Brief communication

Evaluation of web-based distance education of medicine for undergraduates in Sri Lanka

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Abstract

Introduction Purpose: To evaluate distance education via the web facilitates teaching through problem-based learning and incorporating scientific evidence in the context of practical application to medical undergraduates.

Methods: Web-based distance teaching program based on the Zoom video conferencing software was developed and introduced into a selected group of medical students. Current knowledge about handling web-based resources, evaluation of learning activities, and self-evaluation of their involvement and participation of medical students were evaluated.

Results: The provision of lectures and relevant notes through the internet was emphasized during this study. A satisfactory response was observed regarding obtaining factual knowledge. This method was considered relatively ineffective with relevance to the application of knowledge, development of clinical skills, and improvement of professional attitudes. Students believed that it helped to improve the ability of critical thinking, refine reasoning skills, and enhance the capacity of mediating subject matter. Students had a general idea regarding using this method as a supplementary education strategy. The majority of the participants demonstrated considerable satisfaction towards this method, and most of them were prepared to recommend this method for another person. The students had disclosed that lectures showed significantly higher skills while teaching through this method, especially they believed that this distant learning method provided an additional benefit for face to face clinical teaching procedures.

Conclusion: When generally considered, a satisfactory response was received regarding the learning outcomes of using this method, and the quality of participation of students was extremely positive.

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Introduction

Distance education is defined as 'education taking place whenever the teacher and learner are separated by distance or technology'. The World Wide Web was limited to professional circles until an impressive breakthrough in technology allowed it to be used by everyone for their occupations and their social life. The web gives the user a platform to learn, communicate, trade, and engage in leisure activities[1].

A significant drawback encountered is the inability to incorporate methods and principals of traditional classroom teaching into web-based distance education owing to the vastly different environment available for interaction. In comparison to paper-based platforms, the web is superior in distance learning and as a delivery platform[2-4].

However, paper-based methods are more accessible, ubiquitous, and convenient than methods used in web-based learning. If the web is simply used as a study guide, the benefits of its intensive cross-referencing capability, creative exploration, and analytical learning are overlooked[5-7]. Distance teaching is now experimenting on the proper use of an established distance learning system[8-11].

Distance education via the web facilitates teaching through problem-based learning and incorporating scientific evidence in the context of practical application, which will be advantageous, especially to a medical undergraduate[5]. The facilitator encourages self-directed learning involving the learner as an active participant and developing an in-depth approach to learning[6]. Web-based learning performs a vital role in improving the knowledge and education of a student in ways of revising, improving, and updating. The time and pursue of expected educational necessities will be governed by the student in their best interest[7-10].

Even though evidence suggests web-based learning can be effective as traditional education, it is rarely offered by academia[11]. Power Point presentations, Word documents, or PDF files, graphics, and picture files, which are computer-assisted learning materials, are used as mediums of web-based learning. These resources are uploaded to the web to achieve the required educational objective.

The introduction of several communication platforms such as Skype, Zoom, FaceTime, and the availability of advanced camera systems in these devices have enabled teachers to conduct lectures utilizing web-based learning tools. From the more mediocre whiteboard lecture to more advanced Power Point and video presentations, these devices have revolutionized Teacher-student interactions. Among the advantages of such methods are time effectiveness, flexible learning hours, and the availability of interactive teaching and learning tools. Essentially required knowledge of information and communication technology and the lack of interpersonal interactions are some of the drawbacks of such teaching tools[12,13].

The facilitators of the faculty should adopt the role of distance teaching and web-based learning to have an impact on the medical education through this learning system, and motivation should be given to teachers by including this aspect of teaching in their evaluation. The cooperation of students should also be addressed in this new educational paradigm[14,15].

