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Opportunities for pedagogical change in Turkish medical education revealed in the wake of the COVID-19 pandemic

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ABSTRACT

Phenomenon: As the first stage of a large-scale educational design research (EDR) study focused on the complex problem of providing authentic experiential "hands-on, minds-in" learning opportunities online during a pandemic or other exigency, we conducted a literature review and we interviewed Turkish academic staff and students about their experiences during the first year of the COVID-19 Pandemic. ***Approach***: We interviewed faculty members, faculty members of medical education departments, and medical students from both public and private medical schools in Türkiye between October 1 and December 31, 2020. Working in pairs, we analyzed the transcripts of 49 interviews using open qualitative coding methods with satisfactory levels of coefficients of agreement. ***Findings***: We defined six major themes from the qualitative analysis: 1) Fear and concern were the most common reactions when first encountering the pandemic; 2) Teaching methods during the pandemic were primarily unidirectional from faculty to students. This largely one way transmission of information occurred both synchronously and asynchronously; 3) Technological support during the pandemic shutdowns was found to be challenging for both faculties and students; 4) Evaluation of learning during the pandemic was opportunistic and had questionable rigor; 5) Healthy communication was valued by both faculty and students using an array of different tools including social media; and 6) The pandemic had both negative and positive impacts on the educational processes experienced by students and provided by faculty and resulted in recommendations for new approaches to teaching and learning in the future. Medical students were primarily concerned about the susceptibility to COVID-19 of themselves and others, and how the pandemic would affect their progress toward completing their studies. Faculty were primarily concerned about the capacity of online learning to provide clinical learning opportunities and the difficulties of assessing student clinical skills using online modalities. Medical education specialists were primarily concerned about the quality of educational opportunities offered online. ***Insights***: Our findings were similar to other studies conducted in the USA, China, United Kingdom, and other countries. However, the interviews revealed interest among faculty and medical education specialists for further investigation of experiential or active learning models that could be applied in medical education regardless of whether the delivery mode is face-to-face, online, or most likely, blended. In the next stage of our larger scale EDR study, we will design and construct prototype learning environments that incorporate experiential, active, and authentic learning design principles.

Introduction

After the World Health Organization (WHO) declared COVID-19 a global pandemic on March 11, 2020, educators at every level confronted complex problems in providing adequate learning opportunities for their students. The provision of medical education during the pandemic shutdown was an especially challenging problem because of the need for extensive clinical interactions with patients including hands-on

experiences.[1] Various countries adopted different strategies to offering high quality experiential learning opportunities to medical students, but none have found strong evidence for the effectiveness of these exigent approaches.[2–4] For this study, we focused on the responses to the pandemic among medical educators and their students in Türkiye, including their efforts to instantiate experiential education online.

Medical education in Türkiye begins after high school completion and lasts six years. Students are admitted to medical school based upon their scores on a national exam. In most Turkish medical schools, the first three years of basic sciences education were traditionally held in large lecture halls and supported with small group studies and laboratory practices, while the last three years were primarily conducted in clinical settings with much smaller groups of students.

With the COVID-19 pandemic, medical faculties in Türkiye and around the globe were initially closed along with nearly all other kinds of schools. Although there were pandemic influenza preparation plans in place in Türkiye, even the Turkish health sector was caught somewhat unprepared by COVID-19, and initially it was feared that the pandemic would paralyze the entire education sector there. At the onset of the pandemic, educational institutions turned to Higher Education Council, an authoritarian body supervising higher education in Türkiye, for advice. Rather than treating the pandemic as an opportunity for radical change, Turkish educational institutions simply followed the advice from the Council by switching to online teaching very quickly.[5] For example, most Turkish schools and universities rushed to video their lectures and provided the recorded lectures to homebound students *via* online platforms.[6–8] This switch was carried out relatively faster in 123 institutions (61% of all higher education institutions) with Distance Education Research and Application Centers in place.[8] Unfortunately, this overnight transfer from face-to-face lectures to online lectures was not informed by state-of-the-art learning design principles or by adequate consideration of innovative technological affordances that were available.[9–11] In essence, these instructional programs were what researchers have labeled "emergency remote teaching" rather than authentic online learning.[12]

Under the emergency conditions of the evolving pandemic, online learning manifested itself with the "quick and easy" solution of video PowerPoint lectures, online discussions, and prerecorded demonstrations. In this process, unfortunately, no one paid much attention to the satisfaction levels with online learning of the instructors or their students in Turkish medical schools, and much less to reliable and valid evidence of what is learned and how. This study sought to address two research questions:

1. What does the research literature conclude about how medical educators and students in Türkiye and elsewhere responded to the COVID-19 pandemic?
2. What were the satisfaction levels of instructors and students with the emergency remote learning provided in the wake of the pandemic in Türkiye?

Method

Overview

This paper reports the results of the first phase of our larger scale educational design research (EDR) study focused on the complex problem of providing authentic experiential "hands-on, minds-in" learning opportunities online. EDR, also known as design-based research, is applicable to the solution of complex problems in medical education.[13,14] In contrast to traditional approaches to developing and evaluating medical education such as Instructional Systems Design[15] and Program Evaluation,[16] EDR is an iterative and recursive process with two primary goals: to develop a solution to a complex problem while at the same time to refine theoretical knowledge related to the problem.

One complex, even "wicked,"[17] problem facing medical education today is developing an appropriate mix of educational modalities (face-to-face, online, or blended) that simultaneously maximize the effectiveness of both traditional courses focused on foundational sciences and clinical experiences while also minimizing close physical contact in the wake of a pandemic or other calamities. Wicked problems are different from simply complex problems because they have innumerable causes, are tough to describe, and do not have just one right answer. Providing effective clinical education when instructors, students, and patients must maintain constantly varying degrees of physical separation and/or the widespread adoption of personal protective equipment (PPE) during a global pandemic is an obvious example of a wicked problem.

