گروه از دانشجویان پزشکی (مجموعا" ١١٨ نفر) نشان داد که میانگین نمرات سوالات پیش آزمون و پس آزمون در دانشجویان کلاس عصر، و آزمون های میان دوره در دانشجویان کلاس صبح بطور معنی داری بیش از گروه دیگر بوده است (p<٠/٠٥)، اما میانگین نمرات پایان ترم آنها فاقد اختلاف معنی دار آماری بود.

استنتاج: تفاوت چشمگیری در بازده آموزشی دروس تئوری دانشجویان پزشکی در درس بهداشت طی ساعات صبح و عصر وجود نداشته است.

واژه های کلیدی: آموزش پزشکی، دروس تئوری، زمان آموزش، بازده آموزش

تعلیم کے وقت کا میڈیکل تھیوری کے اسباق پر اثرات کا جائزہ

بیک گراونڈ: کسی تعلیم نصاب کی کوالٹی منجملہ اس کے موضوعات بالخصوص میڈیکل تعلیم میں بے حد اہمیت رکھتی ہیں۔ تعلیم پر اثر رکھنے والے عوامل میں جن پر بہت کم توجہ کی دی جاتی ہے کلاسوں کا وقت ہے ۔ اس تحقیق کاہدف میڈیکل تعلیم میں کلاسوں کے وقت کے اثرات کا جائزہ لینا ہے۔

روش: اس تحقیق میں میڈیکل کے طلباء کے دو گروہ شامل تھے ایک گروہ دوپزار نو اور دوسرا گروہ دوپزار دس میں داخلہ لینی والے طلباء سے متعلق تھا۔ یہ تحقیق بابل یونیورسٹی میں انجام دی گئی تھی کلاسوں کی افادیت پر کلاسوں کے ٹائم کے اثرات کا جائزہ لینے کیلئے تین ٹولز استعمال کئے گئے جن میں ایک سوالات تھے جو پری ٹسٹ اور پوسٹ ٹسٹ کے موقع پر دئے گئے تھے، اس کے علاوہ ٹرم کے آخر میں بھی طلباء سے امتحان لیا گیا تھا۔ ڈیٹا کا تجزیہ ایس پی ایس سولہ سے کیا گیا اس کے علاوہ ٹی ٹسٹ کے اعداد و شمار سے بھی استفادہ کیا گیا۔

نتیجی: تینوں امتحانوں کے نتائج سے پتہ چلتا ہے کہ پری ٹسٹ اور پوسٹ ٹسٹ جو کم عصر کے وقت رکھا گیا تھا اور صبح لگنے والی کلاسوں میں شرکت کرنے والے طلباء کے نمبر دیگر گروپوں سے زیادہ تھے۔ ٹرم کے آخر میں لئے جانے والی امتحانات میں اور دوسرے ٹسٹوں میں کوئی خاص فرق نہیں تھا۔

سفارش: مختلف اوقات یعنی صبح یا شام میں لگائی جانے والی کلاسوں کے نتائج میں کوئی خاص فرق نہیں آیا ہے۔

کلیدی الفاظ: میڈیکل تعلیم، تھیوری، کلاس کا وقت، تعلیم کا نتیجہ۔

## INTRODUCTION

The quality of a training program is a very important issue for different groups such as students, teachers and educational officials; so, its continuous improvement is of great importance for educational administrators. In the medical education system likewise other educational systems in the country and globally, passing the theoretical training course and receiving a minimum score is a must to be qualified. Since every year, several studies have been conducted on the effects of various factors on education such as teaching practices (1-3) learning style (6-4), curriculum (7), method of study (8), and characteristics of teachers (9) the quality of teaching and learning and factors affecting academic failure (11-10). Other reasons for addressing the impact of factors affecting education in medical sciences, is universities` assessment. Each year, the results of Basic Science exams in different courses and different universities are published and through this the academic performance of students and teachers, educational authorities and educational institutions will be compared (12). Therefore, discovering the impact of various factors on the educational efficiency of classes, determining the impact of each factor and finding the way to deal with these problems and obstacles in order to achieve the highest quality, is very important.

Regarding Zahedi and Amirmaleki (2007) review, which aims to find the factors affecting the effectiveness of education, in the view of 162 medical students, showed that students thought that in addition to a variety of factors, teachers` confidence and his/her role had a great importance (7).

According to Changizi et al. (2009) study, which was conducted on 600 students of the University of Medical Sciences, it is found that factors such as gender, marital status, GPA, localization and condition of family education have significant effect on academic failure (10).

Roubaix and Shaba (2006) study of the 99 medical students show that factors such as age, gender, marital status and student quota are effective on the average score of their preinternships (12). The results of the study of Abbasi et al., also indicates the correlation between age, gender, scores of some courses, failed courses and students' test scores of Basic Sciences (13).

