

How did changes in medical education during the COVID-19 pandemic affect students' learning and study approaches?

Medical education in the COVID-19 pandemic

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Abstract

Aim: Medical education is undergoing a transformation with the COVID-19 pandemic. The aim of this study is to examine the levels of adaptation and flexibility of medical students within an educational system changing due to the pandemic.

Material and Methods: This descriptive cross-sectional study was conducted in the Düzce University Faculty of Medicine. Students were asked to complete the VARK (V: Visual, A: Aural, R: Read-write, K: Kinesthetic) learning preferences inventory and the Two-Factor Study Process Questionnaire (R-SPQ2F).

Results: In this study, 671 students, with 318 (47.39%) male students and 353 (52.61%) female students, were included. It was found that 25.04% (n=168) of these students participated in lessons via distance learning, while 43.67% (n=293) of them stated that they preferred face-to-face learning and 31.30% (n=210) stated that they preferred mixed learning. The mean visual score of the students who attended lessons via distance learning was found to be higher compared to those who attended face-to-face lessons and those engaged in mixed learning ($p=0.0001$), while the mean visual score of the mixed learning group was higher compared to the face-to-face group ($p=0.002$).

Discussion: The blended education model, which allows students to choose the most suitable model according to their own learning style, seems to be helpful in challenging periods like the COVID-19 pandemic.

Keywords

COVID-19, Distance Learning, Blended Learning, VARK, R-SPQ2F

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Introduction

The COVID-19 pandemic has fundamentally affected the lives of people all around the world in many areas such as health, economy, and education [1]. First restrictions in travel and social settings were implemented, and then face-to-face work and training activities were canceled or postponed in all institutions [2, 3, 4]. Parallel with these developments, faculties of medicine also interrupted face-to-face education and started to implement changes in education, such as giving only online courses for preclinical classes, interrupting small group studies, and canceling some elective clinical courses [5, 6]. However, medical education includes the development of skills and attitudes as well as professional knowledge. The fact that the appropriate skills and attitudes of candidate physicians cannot be developed by online education alone raised some concerns in the education environment. In Turkey, in a report published by the Association for the Evaluation and Accreditation of Medical Education Programs (TEPDAD), it was suggested that blended learning is the most appropriate educational approach in medical education during a pandemic [7].

It is obvious that physicians should be equipped in terms of patient approach before they graduate regardless of the conditions. For this reason, in our medical faculty, it was aimed to train students in terms of clinical approach skills while the necessary preventive measures were taken and a training program within the framework of the blended education model was prepared. It has been reported that blended learning is favorable and welcomed by students [8]. The blended learning model has been rapidly implemented in many countries during the pandemic with its wide choice of options [9, 10].

The aim of this study is to examine the levels of adaptation and flexibility of medical students within an educational system changing due to the pandemic. In addition, it was aimed to investigate whether there is a relationship between learning methods and study approaches of the students and their educational preferences and to discuss alternative methods of education appropriate for both the characteristics of the students and possible threats.

Material and Methods

The study was carried out by the Department of Medical Education with the guidance of the Education Commission. The universe of the study consisted of students enrolled in the Faculty of Medicine. In the 2020-2021 academic year, when the study was planned, a total of 987 students were studying in all years of the medical school. Some exclusion and inclusion criteria were determined for the study sample. Having at least 6 months of experience in medical education during the pandemic period was determined as an inclusion criterion. Students who had a diagnosis of anxiety disorder were excluded because that might affect their participation in their courses. Ethical approval for the study was obtained from the Düzce University Ethics Committee (Protocol Number: 2020/112). Students were reached by student representatives and advisors and data collection tools were sent. A consent form was obtained from the students who participated in the study.

Study Procedure

A questionnaire was prepared for the study, measuring the

level of adaptation and problems of the students regarding the medical education applied during the pandemic period and their educational experiences. In addition, the participants were asked to complete the VARK (V: Visual, A: Aural, R: Read-write, K: Kinesthetic) learning preferences inventory and the Two-Factor Study Process Questionnaire (R-SPQ2F) in order to determine the relationship between learning styles and study approaches. Finally, two open-ended questions were asked to the students so that they could express their thoughts and expectations about the applied education model.

VAR K Learning Preferences Inventory

The VARK Learning Preferences Inventory was developed by Fleming in 1987 and adapted to Turkish by Mustafa Kalkan; it was used to determine the dominant learning preferences of the medical students [11, 12]. The VARK Inventory consists of visual, auditory, literacy, and tactile perception categories. With this inventory, the ways in which individuals exchange information, their preferences for processing information, and their learning preferences are evaluated.

Two-Factor Study Process Questionnaire (R-SPQ2F)

This scale was developed by Biggs and then revised with two factors including 20 questions. The final form of the questionnaire has 4 subscales, namely deep motivation, deep strategy, superficial motivation, and superficial strategy, and it includes two basic approaches including the deep approach and superficial approach [13].