EDR enables an evidence-based solution to a complex problem to be designed, tested, and refined while at the same time extending theoretical knowledge in the form of reusable "design principles." Figure 1 is

a visualization of the EDR approach we are using in this study. This model is derived and modified from McKenney and Reeves.[18]

This paper reports the findings of the Analysis and Exploration phase during which we worked closely with the major stakeholders/target groups in the problem context. We identified medical education students and academic staff including those with administrative responsibilities as well as personnel from medical education departments as the major stakeholders who could enable us to acquire a deeper understanding of the complex problem of providing medical education during the COVID-19 pandemic. We did this primarily through networking with the aforementioned target groups. We also conducted a literature review to identify both scientific and practical aspects of the initial responses to the COVID-19 pandemic deployed by medical education institutions. Those authors of this paper who also teach at the medical faculties conducted field-based investigations in their home institutions to understand the state of the art of medical education responses to the crisis, which further helped us to identify emerging trends. A critical starting point for understanding better ways of providing medical education during a pandemic is investigating how students, academic staff, and other stakeholders have experienced the dramatic shift from "business as usual" to a patchwork of online and blended experiences.[12]

Primary milestones of the Analysis and Exploration phase included the development of an interview protocol and identification of the survey sample. To identify participants for interviews, we mapped medical education phases, and selected academic staff to represent academic staff both in pre-clinical and clinical sciences as well as those with administrative responsibilities. For students, we sought to select representatives from all years except the very first year in medical school. We also included 2020 graduates in the student category who were affected with the COVID-19 restrictions during the last three months before their graduation.

Subsequently, we tested a semi-structured interview guide, including questions both for academic staff and students, with three academic staff and one student. The academic staff interview guide had 19 questions and for those with administrative responsibilities, we added an additional eight questions. Twelve questions were in the student interview guide, but one more question was added for international students and another question was also added for new graduates. The online supplemental appendix includes copies of these interview protocols. Since no significant changes were introduced to semi-structured interview guide, we included the interviews done in the testing phase in the study group.

Setting and participants

We conducted our study in multiple medical faculties, including both state and private (foundation) institutions, that provide medical education in Türkiye. We conducted a total of 49 interviews between October 1 and December 31, 2020.

We included three sub-study groups in the study: Faculty members, faculty members of the medical education department, and students. To provide diversity in data collection among these groups, the
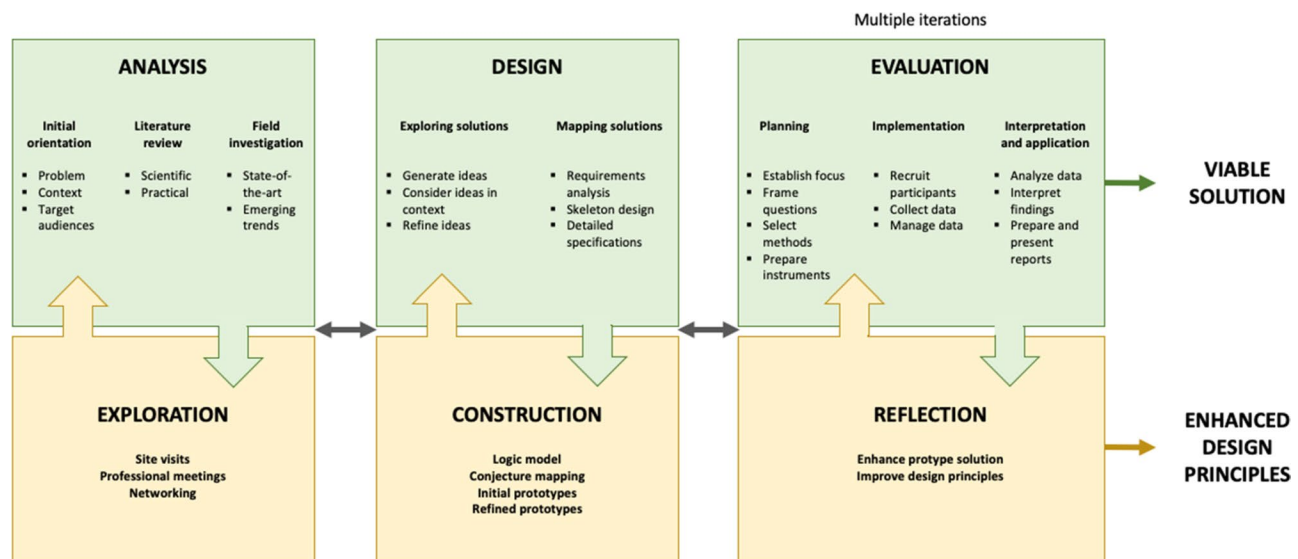

Figure 1. Educational design research details of the study methodology, modified from McKenney and Reeves.[33]

"maximum diversity" sampling method was applied and the people to be interviewed were recruited. In qualitative studies, it is recommended that the sample size be large enough to achieve data saturation.[19] In determining the study group, the first variation was applied in determining the medical faculties. As far as possible, we involved faculties located in different regions of Türkiye. In addition, we ensured that both state and private institutions were represented. In the study, we conducted interviews in 12 different medical faculties, two of which were in private universities.

Data collection

Our study team met online several times to synchronize approaches in interviews as well as plan for interview invitations and informed consent. We developed an informed consent form including a detailed explanation about the study and requesting permission for the audio/video recording of the online interviews. Before the interviews, we presented ourselves as researchers and obtained once more participants' consent in verbal form. The shortest interview lasted 20 min while the longest was 80 min.

Data analysis

We subsequently transcribed all audio recordings, and each text was checked by the interviewer for accuracy purposes. The researchers created open coding suggestions after the first reading. At this first stage, all researchers directly involved in the content analysis independently created a coding list. Afterwards, we came together in paired working groups and discussed the initial lists. Initially, we created three separate code lists (faculty members, medical education faculty members, and students). We discussed together these three separate code lists and decided on the themes that would represent the codes altogether. The data was then divided into analysis units. Paragraphs were designated as the unit of analysis. An Excel program was used to access citations for thematic analysis. We created three separate databases by transferring all the data to Excel divided into paragraphs.

The members of the two study groups who carried out the analysis independently coded the first interview recording from the data in the database according to the code list. Researchers in each study group then came together and discussed the code given to each paragraph together to achieve consensus. We applied the same steps for four other interview recordings and discussed again.

