RESEARCH ARTICLE

ONLINE PROBLEM-BASED LEARNING (PBL) DURING CORONAVIRUS PANDEMIC: TRIAL AT THE LIBYAN INTERNATIONAL MEDICAL UNIVERSITY

Abdulla M. Elmansoury[1], Nuha A. El-Naas[2], Mohamed Elkawafi[2], Atya Kushan[2] and Sara Arfan[2]

1. Al Fawyhat - Kairawan Street, Benghazi, Libya.
2. Faculty of Basic Medical Sciences Libyan International Medical University (LIMU) / Benghazi - Libya Online Problem-Based Learning (PBL) During Coronavirus Pandemic: Trial at the Libyan International Medical University.

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Abstract

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Problem-based learning (PBL) is a modern strategy used in many higher education institutions. The coronavirus pandemic in 2020 urged universities and other educational institutions around the world to close, leading to the shift to online learning as an alternative in order to overcome delays in the education process. The Faculty of Basic Medical Sciences (BMS) at the Libyan International Medical University (LIMU) has adopted the PBL method as a key element in its teaching strategy. The Faculty started a trial for online PBL sessions during the lockdown period to evaluate the student experience at BMS. Here, we used a binary questionnaire where responses of 293 students were anonymously collected. Overall, there was a positive response of about 76%. Each of the questionnaire elements scored at least 73% which reflects general satisfaction with the online PBL experience. However, there seemed to be considerable variation in the responses of the different year groups. First year students reported the highest overall positive response on the experience whereas third year students were overall less satisfied. In addition, this variation in responses was more pronounced when students were asked about the organisation of the session and problems with internet connectivity. This may be due to the fact that the more senior year groups were interviewed first and there was a continuous adjustment of the online PBL strategy throughout the time for this trial. Our study also showed that among the different online PBL aspects surveyed in the questionnaire, the clarity of instructions was the most important element determining the effectiveness of online PBL. Overall, this questionnaire shows that online PBL can be a decent alternative to traditional PBL during crises.

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Introduction:-

Online learning has long been used in higher education institutions in general and medical education in particular [1]. There are two approaches to online learning: synchronous and asynchronous. The former describes real-time learning which involves online face-to-face interaction among students and teachers via live chat or video calls. Asynchronous online learning, on the other hand, has no real-time interaction but it relies on students having open

Corresponding Author:- Abdulla M. Elmansoury
Address:- Al Fawyhat - Kairawan Street, Benghazi, Libya.

access to course material, allowing flexibility in learning [2,3]. Technological resources such as the Learning Management System (LMS) are used in online learning approaches Modular Object-Oriented Dynamic Learning Environment (Moodle) is the most frequently used LMS platform. Moodle is an open-source and customizable Virtual Learning Environments (VLE) , which provides learning services such as forums, blogs, chats, wikis, glossaries, texts, books and quizzes [4]. The Libyan International Medical University (LIMU) was the first libyan university to adopt Moodle in its teaching strategy which has shown considerable positive impact on the learning experience since it was first used by the University in 2009.

Problem-Based Learning (PBL) is a modern teaching method which is based on constructive and critical thinking [5]. PBL is believed to be the keystone in science and medical education as the method enhances the application of problem-solving skills and acquired knowledge. This teaching strategy is well-established globally and is used as a vital educational tool in different educational institutions including information technology (IT), engineering, business and medical schools. In Libya, teaching methods established in higher education are still mainly based on traditional lectures and traditional face-to-face teaching [6]. However, the first Libyan university to adopt PBL is the Libyan International Medical University (LIMU), where PBL has been integrated into the teaching system since 2009 [7].

The emergence of the coronavirus disease of 2019 (COVID-19) led to the closure of many schools and universities around the world. Libyan universities were no exception as the rise of COVID-19 cases led to a full lockdown in late March 2020. History has proved that online learning is an effective approach during global and local crises. For example, during the influenza pandemic, the California Department of Health Services (CDHS) and the California Distance Learning Health Network (CDLHN) used online learning to prepare public health nurses [8]. Online learning was also successfully utilised in the influenza pandemic in Australia [9]. Najran University in Saudi Arabia also benefited from online learning during the war between the Arab Coalition and Yemeni rebel groups [10].