Statistical Analyses

Statistical analyses were performed using NCSS (Number Cruncher Statistical System) 2007 statistical software (Kaysville, UT, USA) software. Descriptive statistics were expressed as mean \pm SD and percentages. Normality of distribution was tested with the Shapiro-Wilk test. Comparisons of normally distributed data between the groups were performed with one-way ANOVA tests. Tukey's test was used for multiple comparisons, t-tests were used for binary comparisons, and Pearson's correlation test was used to examine the relationships between variables. Values of $p < 0.005$ were accepted to be statistically significant.

Results

In this study, 671 students, with 318 (47.39%) male students and 353 (52.61%) female students, were included. It was found that 25.04% (n=168) of the students included in the study participated in lessons by distance learning, while 43.67% (n=293) of them stated that they preferred face-to-face learning and 31.30% (n=210) stated that they preferred to receive some courses face-to-face and some courses by distance learning (mixed preference). Furthermore, 35.92% (n=241) of the students stated that they were satisfied with distance education. When the students were asked what kind of education they would like to receive in the post-pandemic period, while 26.08% (n=175) of them stated that they would prefer to continue distance learning, 39.49% (n=265) stated that they would prefer face-to-face learning more. Some sociodemographic characteristics of the students and their educational behaviors in the pandemic period are shown in Table 1.

There were no significant differences between students according to year of study in terms of visual ($p=0.076$), auditory

($p=0.123$), reading/writing ($p=0.614$), and kinesthetic ($p=0.614$) learning styles. When the study approaches of the students were compared according to year of study, the mean superficial approach score of the second-year students was found to be

Table 1. Sociodemographic characteristics of the students and class participation preferences

| | | n | % |
|--------------------------------|-----------------------|-----|-------|
| Gender | Male | 318 | 47.39 |
| | Female | 353 | 52.61 |
| Year of study | 1st | 137 | 20.42 |
| | 2nd | 102 | 15.20 |
| | 3rd | 115 | 17.14 |
| | 4th | 111 | 16.54 |
| | 5th | 102 | 15.20 |
| | 6th | 104 | 15.50 |
| Residence | Dormitory | 178 | 12.52 |
| | House with friend(s) | 184 | 90.61 |
| | With family | 225 | 8.05 |
| | Alone | 84 | 1.34 |
| Diseases | No known disease | 608 | 25.04 |
| | One disease | 54 | 43.67 |
| | More than one disease | 9 | 31.30 |
| Class participation preference | Distance | 168 | 30.10 |
| | Face-to-face | 293 | 35.92 |
| | Mixed | 210 | 33.98 |
| Distance learning satisfaction | No | 202 | 26.08 |
| | Yes | 241 | 39.49 |
| | Undecided | 228 | 34.43 |
| Future learning preferences | Distance learning | 175 | 26.08 |
| | Face-to-face learning | 265 | 39.49 |
| | Blended learning | 231 | 34.43 |

statistically significantly higher compared to students in the first, fifth, and sixth years ($p=0.011$, $p=0.009$, and $p=0.002$, respectively), while there were no statistically significant differences between the groups in terms of mean in-depth approach scores ($p>0.05$). The distributions of the answers given by the students about their thoughts on the advantages and disadvantages of distance and blended learning methods are shown in Figure 1.

Significant differences between students' preferences for attending lessons and their learning styles and study approaches were found. The mean visual score of the students who attended lessons by distance learning was found to be higher compared to those who attended lessons face-to-face and those educated by the blended method ($p=0.0001$), while the mean visual score of the blended method group was found to be higher compared

Table 3. Relationships between the learning styles and studying approaches of the students

| | | V | A | R | K |
|------------------------|---|--------|--------|--------|--------|
| Deep motivation | r | -0.108 | 0.016 | 0.091 | -0.037 |
| | p | 0.005 | 0.687 | 0.018 | 0.333 |
| Deep strategy | r | -0.164 | -0.150 | 0.072 | 0.139 |
| | p | 0.0001 | 0.0001 | 0.063 | 0.0001 |
| Deep approach | r | -0.147 | -0.062 | 0.092 | 0.043 |
| | p | 0.0001 | 0.106 | 0.017 | 0.263 |
| Superficial motivation | r | 0.149 | 0.096 | -0.078 | -0.122 |
| | p | 0.0001 | 0.013 | 0.043 | 0.002 |
| Superficial strategy | r | 0.126 | 0.118 | -0.073 | -0.066 |
| | p | 0.001 | 0.002 | 0.058 | 0.087 |
| Superficial approach | r | 0.162 | 0.122 | -0.088 | -0.114 |
| | p | 0.0001 | 0.001 | 0.022 | 0.003 |

Pearson's correlation test.