After consensus was reached, we calculated the coefficient of agreement between the encoders on approximately 25% of the data using Cohen's kappa. Agreement coefficients among the coders were 0.87 for academic staff, 0.81 for medical education academic staff, and 0.72 for students, and were all considered as very strong for coding the remaining interviews by the researchers. The researchers involved in coding held meetings together after their work in pairs, discussed the process and the coding list. The trustworthiness of the interview process and analysis is supported by the fact that the researchers work in the field (medical education) where the research is conducted, and because they have a good command of the processes related to the study subject. In addition, pilot applications were carried out for the interview forms and processes. In the data collection process, we took care to create a positive and natural interview environment to obtain trustworthy data. To reduce the obstacles of the online interview process, we informed the interviewees by e-mail and telephone beforehand. At each stage of the data analysis, we discussed the process together.

The Koç University Social Sciences Research Ethics Committee granted ethical clearance for the study on 04 September 2020 (No: 35853172-900). Informed consent was obtained by contacting students, graduates and faculty members by e-mail and telephone, informing them about the study and soliciting their participation. During the interviews, we obtained participant participation for the audio recording. Information that directly points to the identity of interviewees was not revealed in this research report.

Reflexivity statement

We conducted this study in seven medical faculties (five public and two private) located in the north-west, central, central-south and central-east parts of the country where members of the research team were working. Since it is only a fraction of 117 public and 109 private medical faculties in the country, our sample is far from being representative. However, the institutions included in our study were among the top 20 medical schools in Türkiye, and we were confident that the problems identified in these 7 schools could be found in every Turkish medical school.

The study was conducted amidst the uncertain and tense atmosphere brought about by the pandemic. Being academics ourselves, we experienced this uncertainty on a personal level. Despite the uncertainties, we worked together with a shared concern for the

future of medical education and a drive to find answers. However, the tensions inherent in the pandemic potentially led to implicit biases and divergent viewpoints within the research team, particularly during semi-structured interviews when informal conversations among colleagues allowed concerns to be expressed and shared. We took this situation as an opportunity to identify additional thematic fields for the research. To address this, we implemented measures such as holding regular online meetings, working collaboratively during the analysis process, and carefully identifying similarities and agreements in the coding and theme definitions, which greatly minimized biases. We also questioned ourselves as new information came in through interviews whether we ourselves could do things differently in our own teaching practice.

Results

Question 1: What does the research literature conclude about how medical educators and students in Türkiye and elsewhere responded to the COVID-19 pandemic?

The highly contagious COVID-19 disease that originated in China in late 2019 and was officially proclaimed as a pandemic by the World Health Organization in March 2020, had an immediate and enormous impact on medical education. Once the pandemic became evident, most medical schools rushed to put preclinical curricula online and immediately halted those clinical aspects of their curriculum that put medical students in direct contact with patients.[20,21] In the early months of the pandemic, when the availability of effective vaccines still seemed a long way off, some medical educators and their students joined the frontlines in hospitals and clinics to care for desperately ill patients, but most were confined to their homes as were virtually all other educators and students during the lockdowns imposed in many countries in the early months of the pandemic.

Researchers in numerous countries have reported on the impact of the COVID-19 pandemic on medical education.[22–24] For example, after the declaration of the pandemic by the WHO and following the guidance of the Association of American Medical Colleges[25] medical schools and colleges in the USA transitioned academic (preclinical) curriculum to online delivery and most temporarily paused clinical rotations.[26] In the United Kingdom, most UK medical colleges successfully utilized "online home learning" to provide their preclinical medical curricula to homebound learners but struggled to provide adequate hands-on

clinical training opportunities.[27] Most medical schools in China used online platforms to provide academic curricula to medical students, and Chinese faculty and students alike expressed widespread concern about the limitations of online technologies to provide sufficient laboratory and clinical learning.[28]

In Türkiye, the context of our study, several surveys of how medical students and their teachers responded to the COVID-19 pandemic were conducted.[29] For example, one such survey of 3,105 Turkish medical students found that they had high levels of anxiety themselves and great concerns about how the pandemic would impact their medical education.[30] Another survey study of 477 family practice residents in Türkiye reported high levels of burnout and anxiety among residents struggling to cope with the pandemic.[31]

Other researchers reported on attempts to provide clinical learning opportunities to quarantined medical students. For example, Manrique-Gutiérrez et al.[32] reviewed 205 studies that described how medical schools around the world used new technologies such as virtual reality simulators and 3D programs to provide some semblance of clinical interactions with patients. They concluded that while none of the innovations were completely successful in replacing hands-on training, "the adoption of new virtual tools has helped sustain medical education and marks an inflection point in the ways medicine will be taught and practiced in the future".[32] (p. 2) Although most of the studies reporting on applications of learning technologies during the pandemic were descriptive, one review was based upon 16 studies reporting quasi-experimental comparisons of "standalone digital education modalities" and "conventional learning" approaches.[33] No significant differences were found between the two modalities with respect to "knowledge and practice," a finding like that of a meta-analysis conducted before the pandemic of studies comparing online and offline learning.[34]

A different approach to providing clinical experience during the pandemic-imposed lockdown was trialed in the USA.[35] Medical students who would normally have been interacting with patients during clinical rotations, participated in virtual telemedicine patient sessions during which they elicited patient histories, reviewed their symptoms, and triaged them into telemedicine appointments with other healthcare personnel, all while protecting themselves and the patients with exposure to COVID-19.

Space prohibits the full summation of the literature we reviewed for this study, but three major conclusions emerged:

1. When forced by the COVID-19 pandemic to shutdown "business-as-usual" medical education, medical educators around the world adopted various synchronous and asynchronous online technologies to provide primarily academic and limited clinical learning opportunities to their students.
2. Most of the studies reported were descriptive in nature and/or based on online surveys of medical educators and medical students.
3. Very few studies applied in-depth interviews, and none of these were conducted in the context of medical education in Türkiye.

Question 2: What were the satisfaction levels of instructors and students with the emergency remote learning provided in the wake of the pandemic in Türkiye?

We conducted a total of 49 interviews for this study. Participant distribution by sub-study groups and discipline (academy) and year (students) are shown in Table 1.