In Sri Lankan undergraduate setting, the use of web-based methods for teaching and learning in clinical years was highly opportunistic and informal. To the best of our knowledge, it has never been a part of a formal clinical curriculum. The Covid-19 pandemic, however, brought an unprecedented challenge of continuing clinical education for medical undergraduates while upholding its critical principles of interactivity, collaboration, feedback, and community of practice. The adoption of e-strategies, especially using Web tools, was a steep learning curve for both clinical teachers and students. In a period with a lot of uncertainties, tensions, and change of workload, they also had to adapt to a virtual learning environment. This study aims to explore the experience of students' perception of such web-based learning tools and to utilize their expertise to improve the implementation of a web-based educational program to final year undergraduates.

Method

Due to the pandemic of Covid-19 and the policy of social distancing, it became an essential requirement to organize web-based educational activities to continue medical education during this period. The medical faculties of Sri Lanka are also in the process of evolving and deviating from mediocre classroom-based teaching to build up such web-based educational activities.

Academics of the Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka, after lengthy discussions, have developed the web-based

distance teaching program based on the Zoom video conferencing software. As this was a new experience for both teachers and students, we aimed to gather their perspective and experience of distance teaching activities by sending them a feedback form that is available in the format of "Google Form". We designed two types of styles for teachers and students. The students' form, which is the consideration of this study, had three main domains, namely their current knowledge about handling web-based resources, evaluation of learning activities, and self-evaluation of their involvement and participation.

The questionnaires/ Google forms for evaluation data consisted of a five-point Likert scale and each item was rated as follows:
1 = Never/Poor; 2 = Seldom/Mediocre; 3 = Sometimes/ Good; 4 = Often/Very good and 5= Always/Excellent.

A prospective cross-sectional descriptive study has been conducted in professorial units of Medicine, Surgery, Obstetrics, and Gynaecology, Paediatrics, and Psychiatry of Colombo South Teaching Hospital, Kalubowila. All undergraduates in the above-mentioned disciplines attached to Professorial Units, Colombo South Teaching Hospital, Kalubowila, undergoing their professorial final year training in the 2020 period who have participated enrolled for the study (n=136).

Nearly 30 students for each discipline, making a total of 150 students qualify for the professorial appoint-ments annually.

All data entered was saved on Google Docs and converted to SPSS version 21 for analysis. Statistical Package of Social Science (SPSS version 25.0) was used to analyze the obtained data.

Results

A female predominance was noted among the study participants. The male to female ratio is 1:2, and it is representative of the gender distribution of the student population under study (Figure 1).
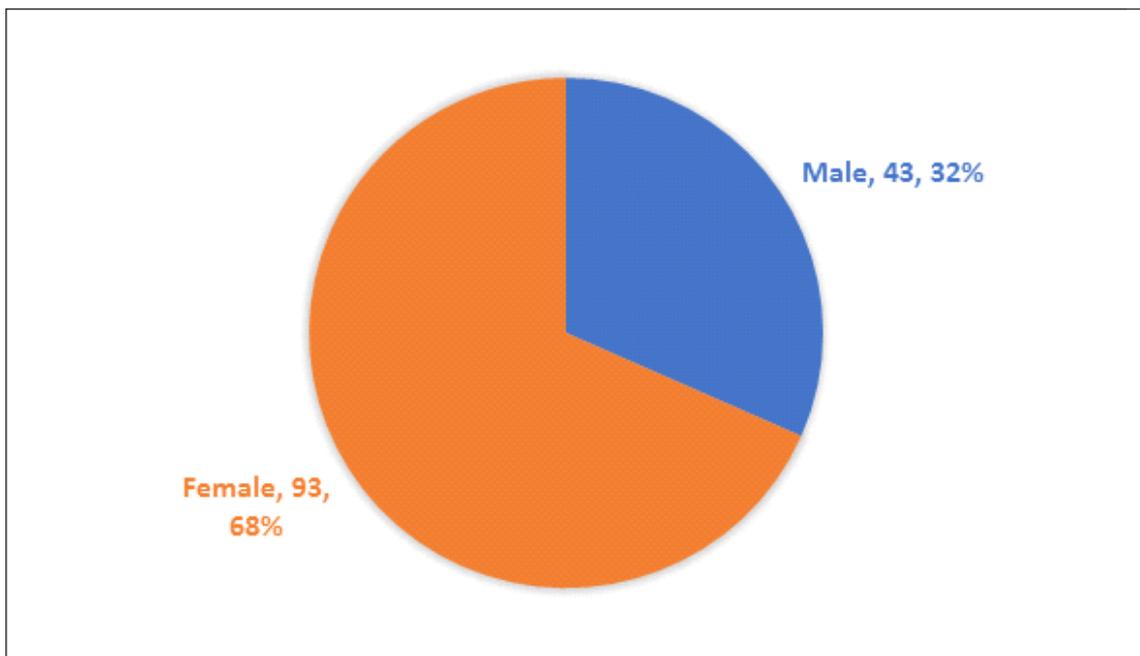