Table 2. The relationship between students' preferences for attending courses and their learning styles and study approaches

| | | Distance n=168 | Face-to-face n=293 | Blended n=210 | p‡ |
|----------------------|------------------------|----------------|--------------------|---------------|--------|
| VARK questionnaire | V | 4.90±2.34 | 3.15±2.36 | 3.80±1.43 | 0.0001 |
| | A | 3.99±1.87 | 2.99±1.91 | 4.37±1.26 | 0.0001 |
| | R | 3.55±2.11 | 4.07±2.15 | 4.52±1.31 | 0.0001 |
| | K | 3.57±2.33 | 5.89±3.34 | 4.37±1.41 | 0.0001 |
| Study approach scale | Deep motivation | 12.79±3.73 | 15.55±3.94 | 18.91±5.46 | 0.0001 |
| | Deep strategy | 12.55±3.97 | 15.66±3.78 | 14.90±2.98 | 0.0001 |
| | Deep approach | 25.35±7.27 | 31.21±7.21 | 33.81±7.31 | 0.0001 |
| | Superficial motivation | 15.33±4.28 | 13.33±3.79 | 13.38±3.29 | 0.0001 |
| | Superficial strategy | 16.23±2.35 | 14.60±2.91 | 14.69±2.74 | 0.0001 |
| | Superficial approach | 31.57±5.60 | 27.93±5.70 | 28.07±5.24 | 0.0001 |

‡ One-way analysis of variance.

| Tukey's multiple comparison test | V | A | R | K |
|----------------------------------|--------|--------|--------|--------|
| Distance/Face-to-face | 0.0001 | 0.0001 | 0.014 | 0.0001 |
| Distance/Blended | 0.0001 | 0.045 | 0.0001 | 0.009 |
| Face-to-face/Blended | 0.002 | 0.0001 | 0.025 | 0.0001 |

| Tukey's multiple comparison test | Deep motivation | Deep strategy | Deep approach | Superficial motivation | Superficial strategy | Superficial approach |
|----------------------------------|-----------------|---------------|---------------|------------------------|----------------------|----------------------|
| Distance/Face-to-face | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Distance/Blended | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| Face-to-face/Blended | 0.0001 | 0.043 | 0.0001 | 0.992 | 0.924 | 0.961 |

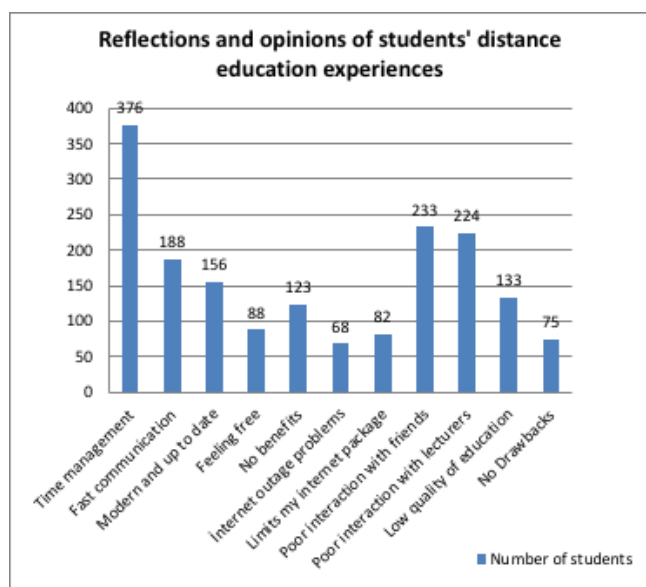


Figure 1. Reflections and opinions of students about distance and blended education

to the face-to-face group ($p=0.002$). The mean aural score of the group of students preferring blended education was found to be higher compared to the distance learning and face-to-face learning groups ($p=0.045$, $p=0.0001$, respectively), while the mean aural score of the distance learning group was higher compared to the face-to-face learning group ($p=0.0001$). The mean reading/writing score of the distance learning group was lower compared to the face-to-face and blended learning groups ($p=0.014$, $p=0.0001$), whereas the mean reading/writing score of the face-to-face learning group was lower compared to the blended learning group ($p=0.025$). The mean kinesthetic score of the face-to-face learning group was found to be significantly higher compared to the distance and blended learning groups ($p=0.009$, $p=0.0001$), while the mean kinesthetic score of the blended learning group was higher compared to the distance learning group ($p=0.0001$, Table 2).

We found a statistically significant negative correlation between the mean visual scores and the deep motivation scores ($r=-0.108$ $p=0.005$), a statistically significant negative correlation between the mean visual scores and deep strategy scores ($r=-0.164$ $p=0.0001$), and a statistically significant negative correlation between the mean visual scores and deep approach scores ($r=-0.147$, $p=0.0001$, Table 3).