Although we discussed pandemic experiences with our research participants in a wider framework, this paper focuses on participant reactions regarding changes in the curriculum, teaching methods, technological tools, learning evaluation, and communication with stakeholders and future suggestions for the continuation of education during the pandemic. Themes defined in interviews are illustrated in Figure 2, and details are given under related subheadings below.

Fear and concern were the most common reactions when first encountering the pandemic

The most common expressions described by participants were emotional reactions. When faced with the pandemic, emotional reactions differed depending on the environment and local conditions. The most frequently expressed common reactions in all three groups were surprise and anxiety. We identified two main rationales that led to these manifestations: protection of health during the pandemic, and continuation of their medical educational programs. Academicians expressed their concerns about the execution of the programs more frequently while students raised concerns and anxiety related to deficiencies that may arise in their learning in the wake of the pandemic.

While some students talked about positive emotions such as relaxation and joy, many emphasized more intense emotions such as fear beyond anxiety and worry. The effect of social media in the formation of this fear is evident:

> In the beginning I was kind of happy and said that there will be a maximum of two weeks of vacation, then it will be fine. We studied pandemics in theory, but now we understood what a real pandemic was by experiencing it. This turned my joy into sadness. (Woman, State, Year 6)

> Honestly, when we learned about the pandemic, we were in great fear, and because we are preclinical, it is something we did not know. Everyone who used Twitter had great fears, including me. (Woman, State, Year 4)

Although participants did not expect the closure of face-to-face classes to last that long, the closure decision was regarded as correct. Students living away from their families were impacted greater than students living with their families. Some preferred to return home quickly, while others preferred to wait in the city where the school was located.

All academicians including those from the medical education departments indicated that initial feeling was that the closure period would be short with temporary disruptions. Changes in the program and transition to online education were perceived as important. Faculty staff members also saw themselves as part of the plan to fight back in pandemic.

Teaching methods during the pandemic were primarily unidirectional from faculty to students. This largely one way transmission of information occurred both synchronously and asynchronously

Students emphasized the uncertainty in the execution of educational programs and its impact on their mood and plans. Students stated that uncertainty created problems in their decision-making that they could not see their way through in their educational processes:

Table 1. Study participants.

Sub-study groups	Discipline (academy) Year (students)	Number of participants
Academic staff	With administrative responsibilities	6
	Basic sciences (pre-clinical)	5
	Clinical sciences (clinical)	7
	Professor emeritus	1
Academic staff	Medical education	7
Students	Year 2	3
	Year 3	2
	Year 4	5
	Year 5	4
	Intern	6
	2020 graduates	3
TOTAL		**49**
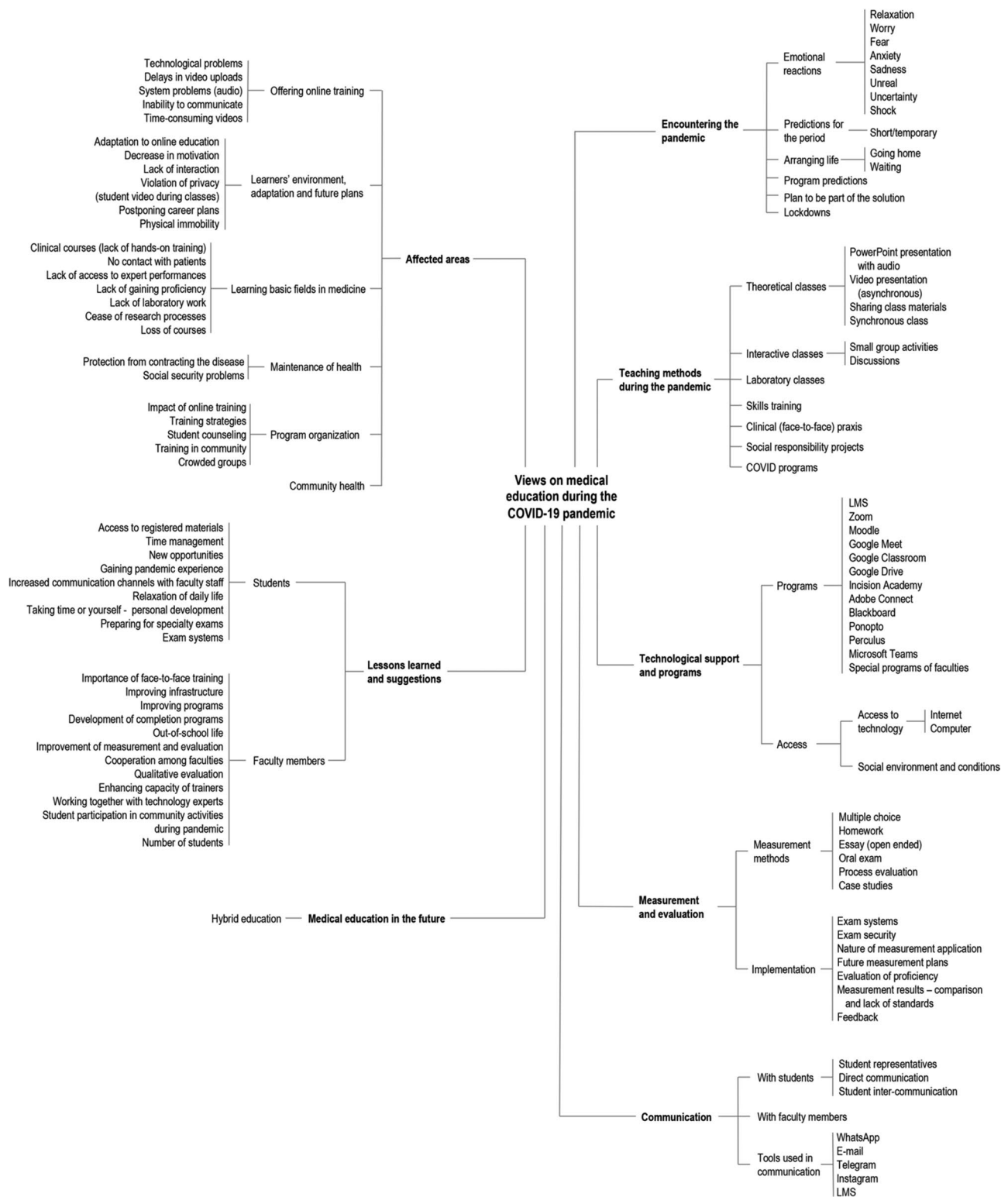
Figure 2. Main and sub-theme categories defined in interviews.