Figure 1. **Gender distribution of study participants.**

Web-based learning experience

The IT skills of students were average. Their familiarity with collaborative activities, e.g., participating in live lectures and interactive videos, was low compared to individual actions, e.g., internet browsing using emails (Table 1).

Table 1. Participants' skill and competence in IT and related activities

Statement	Mean	SD (Males)	Mean (Females)	Mean	p
Skills on using the computer/tab/phone	3.55	.88	3.61	3.52	.56
Skills on internet browsing	3.57	.87	3.69	3.52	.31
Familiarity with email	3.50	.92	3.61	3.44	.30
Familiarity with interactive videos	3.25	.92	3.42	3.17	.14
Familiarity with downloading files from the internet	3.49	.88	3.69	3.40	.08
Familiarity with web-based live sessions, e.g. Zoom	3.18	.95	3.26	3.15	.54

Students have perceived that the structuring and organization, as well as the content of lectures, were average (Table 2).

Table 2. Participants' views on the web-based learning program

Statement	Mean	SD
The duration of the lectures	3.52	1.03
Scheduling of the lectures	3.35	1.02
The time you had to study during the web-based course	3.36	0.94
Contents of the lectures	3.55	1.03
Structure and organization of the course	3.45	1.10
The technical support received for web-based learning	3.11	1.04
The contents of each web-based lectures were clear	3.93	.64

Students have been reasonably positive about the achievement of their personal learning goals through web-based learning (Table 3).

Table 3. Perceived achievement personal learning goals of students through web-based learning

Statement	Mean	SD
I was clear about the learning outcomes	3.80	.85
I was able to achieve learning outcomes at the end of those sessions	3.75	.87
I am satisfied with the quality of my participation	3.80	.84
I learned a lot from these sessions	3.92	.90
I was able to control the pace of learning	3.72	.93
I am satisfied with my overall participation in this course	3.77	.88

Students believed that the current web-based learning program has helped them learning theoretical facts and the application of them in a clinical context. However, the program has not helped develop higher-order thinking skills, such as critical thinking. The current web-based program is considerably inferior in developing their clinical skills and professional attitudes (Table 4).

Table 4. The effectiveness of web-based teaching and learning activities in achieving the outcomes

Statement	Mean	SD
Learning factual knowledge	3.61	1.03
Application of knowledge	2.97	1.13
Critical thinking / reasoning skills	3.20	.97
Developing clinical skills	2.19	1.01
Accessing information resources	3.44	1.01
Written/verbal communications Skills	3.17	1.02
Developing professional attitudes	2.95	1.08

Students have developed a positive attitude, and they have reacted favorably towards web-based after experiencing the current program. They prefer to engage in similar online learning activities as a supplementary educational strategy even after the commencement of face-to-face sessions (Table 5).