Despite extensive studies regarding the effects of various factors on the educational outcome of students (1-11); the effect of the time of holding classes (morning or afternoon) on educational outcome and its effect on the results of exams, such as classroom tests or the final exam have not been addressed. Interestingly, because it is thought that the ability to learn decrease in the hours after lunch, setting the time of the classes in the morning or evening is always of faculty members` concern. Many teachers want to have their classes in the morning hours when seemingly the students have a higher quality of learning.

Comparing theoretical education results at the university level and even among medical universities throughout the country in various forms (such as the Comprehensive Test of Basic Sciences), is another reason that encouraged teachers to have classes in the morning in order to achieve better results and higher level of learning in students.

Whereas in the reviews, no research was found to clarify the effect of time factor on the implementation of theory programs, this study was proposed to investigate the effect of time on the learning (theoretical education efficiency).

## METHODS

This cross-sectional study was conducted on two groups of Medical Sciences students in the University of Babol (a Medical Sciences University in the north of Iran); which can be divided as freshmen students who attended morning classes which is named group one from now, and sophomore students in the afternoon classes which is named group two. Thus, respectively 62 and 56 students who attend in two different classes (8-10 in the morning and 13-15 in the afternoon) were studied. For the purposes of this study, three different tools were used to quantify the impact of the time of the classes on learning:

A.   Using pre-test and post-test Questions
B.   B. Using class test
C.   C: Using final questions

*A: Using pre-test and post-test questions*
Given the number of sessions during a semester (17 sessions), three questions per session and a total of 51 questions were proposed. Each question was given 1 score and in total, the scores of students were calculated out of 51. In order to remove random answers and to reduce the possibility of cheating, all questions are open-ended and should be replied by short answers. For homogenization of the classes and similarity of teaching materials and educational content, all contents were prepared on slides so that the possibility of the differences in two classes reaches to the minimum.

In the first session, the purpose of the study was explained to all students and also the voluntary participation in this study was acknowledged. Then, pre-test papers were disseminated among the students with enough time to answer the questions and then they were collected. This process was repeated at the end of the semester and before final exams. The students were asked to participate in the evaluation of educational performance in health course through answering the questionnaire. However, they repeatedly "were reminded that if they are unwilling to respond, they can refuse to answer the question".

*B. Using class test*
Considering the volume of teaching materials and the conditions, some tests were prepared and taken during the semester. These tests were also used as a complementary tool to compare the effect of the time of the classes on the theoretical education efficiency. So, two tests with 15 and 19 questions (34 questions) were taken during the semester.

*C. Using final exam*
One of the main methods used in assessing the effectiveness of an educational process is students` knowledge evaluation at the end of the semester by final exams. So to evaluate the effect of the time of the classes on theoretical education efficiency, knowledge of medical students in relation to the course content was evaluated by a final exam.

In this phase, questions were designed in multiple-choice and open-ended form and the exam was taken according to the faculty schedule.

For statistical processing of the data, independent t-test was used in addition to descriptive statistics. Significant differences in data in this study were considered as $p < 0.05$.

## RESULTS

To evaluate the effect of time of class on the quality of teaching and learning (educational efficiency) in health course, two groups of medical students that have this lesson in two different times of the day but with a same training team were examined. Table 1 shows students' test scores in various tests of this course as a symbol of quality of learning.

As can be seen, first and second Midterm test scores of group 1 students (morning) are higher than group 2 (afternoon). However, the only difference between the mean scores of the second Midterm was statistically significant. ($p = 0.02$) The pre-test and post-test scores of group 2 are higher than group 1 and in both cases the difference was statistically significant (Table 1). ($p = 0.005$ and $p = 0.001$, respectively)

If the scores of the final exams are considered as major index of educational efficiency, the scores of morning and afternoon students (respectively 14 and 14/7) were a little bit different and the exam doesn`t show any statistically significant difference.($p = 0.237$)

Due to changes in the pre-test and post-test, examining the scores of morning and afternoon students indicated that the score of the later increased from 4.6 to 30, while the score of freshmen increased from 5 to 26/2. Although the improvement of test scores in-group 1 was more than the second group (2.5 times compared to 4.7 of afternoon students) but this improvement in these groups has no significant differences in the process of improvement and despite apparent differences, these are not meaningful.

