

*Medical Undergraduates' CORE Performance Scores and Opinions Towards e-PBL**

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Abstract

As a commonly used method in medical faculties, Problem Based Learning (PBL) is normally performed face-to-face. In this study, online sessions were conducted with multimedia supported (animation-based) problem scenarios. The aim of the study is to evaluate the effectiveness of online PBL (e-PBL) sessions and to compare the success of the both group (face-to-face and online). The study was conducted in the 2018-2019 academic year from 3rd Grade students. There are two group (n = 24) for online sessions, and two group (n = 20) for face-to-face. Three sessions were conducted with each group. After the last sessions, all participants joined Clinically Oriented Reasoning Exam (CORE) online. There are 21 male(48%) and 23 female(52%) students in the study group. There are no significant differences in terms of CORE performance scores between online (61.29±13.98) and face-to-face (62.35±9.61) groups. There are also no significant differences according to gender for CORE performance scores. Female undergraduates (62.87±12.30) have similar scores with their male (60.57±11.99) peers. These results show that e-PBL sessions are as better as face-to-face sessions. We asked e-PBL participants to compare their experience with their previous face-to-face PBL experiences. Although there were technical failures in the online sessions, the students are *satisfied with the following features: (a)effective learning, (b)saving of time, (c)visual elements, (d)flexibility of physical environment, (e)the advances of online learning system*. On the other hand e-PBL has the following advantages: *(a)no physical classroom, (b)animation based scenarios causes less paper consumption and increase audio-visual quality, (c)evaluating the performance of students objectively*.

Keywords: undergraduates, physicians, pre-medical education, online learning, problem-based learning, e-PBL, CORE, performance

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Introduction

Medical faculties are commonly using the pedagogical method of Problem Based Learning (PBL) since the end of 1960s. McMaster University was first that started PBL method in medical education (Zubaidah, 2005; Maldonado, 2011). In Turkey Dokuz Eylül University was first applied “PBL-based method for the first three years of medical education” in 1997-1998 academic year (Musal, Keskin & Tuncel, 2016). Today there are very few universities that apply totally PBL-based method, but most of the medical faculties in Turkey applies PBL method several times in the first three years of medical education. Gazi University applies PBL twice in an academic year for the 1st, 2nd and 3rd grade undergraduates. In Turkey, the PBL method is not used in the pre-university period, there have been several deficiencies in elementary and high education, and students are immature because they enter the medical school at 18-year-old on average.

PBL method uses modern insights on learning: constructivism, self-directed learning, collaborative process, and contextual process. It is a small group method between 6-10 students and normally performed as face-to-face (f2f). The PBL method was found to be rich and powerful especially in the field of medicine, and it was also found in meta-analysis studies (Strobel & van Barneveld, 2009). Thus, by combining clinical and theory in the early stages of education, it directs medical students to clinical decision-making and reasoning and accelerates their adaptation to the profession (Demirören & Demirel, 2006). In this method, students try to understand the problem related to the case in the scenario, to formulate possible hypotheses related to the problem, to identify and research the issues with information deficiencies, to propose solutions and to evaluate the possible solutions based on their knowledge and experience (Persson, Fyrenius & Bergdahl 2010; Gürpınar, Tetik, Alimoğlu & Akdoğan, 2011) both manage their own learning and improve their problem solving skills (Demirören & Demirel, 2006; Vosinakis, Koutsabasis, Zaharias & Belk, 2012, Musal et al., 2016). In this process, students reach gains in deep understanding of knowledge and long-term recall (Valaitis, Sword, Jones, & Hodges, 2005; Spinello & Fischbach, 2008; Strobel & van Barneveld, 2009) and group collaboration, critical thinking (Vosinakis et al., 2012; Gavgani, Hazrati & Ghojzadeh, 2015) and communication skills (Demirören & Demirel, 2006; Gürpınar et al., 2011; Musal et al., 2016). PBL is said to have a strong impact on learning and achievement (Schmidt, Rotgans & Yew, 2011). This method is reported to improve clinical reasoning skills (Rounds & Rapport, 2008).