In fact, LIMU was put in a similar situation during the civil war following the Libyan Revolution in 2011, as this also caused the shutdown of all educational institutions across different regions in the country. There were, however, several challenges facing the shift to online learning at the time. These ranged from the psychological and financial distress caused by the war to technical problems due to the community being generally very unfamiliar with the technologies needed for online learning. Therefore, the Faculty has adopted alternative strategies to online education including transferring students to neighboring countries e.g. Egypt. In contrast, the shift to online education during the coronavirus pandemic was easier due to the fact that over the past decade, the teaching strategies and technologies used by LIMU have developed significantly. This has significantly smoothened the shift to online education during the coronavirus pandemic. In addition to conventional online teaching, BMS students were also encouraged to attend a trial online PBL during the COVID-19 pandemic.

Online PBL sessions have been previously established and are believed to have a positive effect on the learning experience of students, staff as well as the environment [11]. Because the teaching strategy at BMS relies heavily on PBL, and due to the Faculty's belief that the skills developed in PBL are crucial for the students' development into competent graduates. Thus, the Faculty started an online PBL trial as well as online lectures during the COVID-19 crisis. The rationale for starting such a trial was to aid active involvement of students in the teaching process. This trial also aimed to assess the technical feasibility of such an online teaching plan given the expected technological challenges facing Libyan students in particular. These challenges mainly involve unstable internet connection, the generally poor communication services and the long-term unannounced electricity cuts. Here, we used a questionnaire to evaluate the feedback from BMS students on their first online PBL experience.

Methods:-
Preparation and training
Students from all academic years were first gradually introduced to online PBL sessions. This included year 1 students, year 2 Medicine, 3 Medicine, and year 2 Dentistry students who all undergo their basic medical sciences phase at the Faculty of BMS. First, all students were remotely taught and guided using video tutorials prepared by members of the Faculty to familiarize the students with the rules and provide students with any required technical aid. After that, workshops were organized to prepare the tutors responsible for running the actual online PBL sessions. The majority of these workshops were done virtually although some were organized in person following very strict social distancing rules. After all tutors were familiarized with the online PBL strategy, academic

supervisors then organized virtual meetings with their students to ensure all students are comfortable with the new plan.

Questionnaire, data collection and data analysis
Each online PBL session ran for two hours and was arranged independently for each year group. Students were asked to participate in a binary questionnaire immediately after their scheduled session. Students had access to the questionnaire questions for a few hours after the end of the PBL session to make sure the feedback truly reflects their experience. Participation in this study was voluntary and anonymous. The questionnaire contained six statements regarding the participant's first online PBL experience (Appendix A). The survey statements were chosen based on meetings between the academic staff of the Faculty to cover all aspects of the online PBL experience. Data collected was saved in a Microsoft Excel spreadsheet and SPSS-23 was used for data analysis. A P value of less than 0.05 was considered statistically significant. The results were described in terms of percentages to overcome limitations regarding sample size of different academic years. The study was performed after obtaining ethical approval from the Scientific Research Deanship of the Libyan International Medical University.

Results:-
Out of the 437 BMS students, about 67% (293 students) completed the questionnaire. This number includes students from all year groups. The majority of students that participated in this questionnaire were first year students, as these accounted for 45% of the overall responses (Figure 1). There were similar proportions of students from other year groups, contributing to an average of 18% of the total responses (Figure 1).
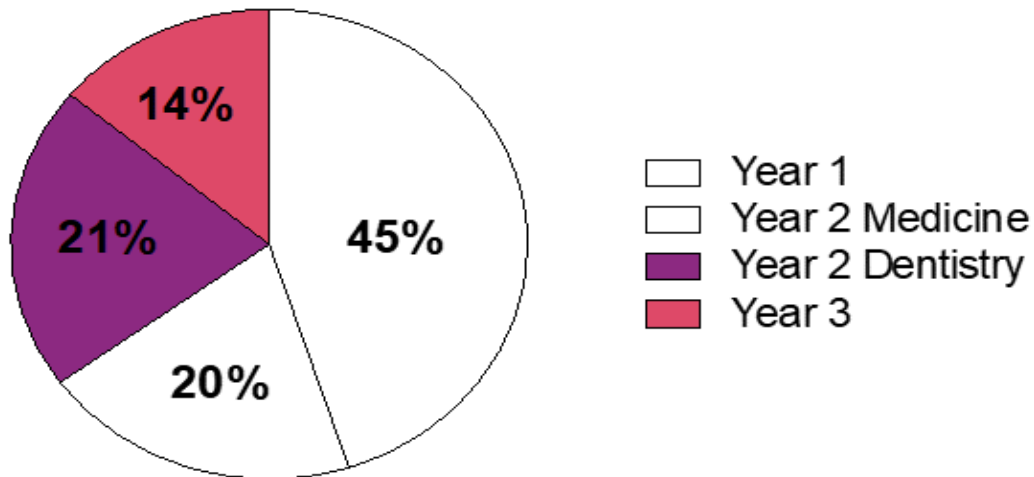