Table 2 shows the mean scores in various tests by gender. As it can be seen, the scores of male and female students were very similar and only the difference in two tests ( Pre-test and Midterm 1 at afternoon ) was significant. ( $p = 0.008$ and $p = 0.000$, respectively) In total, the difference between boys and girls was significant in Midterm 1. ($p = 0.000$)

It should be noted that the number of female students in the morning and afternoon classes (respectively 39 and 33)

**Table 1. Distribution of medicalstudents' scores in various test of health course based on the time of the classes\* (n=118)**

| Type of Exam | Total Frequency | Scores | | Results Independent-T |
| --- | --- | --- | --- | --- |
| | | Morning class (8-10) Mean±Deviation | Afternoon class (13-15) Mean±Deviation | |
| Pre-test | 105 | 5±1.9 | 6.4±3 | 0.005 |
| Midterm1 | 115 | 11.1±2.2 | 10.3±2.5 | NS |
| Midterm2 | 99 | 11.7±3.2 | 10.1±3.4 | 0.02 |
| Final exam | 118 | 14±2.2 | 14.7±2 | NS |
| Post-test | 117 | 26.2±6.4 | 30±6.4 | 0.001 |

\* Inequality among frequency of samples is due to the absence of the number of some students in each test
\* NS indicates no statistically significant difference between the groups

**Table 2. Distribution of medical students' scores of the health course in the morning and evening classes based on the gender (n=118)**

| Time | gender | frequency | Mean±Deviation | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | Pre-test | Midterm 1 | Midterm 2 | Post-test | Final exam |
| Morning | boys | 23 | 5±2 | 10.3±2.7 | 12.1±3 | 26.2±5.4 | 14.1±2.4 |
| | girls | 39 | 4.9±1.9 | 11.5±1.7 | 11.5±3.3 | 26.1±7 | 14±2.3 |
| | p | | 0.82 | 0.63 | 0.5 | 0.95 | 0.75 |
| Afternoon | boys | 23 | 5.1±3.2 | 8.5±2.1 | 10.5±4.1 | 29.9±5.7 | 14.3±2.1 |
| | girls | 33 | 7.4±2.4 | 11.5±1.9 | 9.8±2.9 | 30.2±7 | 14.9±1.9 |
| | p | | 0.008* | 0.000* | 0.48 | 0.86 | 0.29 |
| Total | boys | 46 | 5.1±2.6 | 9.4±2.6 | 11.2±3.7 | 28±5.8 | 14.2±2.2 |
| | girls | 72 | 6±2.5 | 11.5±1.8 | 10.7±3.2 | 27.9±7.9 | 14.2±2.1 |
| | p | | 0.07 | 0.000* | 0.42 | 0.95 | 0.71 |

\* There is a significant difference (p<0.05).

was more than male students in that classes (23 people per class).

According to the results, it was concluded that:

- Midterm test scores in two different courses of group 2 (10/3 and 10/1, respectively) were less than scores got by morning students (a mean of 11/1 and 11/7), which, of course, in one case (the second Midterm) a significant difference was seen. (p=0.02)

- The final test scores of group 2 (mean 7.14) were better than that of group 1 (mean 14), but according to the results of t-test, any significant difference was not detected.

- Comparing the pre-test and post-test scores showed the same result as final exam which itself showed the higher scores of group 2 (6.4 and 30 compared to 5 and 26.2). It is note that in both tests, the statistically significant differences were detected (p=0.005 and 0.001, , respectively).

- Data Analysis based on gender also showed that final and class scores -except one test (the midterm 1) - have no significant difference. Figure 1 shows the mean scores Pre-test, midterm, final and post-test based on gender.

## DISCUSSION

Results of previous studies on the human capability throughout the day clearly show considerable differences in different hours. So that, for example, many physiological characteristics such as blood pressure, heart rate, body temperature can be significantly changed based on the biological clock. In terms of performance, also findings indicate significant differences in the performance of people at different times of the day (14-16).

According to the results, it was concluded that there was no statistically significant difference between two different times (morning and afternoon; 8 to 10 and 13 to 15) to teach a health course in the form of a theoretical course. There were slight differences in some cases or even some significant differences in others, but due to the fact that other variables did not verified the difference between different times of learning cannot be deduced (Tables 1 and 2). In this regard, it should be noted that due to the unavailability of national or international similar studies, there was no chance to compare the results.