… the uncertainty made me very tired. I was in paediatrics internship. It was interrupted in the middle. I worked only in paediatrics for an average of one and a half months. I didn't know whether there will be a written or an oral exam. At the end, I could only complete my 5th year internships in online. That wasn't enough for me… (Male, Private, Year 5)

Teaching methods used in faculties during the closure were predominantly one-way. In March 2020,

faculties started to share lecture presentations online with students as an easy and quick fix. While closure continued, especially in the fall 2020 semester, live or recorded video sessions were used mainly for applied courses, clinical skills, and laboratory courses. While the reading materials for the courses were shared generally, in one faculty, both the infrastructure and the library facilities were expanded to increase the sharing of learning materials to facilitate learning.

Only a few schools preferred synchronous lessons during early weeks of the pandemic, but asynchronous lessons were also partially abandoned in the 2020 fall semester. Synchronous lessons raised interaction issues with it, especially with respect to student participation:

> Of course, it is up to the professor, so if he lets can raise hand to ask questions or write on the chat. (Male, State, Professor)

In medical faculties, in addition to the courses conducted in large groups, there are also courses conducted in small groups such as problem-based learning, team-based learning, and special study modules. In interactive lessons, institutions followed different methods depending on their infrastructure and human resources. Although faculties tried to move to more interactive online lessons, faculty members in general expressed the belief that such online applications do not have the originality or effectiveness of face-to-face education.

Ensuring active participation of students seems to depend on the competence and motivation of the faculty member as well as the student. Especially in large online groups, interactions are more difficult. Although students can share their questions by typing in the chat box, written questions are easily overlooked. A second factor was that although the situation was viewed as interesting at first, after a while it became unexciting.

> The interaction is far below than what we wanted and expected. In the beginning, there was a novelty effect. (Male, State, Dr. Instructor)

Within the scope of the programs, some laboratory lessons were continued as video lessons. Skill training sessions were carried out in a similar way through sharing videos with students and postponing the hands-on practices until after the pandemic eased. Despite such postponement, one faculty tried a different approach by sending a skill training set to its students.

Clinical courses (with bedside learning) in all medical faculties were carried out in online formats during the spring term of 2020. With the 2020 fall semester, clinical course programs were split into two as theoretical and practical. Postponed or not completed clinical courses were planned to be completed face-to-face in the spring 2021 semester. Interns, on the other hand, were reduced in number and started clinical practice. Academic staff stated that the excess number of students affected the quality of education before the pandemic and continued to do so. However, private universities experienced less problems due to limited number of students they had compared to state universities.

> Seeing patients is more important than just the face-to-face training because it means working like a physician. We do not know how long this will last. That's why the training of interns is continuing now, but you must wait for a while for other clinical classes, they are given the theoretical part and we are hoping to give practical training in the second term of the year. (Male, State, Manager)

A few faculty interviewed said that COVID-19 had created an important opportunity for medical students to experience the management of the pandemic process. But most faculty believed that the pandemic brought many additional challenges and responsibilities for them in protecting themselves and their students in both clinics and classrooms. To help students, special programs on COVID-19 were established in some faculties but this was not a common practice.

Technological support during the pandemic shutdowns was found to be challenging for both faculties and students

Regarding technical support, the most frequently mentioned structure was the Distance Education Center (DEC). However, in some faculties, technological infrastructure support was also carried out through information processing centers or learning centers. Although DECs had established learning management systems (LMS) in place before the pandemic, faculty declared that these systems were not used effectively because they were not suitable for the integrated, organ-system-based programs used in most of the medical faculties. One faculty stated that it used the LMS system available at the university level rather than the one provided by the DEC.

The interviews showed that medical faculties used various programs to conduct their education remotely. Among these, the most frequently mentioned course/meeting programs were Google tools (Teams, Classroom, Meet) and Zoom, in the order of

frequency. Various programs were used for sharing materials (Adobe Connect, Ponopta, Sakai, Perculus, Zazamix, etc.). It was also mentioned that some faculties created their own learning management system programs using the Moodle program while others managed the process by making use of existing structures such as a faculty-specific or general learning management systems.

Problems accessing technology were mostly expressed by students. Problems were most evident in rural areas due to limited access to the internet. It was mentioned that some students had to buy computers in the face of the pandemic. Access to technology issues by students were touched upon very briefly by the academic staff, suggesting that that these problems were widely ignored.

Evaluation of learning during the pandemic was opportunistic and had questionable rigor

During the first year of the pandemic, different approaches were used in learning evaluation (assessment). Evaluation approaches varied according to the educational infrastructure and manpower characteristics of the institutions as well as the number of students. Tests with multiple-choice questions were the most favored type, followed by giving homework to the students. Formative evaluations were used only with problem-based learning (PBL) programs used with small groups. Oral exams were used especially with interns.

> All exams have now been removed from the system. Now, we do only theoretical one. The application score has been removed, so we don't do that exam, we can't. (Male, State, Professor)

> This, in my opinion, was the weakest point. A certain number of questions were prepared for the theoretical exam, these questions were less than the number of questions we normally use. Everybody got very high grades. So, did this really measure, not sure? (Female, State, Manager)

> It is difficult to say that we made a very good evaluation. It is not correct to make an evaluation in medical school without practicals - touching the patient and examining- but we had to do it that way at that time. (Female, State, Manager/Clinic)

Faculties took decisions within their own means to ensure exam security and to control cheating. In faculties that had the support of an exam software system, it created opportunities to determine the features of the questions to be included in the exam, to control the application with certain systems during the exam, and to determine the quality of the

application after the exam. In the faculties that did not have the opportunity to use such software or could not adapt the software to the new situation quickly, decisions were taken such as making changes in the exam method, postponing the exams, and holding them face-to-face at a time allowed by the pandemic.