Figure 1. Student distribution.

Overall, 76% of the questionnaire responses reflected satisfaction with the online PBL experience (i.e., responding 'agree' to the questionnaire elements). The highest proportion of satisfaction responses was obtained when students were asked about the ease of online application (convenient application). On the other hand, the organisation of the online PBL session scored the lowest considering the overall response of all participants (Figure 2). The overall response for each questionnaire element is summarised in Figure 2.
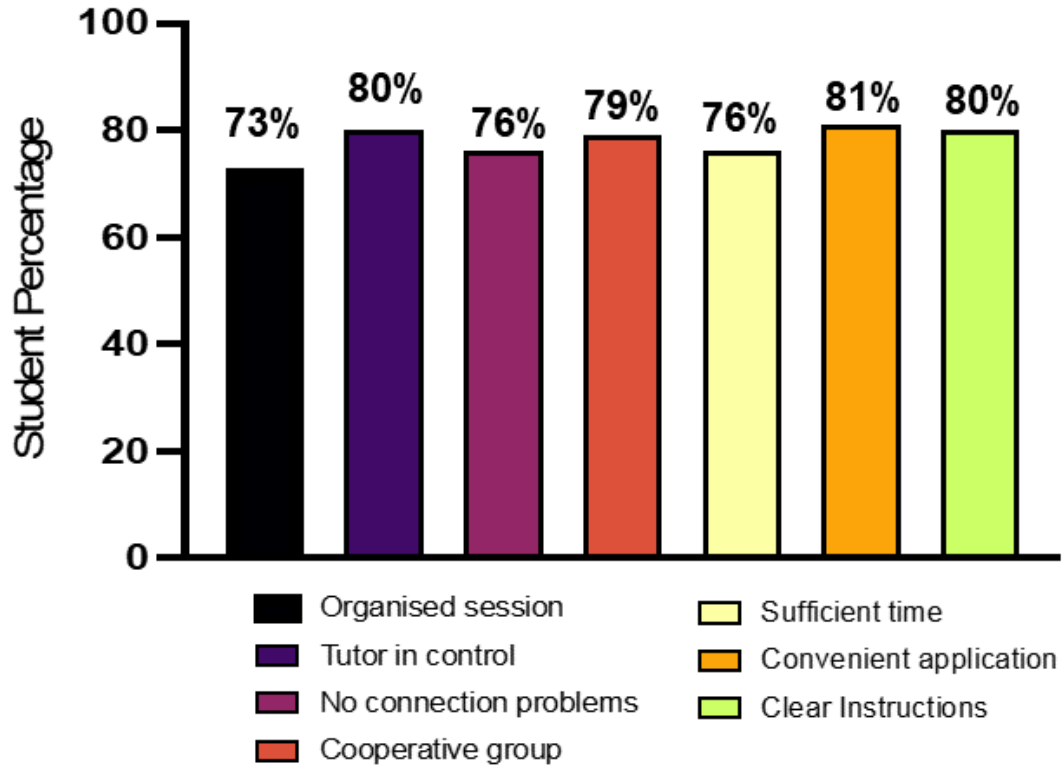
Figure 2. Percentage of overall positive response for each questionnaire element.