The clinical reasoning skills are usually measured by CORE (Clinically Oriented Reasoning Exam) that includes a few stations. The essential clinical skill for the health professional has been the ability to investigate the signs and symptoms experienced by different patients and to treat them as cues to a deeper level of the real pathology (Mattingly, 1991). In each station of the CORE exam small parts of a scenario is given about a patient with many options below. The student can select more than one option. Some of the options are golden standards and have high scores, however some of the options have negative or neutral scores. The student should identify the pathology and select the appropriate treatment in the following stations. This identification allows the professional to extract from his or her repertoire of treatment interventions those scientifically proven to be effective in treating this disease state (Mattingly, 1991). At the end of the exam, usually at the last station, the students are asked to select one option that they thought what the real pathology was.

In this study, we applied e-PBL which has online sessions with multimedia supported (animation-based) problem scenarios. The aim of the study is to evaluate the effectiveness of

online PBL (e-PBL) sessions and to compare the success of the both group (face-to-face and online).

Method

The PBL sessions consist of three parts. In first part students analyze the problem (in general, 12 students), lasting 2 hours in a given day, guided by a subject-matter expert tutor, when students establish the learning goals for self-directed study. The second part of the tutorial session occurs in another day in the next week, lasts 2 hours. The third part of the tutorial session occurs in another day in the next week, lasts 2 hours, and consists of the reporting phase. In the f2f PBL the scenarios were given as paper-based (see Figure 1).

1. OTURUM
2. BÖLÜM

Ece Sağlam'ı karşılayan Acil Servis doktoru Süleyman İmdat'a, hastanın görevi nedeniyle 2 saattir ayakta olduğu ve bayıldığı için arkadaşları tarafından hastaneye getirildiği söylenir. Dr. İmdat, Ece Hanımın öyküsünden aslında 1 yıldır devam eden halsizlik yakınmasının son 3-4 aydır arttığını, zaman zaman da karın ağrısı olduğunu öğrenir. Ece Hanım bu nedenle 2 ay önce kurum doktoruna başvurduğunu ve o zamandan beri de kansızlık nedeniyle demir tedavisi almakta olduğunu da belirtir.

Hastanın acil servisteki fizik bakı bulguları şu şekildedir:

Vücut ağırlığı:	52 kg
Boy:	165 cm
Vücut sıcaklığı:	36,8 C
Kan basıncı:	90/50 mm Hg (90-140/60-90)

Figure 1: In paper-based PBL the scenario was given as printed on paper as Black White

In e-PBL setting the scenario was given as animation based (see Figure 2) via online learning system as a part of Live Classroom (see Figure 3). The students can watch the live classroom after the sessions via an LMS system. All participants were educated about the online learning system before the real sessions. However, there are several dysfunctional groups during the tutorial process because of a low level of self-study before the reporting phase of tutoring session.



Figure 2: Animation based problem scenarios.

There are three different screenshots in Figure 3, in the first one (A) the patient speaks with the doctor about her symptoms. In the second (B), the laboratory test results of the patient were given and in the last screen (C) the learner-driven self-identified analysis of problems, hypothesis, mechanisms, and learning issues table. The students can see the PBL facilitator video on each screen. Under the video there is a chat box where students can write and discuss their ideas.