> So, is it very safe? I think it depends on the students, but how do you ensure security in the online test, there is no clear answer to it, you know, when you are remote, I think anyone can get outside help in some way, you can't guarantee it somehow. (Female, State, 3rd year, International)

Faculty members were concerned about not being able to measure proficiency mainly due to nonexistence of measurement and evaluation standards. Most faculties compared results with previous years but were not satisfied that this reflected quality. Academicians thought students were the primary victims of such dramatic change with the pandemic. This thinking led them to choose easy questions, and sometimes to a decision to pass borderline students.

Healthy communication was valued by both faculty and students using an array of different tools including social media

Most of the respondents indicated that maintaining healthy communication with students and academicians during the pandemic was critical, especially in sharing developments and decisions regarding the academic program as well as receiving feedback. Faculty members responded that regular communication with students reduced student's anxiety and contributed to the effective running of the process.

> There has been indeed critical response in the COVID-19 pandemic. Naturally, the students were in great anxiety, that is, 10% of the students had relatives at home – making them close contacts, and some were sick at home. This heavily affected their psychological state. It was important that we had a smooth communication with them. (Male, State, Dr. Instructor)

Communication with students took place either directly or through student representatives, as well as through various student networks. As the decision-making institution, the Higher Education Council was part of the communication during the pandemic, mainly in provision of decisions to faculty administrations.

> We had representatives, thanks to our representatives, they were always in contact with the Dean's office and

the coordinators. They were giving us information and updates every week. (Female, Government, Graduate)

Not surprisingly, some problems were identified in the communication processes through student representatives.

> At the beginning of that period, we had a little difficulty in communicating with the Dean's Office, especially since we used a student representative from time to time, since no one could foresee the process a bit, many of our friends were writing to the student representative individually. Even an innocent suggestion could turn into a harsh one, we had a little miscommunication because of it, but I attribute this to the course of the process. (Male, State, Graduate)

Social media tools were frequently used to ensure communication during the COVID-19 outbreak. Among the social media tools, WhatsApp was the most frequently mentioned followed by Telegram and Instagram. In some faculties, communication was carried *via* e-mail as well as LMS.

The pandemic had both negative and positive impacts on the educational processes experienced by students and provided by faculty and resulted in recommendations for new approaches to teaching and learning in the future

The primary themes from the student perspective regarding education and life during the pandemic were maintaining health, learning basic areas in medical education, adapting, and participating in distance education, living environment and future plans. Students felt uneasiness in protecting themselves from the disease and for being outside the social security system in the maintenance of health. The problems experienced in learning the basic areas of medical education can be summarized as not being able to see patients and benefiting from the experiences of professors, not being able to carry out laboratory studies, interruption of research processes, losses due to canceled praxis, and not being able to acquire necessary competencies. The prominent problem areas regarding the delivery of distance education concerned technical and communication problems. Variance in the adaptability of students, their unique environment, and future intentions brought more complexity to the context. It was evident that a learner's inability to adapt led to losses in learning motivation and alienation. Another problem area mentioned by the learners was the visibility of private life due to the cameras used.

Main themes of the faculty members' view were consolidated as reaching competencies, especially skills, the lack of technical infrastructure, communication problems, the effect of distance education, and inadequate teaching strategies and processes. Difficulties in maintaining interactive distance education with the large number of students, providing student counseling, and the inability to practice in the community were problems frequently mentioned.

In the distance education process, great concern about gaining the competencies was expressed by faculties. Faculty worried that significant parts of the graduation qualifications defined in the education program could not be reached through distance education. The most important reasons for these concerns were the separation of the teaching of knowledge and skills by the distance education process and restrictions of obtaining direct experience in clinical settings. In addition, the construction of new learnings on top of these deficiencies created doubts whether this gap could be closed. Concern was expressed that this gap will continue until graduation and will be reflected in post-graduation practices. However, some faculty members stated that these losses will be overcome by the students themselves in practice.

> There are things that will be difficult for us to achieve in terms of qualifications, there are targets, obviously. For example, we have interns who could not practice the emergency and left the internal medicine practice unfinished. We planned a 6-year output over this period, but we couldn't compensate. At the beginning of the last year, we said that at least we should offer our graduates a chance for them to complete missed studies in our institution after their graduation, which we could not realize. (Female, State, Professor)

> I think that the practical aspect of education has been hampered a lot. In faculties, which are already more limited in terms of the number of patients, this created problems that cannot be reversed in the future. (Male, Private, Clinic/Manager)

Faculty members emphasized that the education applied during the pandemic was not carried out in accordance with the predefined educational frameworks, but rather as a crisis management and an emergency approach. They expressed their concerns regarding the effectiveness of distance education, especially by emphasizing the lost connection with real life and the acquisition of professional values.

Despite negative reflections of the process, students emphasized some advantages that the pandemic period has created. These included taking time for oneself, planning study time and place, accessing recorded materials, researching different sources, practice exam system, studying for specialty exams, creating an

opportunity for change in education, increasing communication opportunities with faculty members, gaining knowledge and experience in the pandemic, and relaxation of daily life.

Faculty members stated that the experience gained during the pandemic reminded them once again the importance of face-to-face teaching. Here, suggestions for the development and execution of the programs came to the fore rather than the advantages. It was emphasized that the infrastructure and programs for quality education should be developed, interactive sessions should be increased, and innovative measurement and evaluation standards should be developed. Developing supplementary education for closing the deficiencies were suggested.

It was also stated that it is necessary to organize training programs for instructors on the new skills revealed by the change, as well as increasing communication and cooperation between faculties to share experiences, and the importance of necessity of technology experts taking part in the faculties. Finally, it was stated that the excessive number of students added to the difficulties faced in the implementation during the pandemic.

There were predictions that the change in education during the COVID-19 will result in significant changes in medical education for the future. Faculty members think that the change will continue with acceleration. They believe this change will not be limited to the preclinical years. Faculty members stated that some of the faculties will decide to implement distance education and move to a mixed system, and work has already begun in this direction.