Additionally, first year students exhibited the highest proportion of overall positive responses (mean=91%) as compared to the other academic years (mean=87%, 69%, 79% for year 2 Medicine, Year 2 Dentistry and Year 3 Medicine respectively). Also, responses for the different questionnaire elements were consistent among the Year 1 cohort. These exhibited considerable variation among the other different year groups including the organisation of the online PBL session, successful management of the session by the tutor (Figure 3). On the other hand, the clarity of instructions reported a consistent high satisfaction response from all four year groups (mean=89%, SD=3.4).
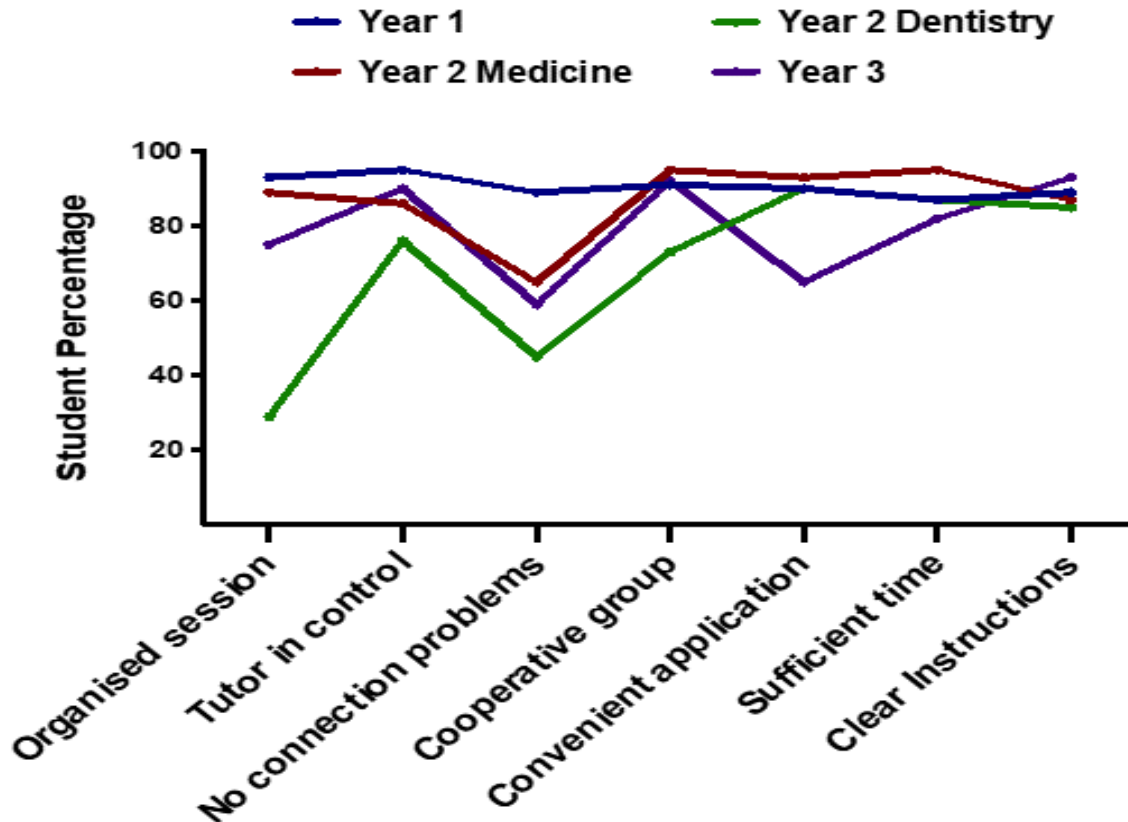
Figure 3. Percentage of positive response for each questionnaire element for each academic year surveyed.

Discussion:-

The lockdown resulting from the COVID-19 pandemic has urged universities around the world to shift to online teaching. The Libyan International Medical University (LIMU) was the first Libyan educational institution to adopt an online teaching strategy during the pandemic period. Because students have their PBL sessions as a crucial element of their studies at Faculty of Basic Medical Sciences (BMS), online PBL strategy was gradually introduced and integrated into the online teaching strategy during the COVID-19 pandemic. Here, we assessed the effectiveness of online PBL sessions as a first trial at BMS. Our questionnaire responses show that overall, students have had a positive experience with online PBL sessions. Although this does not entirely replace traditional PBL as some transferable skills acquired through direct contact will be eliminated, yet our results show that this online experience has offered students an effective solution during the COVID-19 pandemic.