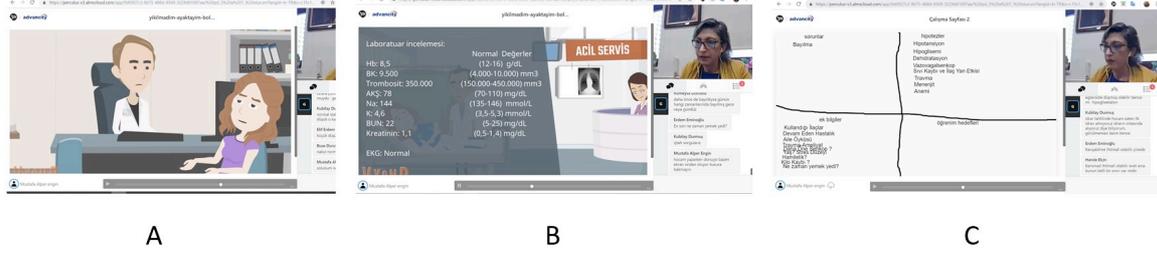


Figure 3: Screenshots from e-PBL session live classroom

The study was conducted in the 2018-2019 academic year from 3rd Grade students. There are two group (n = 24) for online sessions, and two group (n = 20) for face-to-face. Three sessions were conducted with each group. After the last session, all participants joined Clinically Oriented Reasoning Exam (CORE) online (see Figure 4). CORE Exam was implemented using Socrative platform (<https://socrative.com>). The exam has 6 stations about «abdominal pain» under the Gastro-Intestinal Course Board. Before starting the exam all students were given a short instruction about how to use the Socrative system. Each student entered the Socrative system once, and we evaluated that score.

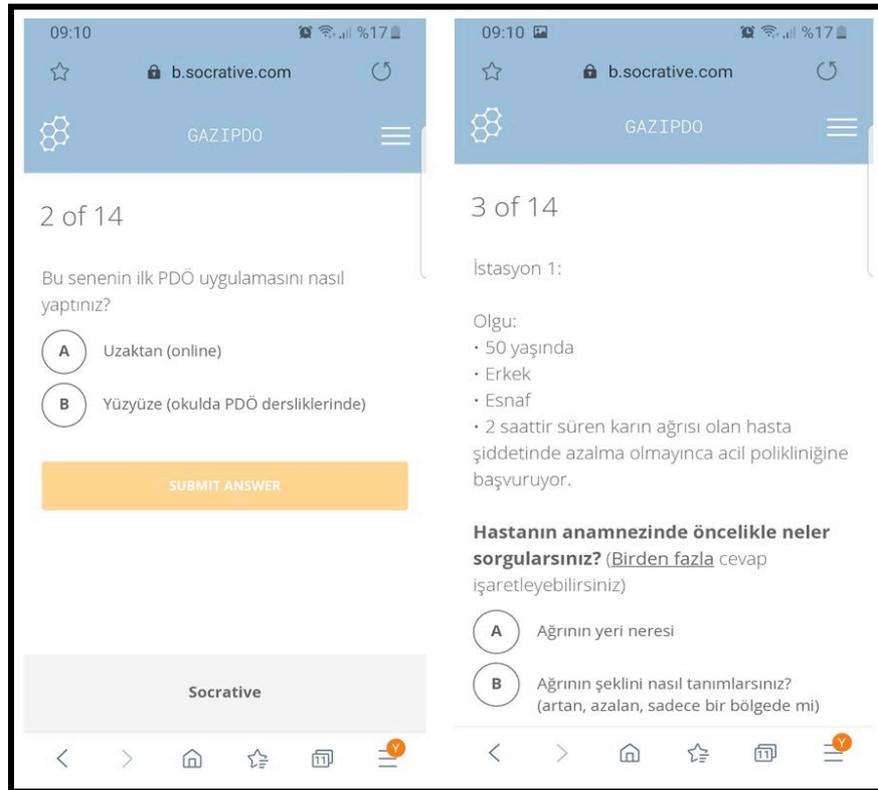


Figure 4: (left) A screenshot from beginning of the CORE Exam: a question aims to determine the students f2f or e-PBL. (right) A screenshot from CORE Exam: Station 1

Results

There are 21 male (48%) and 23 female (52%) students in the study group. There are no significant differences in terms of CORE performance scores between online and face-to-face groups ($p > .05$; see Table 1).