Table 5. Participants' attitude and reaction towards using web-based activities for clinical education based on their experience

Statement	Mean	SD
Attitudes		
It is unlikely that I will engage in it after this period	2.64	1.01
I would strongly recommend it to my colleagues	3.83	.91
It would be a supplementary educational strategy for my face-to-face clinical teaching	3.78	.98
It is an utter waste of time	1.65	.80
Web-based education is not for me	1.90	.91
I consider that web-based learning programs are efficient for medical undergraduates	3.63	.99
Reaction		
I very much like to learn more about it	3.71	.98
I found the web-based learning experience satisfying	3.90	.76
I found the web-based learning tools/ software satisfying	3.78	.76
I found the web-based learning experience easy	3.77	.80
The lecturers' overall performance	4.01	.75
The overall experience of web-based learning	3.6	.78

General knowledge and understanding were denoted by the study participants regarding the internet, email, and other communication methods and skills. The provision of lectures and relevant notes through the internet was emphasized during this study. During this, a limited period was allocated for demonstrations and practical tests. Lectures were concerned, special attention was paid regarding the duration of the talks, having scheduled talks, contents of the lectures, and the manner of organizing them. The majority of the study participants had provided a general response regarding these aspects.

When the outcome of the research model used for this study was considered, a satisfactory response was observed regarding obtaining factual knowledge. But according to the students who participated in this study, this method was considered relatively ineffective with relevance to the application of knowledge, development of clinical skills, and improvement of professional attitudes. However, students who participated in the study believed that it helped to improve the ability of critical thinking, refine reasoning skills, and enhance the capacity of mediating subject matter.

Students who participated in this study believed that this distant learning method should be used even after resolving the current pandemic situation. Also, students had a general idea regarding using this method as a supplementary education strategy. A minimum number of students had identified this method as a time-wasting practice. The majority of the participants demonstrated significant satisfaction towards this method, and most of them were prepared to recommend this method for another person.

The majority of the students who participated in the study had identified it as a clear and satisfactory learning experience, and they have stated that used software and other teaching and learning tools were extremely convenient. Also, the students had disclosed that lectures demonstrated significantly higher skills while teaching through this method, especially they believed that this distant learning method provided an additional benefit for face to face clinical teaching procedures. When generally considered, a satisfactory response was received regarding the learning outcomes of using this method, and the quality of participation of students was extremely positive. Also, many believed that it is more suitable to develop web-based learning programs that are suitable for a broad range of participants. Also, recommendations from students had emerged regarding further use of improved distant learning methods for medical education.

Discussion

The key findings of this evaluation are: a basic web-based educational design can be used effectively to impart some aspects of undergraduate clinical education. Although students are digital natives they may not have been exposed to a collaborative and interactive platform at least for educational purposes; a web-based design may be restricted to address only the knowledge-related outcomes, but not the practical and attitude associated issues; a web-based clinical education program help achieve personal learning goals, maybe more than the traditional group-based clinical education, i.e., the web-based approach may be more useful for providing personalized learning; the engagement of students in web-based learning programs help develop favorable reaction and positive attitude towards web-based learning approaches and their attitudes.

Bernado et al. have described that the overall outcome of the web-based courses is productive and successful. During the present study, and[16] had confirmed that effectiveness could be further increased when online materials and familiarity is improved. When conducting a web-based course, it is possible to achieve the opportunities available at traditional classroom set up to enhance the skills and knowledge of the students[17,18] self-confidence of the students are improved during web-based learning methods[19]. Therefore, it is possible to establish that there are vast implications of web-based teaching procedures.

Concepts and theories relevant to education are included in a subject stream that changes day by day. They are observed to be altered from time to time and from a specific area to another. Also, it is perceived that there could be many alterations of teaching and learning methods relevant to particular subject streams in different fields. On the other hand, depending on the intelligence level of each individual, teaching methods and capacity to accept knowledge could demonstrate a considerable variance. However, education specialist faces significant challenges while preparing educational plans for an erudite community. One is the universal and infinite nature of knowledge. On the other hand, limited dimensions are available for learning.

