

A Technology Enabled Learning Model in Healthcare during COVID-19

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Abstract: The World Health Organization has warned about the spread of communicable and non-communicable diseases especially in the developing countries. The COVID-19 has also emerged as one of the most challengeable pandemics of the whole world. In current medical emergency, the virtual health education is much vital for handling alerts and outbreaks of diseases for a community of users. The Information and Communication Technology provide an opportunity to deal with the challenges related to handling alerts and outbreaks of diseases. The technology infrastructure in the developing countries is surging rise and can be used to develop Technology Enabled Learning Solutions for the basic health issues. This paper presents a technology model for virtual education of the masses during the recent era of pandemic diseases like COVID-19. The paper focuses on the health issues both in the developed and the developing countries. It also examines the technology options available for basic health education. Based on the literature review, opinion of health professionals and survey results on ICT accessibility, this paper presents a model of virtual online education on basic health issues for a rural community of users. A pragmatic approach (from literature) has been employed with constructivism theory in order to build the model. We have restricted our study to the geographical location of District Swat, Khyber Pakhtunkhwa and suggested sampling level of basic health education to address the research problems. A prototype with basic health education modules was also developed to demonstrate and test the model. The feedback has been found encouraging to develop a complete basic health education portal.

Keywords: ICT; technology in basic health; virtual learning

1 Introduction

Information and Communication Technology (ICT) is changing the landscape of societies as its use is increasing in every field of life [1]. The ICT infrastructure is pacing up at a very fast rate in both developed and developing countries [2]. This infrastructure includes mobile intensity, Internet access and availability of computer systems. The major chunk of ICT is based on Internet technologies which are disseminating huge amount of information to the masses especially in the developing countries [3]. The digital transformation is one of the top agendas of these growing societies. It is the assimilation of digitization into different areas of



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education, business and health [4]. It is also the transformation of basic health with the blend of technology where society delivers services to the customers at their doorstep. The services of education [5] and health [6] are the most important due to their influence on the society. Although technology is providing many opportunities yet there are challenges of providing seamless health and education services [7]. One of the challenges is the Development of Virtual Learning Systems for Health and Education during COVID-19 pandemics scenario.

The COVID-19 has resulted in closure of the educational institutions. More than 1.2 billion students are out of classrooms [8]. It has resulted in change of the educational mode from traditional class based learning to virtual education or e-learning. There are different approaches of virtual education like Computer Based Training (CBT), Online Learning and Technology Enhanced Learning (TEL) [9]. TEL refers to the technological support for learning activities. It overcomes the difficulties of distance between students and teachers and provides robust technology-based learning environment [10]. It also provides the source of communication and delivery mechanisms to support the process of learning. It utilizes ICT for the support of synchronous and asynchronous learnings. The synchronous systems are real time systems in which teachers and students are present at the same time. Asynchronous is offline communication between the stake holders in the form of digital content and presentation communication through email and forums, etc. [11]. This potential of technology can be used to develop health tutoring systems.

According to World Health Organization (WHO), basic health is also called primary health which covers common disease prevention, control, and treatment. Popular basic health problems are often the making of unhygienic activities including drinking contaminated and unclean water, food or weather shifts, widespread ignorance of disease awareness and (cause) knowledge [12]. The level of BH knowledge, however, varies in different countries as health initiatives and lifestyles (different in developed and developing countries), differ in health policies, commitments and financial support for each nation [13]. This is a very important practical strategy, especially given the low government expenditure on the health sector and the lack of facilities in local BH units throughout the country. A broad range of publicly accessible information may enable society and people to join hands with each other in preventing/combating outcomes rather than hoping that anything can be done by government. Here, researchers focus on ICT education infrastructure which schools (and the public) can use to access virtual education, health knowledge and common communicable diseases.

The COVID-19 has posed many challenges and has also opened up an opportunity to educate the out of school children and their families about the communicable diseases, i.e., diarrhea, cholera, typhoid fever, acute respiratory infection, hepatitis, skin diseases and COVID-19 at the same time [14-16]. In case of rural areas, the health facilities are less developed as compared to urban localities due to non-availability of health professionals, high cost of medical experts and geographical distances. Therefore, the potential of ICT may be utilized to develop technology driven health mentoring system, especially in rural area of a developing country like Pakistan. Keeping in view these challenges and opportunities, the emphasis of this research study is to propose a Technology Based Virtual Education Model for Basic Health that is referred to hereafter as the proposed VEBH Model. The rest of the paper is organized as: Basic health is detailed in Section 2. Usage of technologies in basic health education is described in Section 3. Preparation for building the VEBH model and algorithm for VEBH model workflow are briefed in Section 4. Implementation is also given in Section 5. Conclusions are provided in Section 6. References also are given in the last.