Table 1. CORE performance score change in terms of PBL modality

	Online (e-PBL) (n=24)		Face-to-Face (n=20)		df	t	p
	M	SD	M	SD			
CORE Score	61.29	13.98	62.35	9.61	42	-,287	.776

There are no significant differences according to gender in terms of CORE performance scores. Male undergraduates have similar scores with their female peers ($p > .05$; see Table 2).

Table 2. CORE performance score change in terms of gender

	Female (n=23)		Male (n=21)		df	t	p
	M	SD	M	SD			
CORE Score	62.87	12.3	60.57	11.99	42	-,626	.534

We also asked students to compare their e-PBL experience with previous f2f PBL sessions. They shared their opinions in open-ended format. We analyzed all the content and classified under five titles. The examples from students' quotes are given below under the related titles. The "P1, 21, M" coding means that "Participant one, 21 years old, and Male".

a) *Effective learning:*

P1, 21, M: In general, we have made a more memorable, fun work. I want it to continue.

P20, 20, F: It is good to share the information with each other and make common decisions while solving the problem step by step thanks to group works. Reaching the most accurate information through the discussion environment, the fact that each student is able to recognize the pros and cons of other students are other positive aspects.

b) *Saving of time:*

P3, 21, F: It allowed us to do lessons when we were available.

P10, 25, F: Ankara is a big city and is not easy to transport from home to faculty. It was nice to join training from where I was without wasting time on the road. We used time more effectively.

P25, 21, M: This environment is more successful in routing time.

(c) *Visual elements:*

P2, 21, F: I liked having visual content in the form of animation. It was easier to visualize.

P9, 20, M: Lots of visual materials make learning more permanent. I can also understand the case with a wider angle with animations.

(d) Flexibility of physical environment:

P2, 21, F: There used to be sessions I couldn't attend because I was out of town. Thanks to the virtual session, I was able to participate even if I was far away.

P13, 22, M: Home environment, comfort, class hours. We avoided waiting at the door of the PBL class.

(e) The advances of online learning system:

P7, 20, F: During the discussion, I was able to search the questions over the internet. It made me pay more attention.

P10, 25, F: The program can share documents, screen recording can take. It is also good to be able to watch the lesson from the recordings afterwards.

They also noted the advantages of e-PBL under three titles as follows:

a) No physical classroom:

P14, 20, F: It was nice to be able to do lessons at any time without having to come to school.

P21, 20, F: I was pleased that it was done at a convenient time and accessible from everywhere.

b) Animation based scenarios causes less paper consumption and increase audio-visual quality:

P13, 22, M: Paper usage decreased.

c) Evaluating the performance of students objectively:

P12, 20, F: Better evaluation of assignments.

P13, 22, M: Homework can be submitted easily by citing the sources.

Conclusion

No significant differences between e-PBL and f2f PBL show that the all participants have similar learning gains and these environments are coequal of each other. If the students have required hardware and internet access, we recommend them to join e-PBL sessions. On the other hand, free from accessibility; participating to each environment voluntarily is the most important point. Because while some of the students prefer e-PBL some of them prefer f2f.

e-PBL sessions may transfer some of its advantages -such as multimedia based scenarios- to the face-to-face sessions in order to consume less paper. It may be another useful outcome of this project. The total number of students are 1875 for the first three years. Each scenario have at least 10 pages. The paper consumption is so huge that we should produce and consider practical solutions.

These results show that e-PBL sessions are as better as face-to-face sessions. We asked e-PBL participants to compare their experience with their previous face-to-face PBL experiences. Although there were technical failures in the online sessions, the students are satisfied with the following features: (a) effective learning, (b) saving of time, (c) visual elements, (d) flexibility of physical environment, (e) the advances of online learning system. On the other hand e-PBL has the following advantages: (a) no physical classroom, (b) animation based scenarios causes less paper consumption and increase audio-visual quality, (c) evaluating the performance of students objectively.

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