> I think that distance learning should be on our agenda from now on. Face-to-face learning packages, distance education packages and activities where the learner organizes his/her own learning process should go together. (Female, State, Professor)

In addition, some faculty members in this study suggested that "different plans" with respect to technology should be considered:

> "Distance learning should be on our agenda from now on. Face-to-face learning packages, distance education packages and activities where the learner organizes their own learning process should go together. The proportion of distance learning may differ from grade to grade. Considering these proportions, distance education should always exist in our lives, at least as a plan B. If we encounter an extraordinary situation again, I also think that this platform will be supportive, especially in terms of readiness and organizing students' own learning processes." (State, Professor, Woman)

Discussion

For this study, we interviewed three primary medical education participant groups (medical students, academic and clinical faculty members, and faculty members of the medical education departments) over the last three months of 2020, seven to 10 months after the COVID-19 pandemic began. Although there were some differentiating issues raised, there were primarily similarities in the opinions of these three groups about the impact of the pandemic on medical education in Türkiye. Similarities included general concerns about the pandemic, including worries about contracting the disease and how it would affect the whole population. Despite having different roles and positions in the educational environment, students and faculty members expressed similar concerns regarding the outcomes such as "not getting quality education" by students and "not being able to provide quality education" by faculty members. In a similar study conducted by Harris et al.[36] medical student respondents from across the US similarly experienced anxiety in the face of the pandemic, viewed it as a significant disruption to their medical education, shared a desire to continue with in-person rotations, and even were willing to accept the risk of infection with COVID-19 to continue face-to-face interaction in clinical setting.

In our study, participants stated that they experienced "anxiety about being sick" or "even dying" about themselves and their families, especially in the initial stages of COVID-19, when the unknowns were so prevalent. Such concern is very human and in line with findings from other studies in the literature. The psychological impact of the pandemic in the general population suggested a moderate-to-severe level impact on mental health, with increased anxiety, depression, and stress.[37–39] Similar findings were also found in medical students.[40]

Clearly, the pandemic has made it difficult to run medical education programs in "business as usual" ways. "Uncertainty" prevailed during the initial phase of the pandemic, especially during the lockdown periods. Uncertainty centered around whether the requirements of medical education could be fulfilled in a timely manner. Uncertainty about the implementation of the curriculum was especially prevalent among those medical students in the final year before their graduation.

The interruption of medical education during the pandemic caused the knowledge, attitudes, and behaviors expected to be gained during the education process not to be learned as desired. In this regard, faculty members and students have clearly identified

their deficiencies, especially in skill training. In addition to the restrictions imposed on the time for learning the core education program content, the "limitations on training that would normally be done face-to-face" was identified as a major concern. Faculties have produced different solutions for the continuation of skill training. For example, one faculty sent a "skill training set" to students to enable them to acquire skills by using this set combined with online interactions. Although such innovative solutions produced are positive, they were rare and the inability to ensure continuity and not creating similar opportunities for all faculties was an important limitation.

COVID-19 not only created considerable difficulties in maintaining medical education classes, it also negatively affected the standard of education. Reasons such as differences in the adaptation processes of students and faculty members to interrupted education, technical limitations and difficulties, incompatibility with technology, and inadequacies in education infrastructures in faculties were the main causes of these difficulties.

During the pandemic, "problems related to the objectivity of measurement and evaluation of knowledge, skill, and attitude learning in medical education programs" were also expressed. Faculties had to change their evaluation methods. Such changes may have broken the standards in the measurement and evaluation processes and made it difficult to compare the compliance of these assessments with the content of the core education program.

Converting face-to-face classes to online video PowerPoint lectures and prerecorded demonstrations (asynchronous) were viewed as "quick and easy" solutions. In addition, synchronous (live) solutions, like video conferences, online discussions, and virtual classrooms were also tried. Some medical faculties were more successful in merging these two approaches into a type of "flipped classroom" whereby asynchronous and synchronous solutions were blended.[41] To support these coping efforts, very limited guidance was provided by the Higher Educational Council. In some faculties, Medical Education Departments were instrumental in assisting academic staff in preparing the online content. However, more research is needed in understanding how the initial months of the ongoing pandemic have affected all aspects of medical education.

It is understandable that medical school administrators and teaching staff in Türkiye wanted to retain most of their traditional education services even in the face of the sudden closure of the campus, if only to demonstrate that medical education is sustainable despite the stringencies of the pandemic. However, considering the persistent nature of the COVID-19 pandemic, it is imperative that some form of redesign and development of online education programs be undertaken. After all, it appears that some forms of flexible or blended education will have to continue even as the pandemic subsides.[42]

A closely related problem is that medical faculty have very limited resources for the extensive redesign of medical education that could theoretically be accomplished to radically improve the pedagogical dimensions of medical education in Türkiye. Without radical redesign, there is a great risk that simply uploading existing content and instructional methods to the online platform without changing traditional teaching and learning strategies will produce the same kind of education and learning experiences and outcomes as before. Producing hours and hours of PowerPoint-based videos and uploading them to the web without making strategic pedagogical changes is ill-advised because medical education is not just about providing access to content. Content gives us nothing more than something on which to work. The important things rest in interaction with the students, social events, interpersonal relationships, solving ill-structured (as opposed to textbook) problems, the generation of rich dialogue and deep reflection, and students discovering new content that was not pre-defined.

Conclusions

This pandemic has shown how vulnerable the current medical education system is during a crisis, especially if physical distancing and lockdowns are forced. Although video PowerPoint presentations were brought up as "quick and easy" solutions for education to continue, both students and academic staff agreed that such solutions cannot replace face-to-face learning mainly for skills. However, there are creative examples of involving students remotely through various technical solutions.[3,43–46]

Clinical and written examinations had to be postponed, delayed, or canceled in almost all medical faculties and were replaced with online examinations, bringing new challenges in assessment of students. Again, creative examples were seen such as using actors instead of real patients.[27] As for the future, additional comparative analysis of classical and online assessment results would help regarding how to use reliable and fair assessment approaches during such a restrictive period.

Technical challenges were faced both by students and academic staff as well as limited technical skills.[47] Although adoption of online learning would surely be a key strategy when facing new pandemics that require similar public health restrictions or other emergencies, it may well be time to create nurturing online educational environments as part of the new "business as usual" medical education.