2 Basic Health

According to WHO [17], basic health deals with the fundamental conditions of the whole body for welfare of the society. It is the minimum information that each individual should acquire to stay vigorous and safe in a community they belong to. It includes control, prevention and care of the diseases, physical and psychological welfare. WHO also categorizes basic health problems into “communicable diseases”

and “non-communicable diseases” [18]. Non-communicable diseases are not transferable from the infected persons whereas communicable diseases are transferable. The COVID-19 is an infectious disease and highly communicable [19]. Due to wide spread of diseases, WHO stresses on improving person or community health and declaring health education important and safe for rural and urban populations [20]. The requirement of health education is influenced by life styles, local health infrastructure, economic conditions and relevant policies and procedures. These parameters vary in different countries, therefore, the identification of health issues in developed and developing countries [21] are important before proposing any technology-based health education model and achieve a Sustainable Development Goal (SDG) [22].

2.1 Basic Health Issues in Developed Countries

Hypertension, mental wellbeing, cancer, diabetes, HIV/AIDS, respiratory infection, tuberculosis, overweight and obesity are the most prevalent diseases with a higher ratio in the United States [23]. Likewise, these diseases are widespread in European countries as well [24]. Similarly, in France, tuberculosis, suspected malaria, hypertension, diabetes, overweight/obesity, suspected HIV/AIDS, insomnia, sore throat and aches are most wide spread [25]. Similarly, hypertension, overweight/obesity, tobacco, suspected HIV/AIDS, malnutrition/physical inactivity and cancers have been identified in Chile [26]. Asthma, hypertension, diabetes, depression/mental health, overweight/obesity, osteoarthritis/carpal tunnel syndrome and high cholesterol are found excessive in Australia [27]. Peptic ulcer disease, hypertension, diabetes, overweight/obesity, suspected HIV/AIDS and osteoarthritis/carpal tunnel syndrome were Germany’s most frequent diseases [28]. Likewise, the England Health Profile [29] identified lower respiratory infections, liver cancers, kidney diseases, hypertension, diabetes, drug/substance abuse, overweight/obesity, tobacco, alleged HIV/AIDS, malnutrition/physical inactivity and cancers. The COVID-19 has badly affected the societies of developed countries as its spread is exponential in USA and in majority of the European countries.

2.2 Basic Health Issues in SAARC Countries

The main reconstruction problems, Afghanistan’s healthcare system consists of lack of stability and infrastructure, financial deprivation, weak coordination among authorities and fitness care providers, challenging access to healthcare facilities, unsuitable hospital conditions and few qualified people in healthcare [30]. According to Ali [31] and El-Saharty et al. [32], Bangladesh is facing double disease burden due to large population diversity. Similarly, they further described that the most prevalent communicable diseases are hepatitis, HIV/AIDS, suspected malaria, measles and rubella etc. Diabetes, cardiovascular diseases, hypertension, stroke and cancer are also non-communicable diseases in Bhutan [33]. The most common health issues include diarrhea, intestinal worms, respiratory infection, suspected malaria, skin infections, eye infection, hypertension and malnutrition. In this country too, chronic kidney disease, heart disease, diabetes and tuberculosis are high [34]. According to Dhara et al. [35] in India, the most prevalent diseases are diarrheal diseases, respiratory infections, tuberculosis, heart disease, suspected malaria, dengue fever, malnutrition, oral diseases, kidney disease, HIV/AIDS diabetes, cancers and tumors [36]. According to WHO, the most common diseases of Maldives are acute respiratory infection, diarrhea, conjunctivitis, suspected malaria, HIV/AIDS, tuberculosis, measles and dengue fever. There have also been health illnesses, hypertension, diabetes and liver diseases [37]. The most common health problems in Nepal are respiratory infections, tuberculosis, diarrhea, measles, heart diseases, diabetes, tetanus and autoimmune disorders [38]. In Sri Lanka, the most common diseases are diarrhea, respiratory infection, dengue fever, HIV/AIDS, tuberculosis, flu, heart disease, diabetes, kidney disease and cancer [39,40]. The COVID-19 has also spread in the SAARC countries. The first confirmed case was found in Nepal in a man who came back from Wuhan China. The other countries are also badly affected by the pandemic and there is a continuous rise of infections during the second wave of COVID-19. Millions of

people have suffered from the pandemic and more to come. There is a dire need to educate the people especially in the rural areas of these countries.