Discussion

In this study, students' compliance, satisfaction, and future expectations in blended education were investigated based on its application in our faculty during the pandemic. In addition, it was sought to determine whether students' learning styles and study approaches were effective on adaptation to this period. According to the results of the study, approximately half of the students attended classes face-to-face and one-third preferred to attend classes in a mixed format. It was determined that one-fourth of the students attended lessons only by distance education. Their education preferences for the future were found to be at similar rates. There may be many reasons why face-to-face learning was the most preferred method among these students. In studies evaluating feedback from students

during the pandemic period, contradictory results have been reported. In the study conducted by Torda et al., it was found that although the students adapted to distance learning, half of them still preferred face-to-face learning [14]. When evaluated in the context of satisfaction with distance education, some of our students stated that although they were satisfied with distance education, they did not prefer to continue it in the future. This may be associated with the dynamics of medical education itself. A student who thinks that he or she cannot fully learn his or her professional skills by distance learning will prefer on-site and face-to-face training. Similarly, it was reported that compulsory distance learning affects students negatively due to lack of suitable learning materials and a well-defined learning environment [15]. It was observed that many students had some concerns about the education they received. These concerns can be accepted as inevitable. Medical students in different regions of the world stated that they could not acquire the necessary professional skills online [16].

According to the results of the present study, although face-to-face education seems to be indispensable, the number of students who want to continue to have distance and blended learning options in the future after the pandemic is not negligible. There are other studies supporting these findings with reports that distance and blended education can be associated with some educational opportunities and can create satisfaction among students [17, 18]. The most frequently stated advantage of distance learning is the flexibility of time that it provides to students [19]. Similarly, in this study, the advantages of distance learning were stated to be flexibility of time, the perception that online learning is a more technological and modern method, and the ability to manage the study process more freely. The most frequently expressed disadvantages of online learning sessions applied during the pandemic period included technical problems, economic inadequacy in access to the internet, and insufficient interaction with lecturers and peers. The statements of the students suggesting that the distance learning materials were inadequate or of low quality and that their interactions with the instructor were also inadequate should be emphasized. In studies from other faculties experiencing similar problems, recommendations regarding the development of distance learning and improvement of problematic aspects were suggested. Enhancing interaction by increasing student participation, measures against technical problems, and appointment of a facilitating moderator can be listed among those recommendations [20, 21]. It is especially emphasized that in low- and middle-income countries, where opportunities for digital education may be limited for both students and instructors, distance learning can usually be of poor quality and inadequate. Therefore, new educational opportunities should be developed urgently [22].

In this study, it was found that students with higher visual and auditory scores preferred distance learning more frequently, whereas students with higher kinesthetic scores preferred face-to-face learning. In medical faculties, various visual materials have been developed and used in distance learning since the beginning of the pandemic [23]. In this respect, students with higher visual and auditory skills seem to be a relatively more advantaged group in terms of distance learning. In order to

understand the real impact of this situation, studies are needed to evaluate these factors together with student outcomes. It was found in the present study that medical faculty students have tried to adapt to this new process by choosing the models most suitable for their own learning styles in the blended learning model during the pandemic period. In this context, blended learning can be considered a helpful education model in terms of providing options suitable for the learning preferences of the students. However, when we evaluated the results of the study approaches scale, we observed that the students who preferred distance learning also focused on superficial learning. This preference may be a natural consequence of distance learning. The prolongation of the pandemic period and the evolution of education into distance learning may have changed the study approach of the students. Students who prefer a superficial learning approach usually depend on their instant memory instead of understanding the subject in depth [24]. On the other hand, the deep learning approach provides permanent knowledge that enables the students to combine information to create new inferences and hypotheses [25]. Discontinuation of the deep learning approach, which is required for the permanent knowledge necessary for medical practice, may compromise medical education. However, despite the reported problems, medical education has to continue to supply personnel to meet the health needs of society.

Limitations

Since this study was carried out in only one medical school, the results cannot be generalized to all medical school students. Another limitation of this study is that the learning and studying approaches of the students before the pandemic were not evaluated. However, we aimed to evaluate the learning approaches of students that were transformed due to the pandemic with open-ended questions. Since the open-ended questions provided qualitative responses, they are valuable in terms of reflecting the views of the participants directly. This can be considered a strength of the study.

Conclusions

The results of this study show that students prefer education models appropriate for their learning styles. We found that students with visual and auditory learning skills preferred distance learning, while students with kinesthetic learning skills preferred face-to-face learning. This shows that students are adapting to dynamic changes in ways appropriate for their skills and appropriate for the situation. Since every clinician who will serve in medical practice should be sufficiently equipped, the results and suggestions of this study should be discussed in a detailed manner.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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