When both these factors are combined and balanced together, it is possible to achieve a more productive

educational outcome. With rapidly developing technology around the world, many tend to divert towards distant learning methods. With the rapid advancement of the whole world into a global village, knowledge is dispersed so swiftly among people, even overruling the geographical limitations and knowledge barriers. Methods to transmit maximum knowledge to the maximum number of people within a minimum period were popularized around the world. It was observed that it is practically possible to achieve maximum productivity by minimum utilization of time and other physical resources relevant to education.

It is possible to observe that special attention is focused on distant learning methods with relevance to most of the places around the world[20]. The main identified reason for this trend could be the possibility of preserving time and physical resources through this method. However, the tragic situation created by the COVID-19 pandemic around the world, sheer need for distant learning methods, was indeed emphasized by the specialists of many subject streams. By the video conferencing method used during this study, it was possible to create the basic structure to develop a model to proceed with medical education. During this, it was possible to experience its practical situation, and analysis was obtained from both students and lectures. The essential aspects of this method include the possibility to avoid public gatherings and close contacts while saving a lot of time. Apart from that, the chance to learn within a more comfortable environment opens the opportunity to absorb and memorize subject matter better than at other circumstances.

Burtrend Russel had disclosed that it is possible to create a more successful memory by providing an opportunity to learn within a supportive and friendly environment. Traditional education procedures conducted inside a room may not be familiar to all the students who participate. During this procedure, this situation is completely avoided, and on the other hand, there is a golden opportunity to record these study materials by using electronic devices. Recording helps to overcome the challenging procedure of taking lecture notes while listening to the lectures. Collecting lecture notes while listening to the speech is a different skill that should be mastered separately, and gaining this ability differs from an individual to another. Distant learning method simply provides a solution to these challenges which occur due to individual weaknesses, and it generates an opportunity to obtain a broader

knowledge and understanding regarding the subject matter by listening using adequate time.

It allows understanding a specific subject stream with less effort and less period rather than understanding through analysis of subject notes extracted from many books relevant to a particular topic. The video model, which was used for this study included the opportunity to raise any question as an option. The most important feature was there was an opportunity to request a chance to speak while avoiding any disturbance to the educational session for required clarifications[21].

This allows solving every person's questions and problems without disturbing others, which is not generally experienced within a traditional classroom setting. Even to a person who analyses subject matter more keenly, this preserved time can be used for any mental relaxation activity such as a hobby. Indirectly this is an opportunity to improve one's knowledge and skills. But this method also has many drawbacks, such as the inability to develop clinical skills and professional attitudes. Also, it appears less practical with subject orientated procedures that require hand skills. Specifically created laboratory or any other suitable environments are still essential for such practical activities. Also, some essential practical components of assessments such as clinical case base discussions with real time patients, objective structured clinical examinations (OSCEs) find difficult to conduct by e-platforms alone. But study findings distinctly demonstrate that this method can be more practically and effectively used to achieve a satisfactory educational environment during a pandemic situation we experience at present or during any other disaster while avoiding possible risks to students. Although it is possible to generate a bias by including medical students only to the study sample, it is observed that an opportunity is made to apply current study findings to proceed with medical education.

Conclusions

A web-based learning program, which is designed with necessary teaching/learning activities and delivered by a group of clinicians with limited skills and experience in eLearning can be useful in developing certain critical aspects of clinical education among medical students. The investment of time and effort of developing such a program is affordable for clinician academics amidst their busy schedules. Web-based clinical education

programs facilitate personalized learning and the development of positive attitudes towards e-learning, which is a mandatory professional skill of continuing medical education in the current context. The developers should be mindful of addressing a broader scope of outcomes and structuring the program to improve its educational impact.

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Author declaration

Conflicts of interest: No conflicts of interest.

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