2.3 Basic Health Issues in Pakistan

In Pakistan; diarrhea, acute respiratory infections (ARI), influenza, tuberculosis, etc. are communicable diseases and diabetes, obesity, cardiovascular disorders, malignancies, etc. are referred to as non-communicable diseases [41,42]. According to Khadim [43], more than 60 million residents have no penny to address basic health issues in Pakistan. Pakistan has the worst state for basic health problems which are rising day by day due to unhygienic food and drinking water. The most common basic health problems in Pakistan are communicable diseases and some minor non-communicable diseases [44,45].

According to Khan et al. [45], the most frequent cases in a rural area of Swat are acute respiratory infections, gastrointestinal diseases, hepatitis and typhoid fever. The study reported that hepatitis, diarrhea, typhoid fever and skin infection diseases are high in occurrence due to unhygienic and polluted drinking water. According to District Health Officer Swat (2020), ARI (lower and upper), acute diarrhea, bloody diarrhea, typhoid fever, worm infestations, acute viral hepatitis, suspected malaria, suspected measles, unexplained fever, scabies/skin infection, tuberculosis and COVID-19 are the most common disease found on males and females. The second wave arrival of COVID-19 has been announced by the government. The daily cases of infections and deaths are rising and Government has imposed restrictions on the public gatherings. Basic health information and awareness were also established at high school level [45] for basic health-related problems and their solution. If the local adults and teenage students (and families) are well informed regarding knowledge and warnings about infectious illness, precautionary steps could be taken by communities and societies and major accidents could be avoided.

3 Usage of Technology in Basic Health Education

The trend of using technology is increasing to meet the challenges of various fields including the basic health education. The COVID-19 has opened up the ways of educating the masses at their homes. The technology is providing many possibilities for the delivery of health knowledge, i.e., preparation of health tutorials, health information portals, telemedicine systems and health websites.

3.1 Mobile Phones

Mobile phone is one of the most commonly available devices for communication because of its high intensity and growth rate throughout the world [46]. The device can effectively be used to deliver health information and knowledge in urban and rural areas across the globe [47]. The smart phones are the newer version of mobile devices which are capable to interact with multimedia applications, web browsing and act as minicomputer systems. Smart phones are common in every part of the world including the developed and the developing countries. Valle [48] studied the effectiveness of smart phone for medical education in a clinical environment. The positive impact was found dominant as compared to negative impression and its more vibrant use was recommended in health education. Latif [49] studied the effectiveness of smart phone in medical teaching and ranked the device as a powerful tool for medical education. Mobile applications for health education are available for iPhone and Android devices. Some of the applications focus on explaining the internal structure of human and animals and simulating the parts and functions of living organisms [50]. There are other applications which educate the patients about some pandemic diseases.

3.2 Multimedia

Multimedia is the collection of media objects like text, animations, audio and video. Multimedia instruction objects can be used in healthcare for training and education purposes. Multimedia course

wares were developed for medical teaching [51]. The feedback of students was positive and encouraging. In another study, the effectiveness of multimedia tweets was investigated. The re-tweets were found more informative and influential among the targeted users [52]. They also recognized the learning capability of multimedia objects. The significance of e-learning objects was studied [53] on the basis of ten years feedback in Korean medical colleges. It was revealed that multimedia resources may be strengthened for education and training. During COVID-19, the perspective of distance learning was investigated for medical education. The overall satisfaction rate was found high with the use of multimedia objects and e-learning tools [54]. One more study recommended that shortage of healthcare professionals and time barriers could be overcome by providing multimedia education to diabetic patients [55].

3.3 Personal Digital Assistants

Personal Digital Assistants are small computers that act as hand held PCs. Mostly, they were used in classrooms for listening audios/videos in addition to face to face lectures. They were also used by medical students for submitting questions and assignments. The literature has also reported the use of PDA for patient record management and decision making for the treatment [56]. However, with the advent of technology, the PDAs have been replaced by the smart phones.