The pandemic has been associated with high levels of mental health problems both in general population and medical students the world over.[40,48,49] It is important that the well-being of medical students should be addressed through early detection and intervention programmes for similar situations in the future.

The results of this study highlighted the critical importance that medical student and academic staff communication and interactions during a crisis. Student representatives play critical role in facilitating this communication.[50]

The COVID-19 pandemic indicates that all medical schools need contingency plans to address threatened integrity of medical education during a crisis. In this sense, countries with experience of 2003 SARS epidemic and 2009 H1N1 pandemic have come up with unique learning solutions to minimize disruption to their curriculum. In Singapore, a contingency plan was developed for medical schools following the H1N1 pandemic with the applicability of similar containment measures to be implemented in the future.

Table 2. Major dimensions of authentic experiential learning and examples applicable to medical education.

Dimensions	Context	Examples	References
Authentic context	This aspect is the most used principle in many medical schools, especially in clinical settings, where the students are exposed to a physical or virtual environment that reflects the way the knowledge will be used in real life. In this design, it is critical that the pathway students would take through the learning environment should be flexible and that the students should be able to move around.	Virtual classrooms, staged work settings, and practice facilities	55
Authentic tasks	Authentic tasks require clear goals and real-world relevance. Most importantly they need to be complex and ill-defined and give enough time to students to complete the task. It would not be too motivating if the full picture of a clinical case is described including all radiology, pathology, and laboratory results, asking for the diagnosis. Rather it could be left to students to decide what additional tests or consultations could be done in order to either rule out certain conditions or reach a diagnosis. Students should also be able to choose information from a variety of inputs.	Staged work settings and practice facilities	56
Expert performances	Naturally, the teacher plays an expert and role model in medical education, where with the pandemic disturbance access to such expert performance was greatly affected. However, we should note that the learning environment should provide access to expert performance and opinions from a variety of sources, not from a single expert.	Simulations, podcasts, and vodcasts	57,58
Multiple roles and perspectives	Textbooks are good, but not enough for students to understand the depth of conclusions since they are considered as single source. Students should be encouraged to find different resources from various channels to construct a robust mental model on the subject. It is also important that students experience different roles in problem solving, such as wearing the hat of a nurse, or a janitor when studying hospital infection.	Digital libraries, discussion forums, simulations, skits	59,9
Collaborative learning	"Though we work alone from time to time, often we work together with others through idea sharing and thinking to accomplish a common goal. Collaboration takes team work to a higher level with a strong sense of purpose. Team members need to demonstrate ability to work effectively and respectfully in diverse environments, utilizing the strengths and skills of everyone involved. Collaborative work often allows team members to come up with ideas and solutions at a faster pace compared to individuals working alone. Collaborative working also encourages and stimulates reflection and articulation."[59(p3)]	Wikis, discussion forums, digital stories, joint reporting or publication	59,60
Reflection	Reflection provides opportunity to think about, reflect and discuss choices. This allows students to question themselves how they can do it better later. In this regard, it is not really a quiet and solitary process, rather it is quite social. Students can collaboratively decide on the best approaches to achieve the goal.	Learning diaries, and reflection sessions	59,61,62
Articulation	Articulation provides opportunities for students to speak about their growing understanding, and promotes development of metacognitive abilities, creativity, and interaction between colleagues/students.	Learning diaries, Flipgrid videos, discussion forums, WebEx	63
Coaching and scaffolding	Scaffolding is about helping students at the metacognitive level and not simply delivering information or answers.	Discussion forums, one-on-one feedback sessions	64,65
Authentic assessment	"Authentic assessment is not separated from the learning process but is seamlessly integrated in the activities. Moreover, authentic assessment requires that learners are provided with the opportunity to become effective performers with the skills and knowledge they have acquired. In the online 'Pharmaceutical Cold Chain Management (PCCM)' course, most of the solutions generated by the teams of learners are subjected to expert, peer, and self-review, rather than 'graded', using a predefined scoring scheme. While some solutions are clearly better than others, creativity is encouraged and there is no penalty for being 'wrong', but feedback helps learners to improve their solutions to complex problems. The kind of learning that is supported through authentic learning cannot be easily measured with multiple choice tests."[59(p9)]	Peer-review, expert review, and self-review.	59

This plan was in full force during the COVID-19 disruptions.[51]

On the basis of our review of the literature and interviews conducted, the lessons we learned during the pandemic process also strongly suggest that different innovative approaches are needed in medical education in the future. A similar conclusion was found in a recent bibliometric analysis of 1,061 papers about how higher education institutions around the world responded to COVID-19 included studies from 103 countries or regions.[52] A major conclusion of this comprehensive analysis was that "With technology often conceptualized as the solution to support online learning, it is imperative to put innovative pedagogy at the forefront of the design of online teaching and learning".[52] (p. 621)

Since clinical experience and patient interactions cannot be fully replaced with online solutions, medical faculties should be prepared with innovative contingency plans rather than quick and easy fixes as reactive measures and be ready for recurring infectious disease outbreaks and pandemics. Reflecting on the impact of COVID-19 on medical education, Wayne et al. concluded that "Many improvements to medical education are a natural consequence of disruptive moments."[21] (p. 1) We agree and believe that one innovative direction would be a much more widespread adoption of experiential or active learning models that can be applied regardless of whether the delivery mode in face-to-face, online, or most likely blended. Experiential learning involves learners learning by doing and subsequently reflecting on their experiences.[53] Experiential learning activities include internships, practicums, clinical rotations, games and simulations, field trips, and service learning. Table 2 presents the major dimensions of authentic experiential learning that have been applied in public health and other sectors that Turkish medical educators may wish to consider.[54] Adaptation of this model to medical education in Türkiye will be the focus of the Design and Construction phase of the larger scale EDR study in which we are now engaged (See Figure 1).

Limitations

The limitations of this study are akin to other qualitative studies using the interview technique. The data was obtained from semi-structured interviews with the participants and is based on the participants' self-reporting. While efforts have been made to ensure maximum diversity in the study, this study should not be construed as representative of the situation and context of all medical schools in Türkiye and elsewhere.

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
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