There are various benefits of online PBL. For example, it offers flexibility in some logistical difficulties, such as travel time. This ensures that students are engaged in academic activities regardless of factors such as geographical location [12]. Additionally, in this online PBL trial, students were offered the opportunity to enhance their IT skills e.g., use of Google Drive. This adds an important benefit to our students particularly as the use of such IT technology is still compromised in the region. Also, because this trial was introduced during a time of considerable psychological and financial stress resulting from the lockdown, online PBL sessions promoted an enthusiastic environment because students and tutors were able to actively interact and discuss thoughts and knowledge which decreased the social isolation impact during the lockdown period.

On the other hand, one of the main difficulties facing online education are technological problems and internet connectivity [13]. In this questionnaire, sufficient internet connection scored among the lower overall satisfaction responses (76%). Similar results were reported in Erickson et al.[12] where students were unhappy with the audio and

video quality at some parts of the online session due to poor internet connection. However, 76% is still a relatively high proportion of students and there seems to be considerable variation in the response for this aspect of the questionnaire among the different year groups (Figure 3). This variation can be explained by the technical solutions developed by the Faculty throughout the period of the trial. For example, students were provided with a phone number to report any issues with the internet in which case the PBL session would be rescheduled for the student in question. Similarly, alternative tutors were available in addition to the main tutor so that they are able to run the session if the main tutor is unable to join.

Furthermore, this online PBL trial used Google Hangouts as a live chat online application as it offers several features including slide share, which enables students to share illustrative media during PBL sessions, and a chat box for live text messages. The majority of our participants (81%) were generally satisfied with the use of Google Hangouts application for their online PBL trial (Figure 2). This is consistent with the results from a similar study which showed that 70% agreed that the session objectives were met when discussion took place using Google Hangouts [11]. In addition, this study revealed that the majority of students agreed that the length of PBL sessions was sufficient. This is partly because we allowed access to the PBL problem scenarios about 15 minutes prior to the start of the session which allowed more time for students to read and prepare for the online session. This was first offered to first year students as these tend to struggle with the English language the most but was then extended to all years because more time is thought to be needed for online PBL as compared to traditional PBL sessions [12].

Additionally, training of the academic staff to monitor online classes was advised by various health and educational organizations [14]. Therefore, as part of our preparation strategy, the faculty of BMS carried out a series of preparation workshops prior to the start of the online program. This was done to guarantee that tutors are able to control the sessions and ensure that the objectives are achieved. Other workshops aimed to introduce Google Hangouts. Similarly, the students were provided with multiple video tutorials to provide them with the support needed, familiarize them with the technologies and encourage active participation during the session. Our efforts in preparing our staff and students for the online sessions were effective as reflected by the high score obtained for clarity of information (Figure 2).

Conclusions:-
This online PBL trial at the Faculty of Basic Medical Sciences shows that, overall, online PBL provides an effective strategy as a replacement for traditional PBL during crises. The introductions and training sessions offered at the beginning helped familiarize students with this online learning system in general. This is reflected by the consistent high percentage of students satisfied with clarity of information (Figure 3).

The poor and unstable internet connection seems to be the main obstacle facing the application of online PBL sessions and online education in Libya, as the availability of suitable internet connection is key to online education. Also, the unfamiliar nature of online education in general is another limitation as such strategies are not normally encouraged in the Libyan society. However, this fear of online education was a lot less of a burden during the coronavirus pandemic as compared to our experience during the civil war for example. In fact, students were very supportive of the idea to shift to online education which is because of the worldwide shift to online education.

Traditional face-to-face PBL remains the ideal situation as it is crucial in the development of interpersonal and communication skills. In this study there was no question comparing online and traditional PBL and therefore direct inferences cannot be made. Interestingly, when Hashim et al. asked students whether online PBL was as effective as face-to-face PBL, only 11% of participants agreed. However, this study was performed before the coronavirus crisis where traditional PBL was also a viable option and therefore this does not necessarily apply to our students as the only possible option available for PBL was a virtual PBL strategy. Because the faculty of BMS is keen to maintain PBL sessions as a key aspect of the teaching strategy, this trial was extended to cover the entire lockdown period. Additionally, online PBL would indeed be considered in case of another lockdown or other unforeseen crisis. However, further studies are needed to assess the effectiveness of online PBL in the long term on the end of year results as compared to previous years.

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