One important point in relation to the results is that, although it was concluded that the time of the class has minimal effect and no statistically significant difference in theoretical lessons, it could not be generalized to other times of a day or other classes with different subjects such as practical or computing lessons and obviously more study is needed.
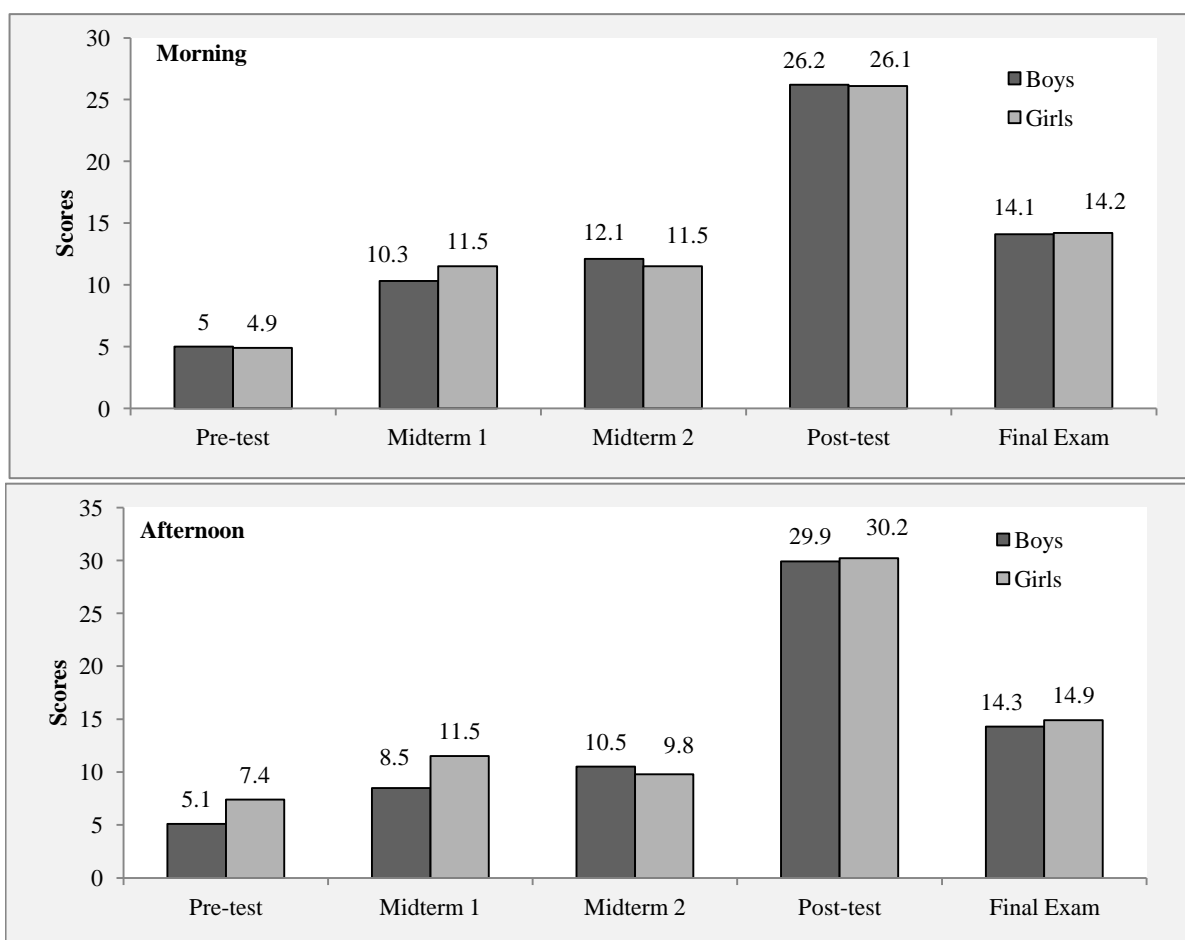


Figure 1. Distribution of mean scores of the health course exams in morning and evening classes based on the gender

One of the important features of this study was increasingly officials` attention to "education quality", especially in medical education, and the threats and disadvantages are the difficulty of removing the effect of the time of holding classes due to other factors such as personal characteristics; and the obligatory necessity of holding some educational classes in the evening.

Notable features of this study include: 1-addressing new issue, 2- acceptable volume of sample, 3- homogenizing learning process through the use of same educational materials, and 4- addressing a common issue in teaching of theoretical courses.

The limitations of this study include: 1. Examining just one training course, 2. Unavoidable use of two groups of medical students who have different capabilities, 3. Lack of similar studies in other student groups and other levels of education, 4. Type of educational material, because the study was conducted only on a theoretical and non-computational course.

The findings of this study suggest:

- Despite the significant superiority of scores of group 2 in pre-test and post-test questions, and despite the significant superiority of group 1 scores of midterm exams, the results of the final test of group 1 and 2 were the same and had no significant difference.

Therefore, as a conclusion no significant outcome differences observed between morning and evening medical students in health course lecture. However, in spite of small effect of such variables (different time of training in the morning and afternoon) on all educational levels, further research and attempt to eliminate its effect is necessary.

It should be noted that Ethical Committee of Medical University of Babol has confirmed the study.

## ACKNOWLEDGMENTS

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