3.4 Social Media

Social Media is the knowledge sharing platform for the dissemination of information. It is used to share the thoughts, interests and other ideas of expressions via social media applications. There are different social media platforms available like social networking sites, blogs, wikis etc. One of the most famous and commonly is Facebook which is used by every age group and different schools of thought. Its popularity makes it useful for the delivery of health education. The literature has reported extensive use of social media in medical and health fields [57]. It can effectively be used to promote public health education and professional development of doctors and para-medical staff [58]. It has been found useful for hospitals and health education [59]. A study during pandemic revealed that Twitter can be used to communicate important health tips and events for health education [60].

3.5 Simulations

Simulation is an artificial environment of a system or process that portrays to operate on real parameters. The potential of simulation can be used in health care and medical education. It has proven helpful to take experience of a real environment by going thorough medical treatment, working in Intensive Care Unit (ICU) and handling emergency situations at hospitals and homes. It has been found valuable for training of doctors and para-medical staff [61]. The development of simulations is expensive, therefore, it is not suitable for basic health education as compared to other available technologies.

3.6 Web based Tutorials

Web commonly known as World Wide Web (WWW) is the collection of pages connected via hyperlink. Web based tutorials are accessible through the Internet and are widely used in health education. A web-based course on patients was developed for medical students. It was found useful in distance learning paradigm [62]. In another effort, the interactive web-based lectures for health education have been developed. It is a collaborative effort of health professionals and experts of library sciences [63] and are found useful for health education. One study investigated that the perception of school mentors for developing a web-based tutorial regarding mental health education. The feedback recommended adaptive rich contents for such a sensitive system [64]. One more study demonstrated the development of self-paced materials and case studies to teach the epilepsy issues during the pandemic [65]. WWW has been found as one of the most effective and cheap mediums to teach on the health issues and proposed remedies.

3.7 *Complex Adaptive and Expert Systems*

Complex Adaptive Systems (CAS) are agent handlers with interactive and adaptive features. They perceive the environment and learn from the experience. CAS has been used in health care sector for scaling up the health facilities. The isolated healthcare incidents have been evaluated by using CAS. These incidents are related to organizational development and the management of health workers [66].

Expert systems are another dimension of specialized applications that use Artificial Intelligence for the decision making. Public health expert systems analyze health data and generate expert advice for health decision making [67]. Public health expert systems are much relevant to interpret the data on surveillance diseases and to disseminate awareness and information to avoid any outbreak. But, the expert information and knowledge system for public health is still a question mark especially in current scenario of medical emergency during COVID-19 pandemic.

Many avenues of technology are available for health education. They include health portals and electronic health records, telemedicine services, tele-ICU services and health information networks which help improve and promote health by assisting us to detect, diagnose, prevent, monitor and treat diseases and manage our lifestyle through improving our wellness and quality of life.

4 Preparation for Building the VEBH Model

Following the literature review related to health and technology, survey results and our previous work done [68–70] and extension of OLIVE e-learning framework [71], the following approach was laid down to propose the model:

- The model of virtual education will be available for access over a public Internet or mobile data network.
- The users will be any personally supported student, teacher, doctor or public educationist.
- The model is to be implemented using open source tools.

This is an exercise on designing a level of knowledge. However, it wasn't full-blown medical and technical information to students, but handy and simple knowledge. It should be in a plain language and easy to understand, but cover other common aspects of the disease(s) included in the knowledgebase.

We used pragmatic approach with constructive theory for development of VEBH Model [72]. The realistic approach focuses on real-life situations, rather than logically inclined. In a pragmatic approach [73] in its presentation sense, the problems or issues are identified and a series of research inquiries are undertaken and decisions are made on the real situations as they can be encountered in different phases of the problem. A case study of real-life scenarios is discussed in this research, and a model has been proposed in the first scenario, we restricted our study to the geographical location (Swat District: A rural area in Pakistan) and suggested sampling level of education (High School) to study the research difficulties and the background problems of different aspects [68–70].

4.1 *Virtual Education for Basic Health (VEBH)*

We defined the final model here and the components thereof. The proposed VEBH Model was discussed in numerous conferences with healthcare and educational professionals [67–69]. The model was updated as shown in Fig. 1 as extracted from the literature review of virtual education and basic health issues [64], addressing their recommendation and comments for the proposed model.

4.1.1 *VEBH Application*

VEBH is a knowledgebase system which uses basic health data and information in the VEBH Model for inputs and extraction. It shows the details and knowledge of basic health conditions, advanced health

diseases, national diseases, seasonal diseases and pandemic like COVID-19. Analysis is dependent on users and disease data that are linked to an expert system module. It is interconnected via portal for processing, editing, updating, and collecting data and information for learning and analyzing to generate areas of warning and outbreak, if any.

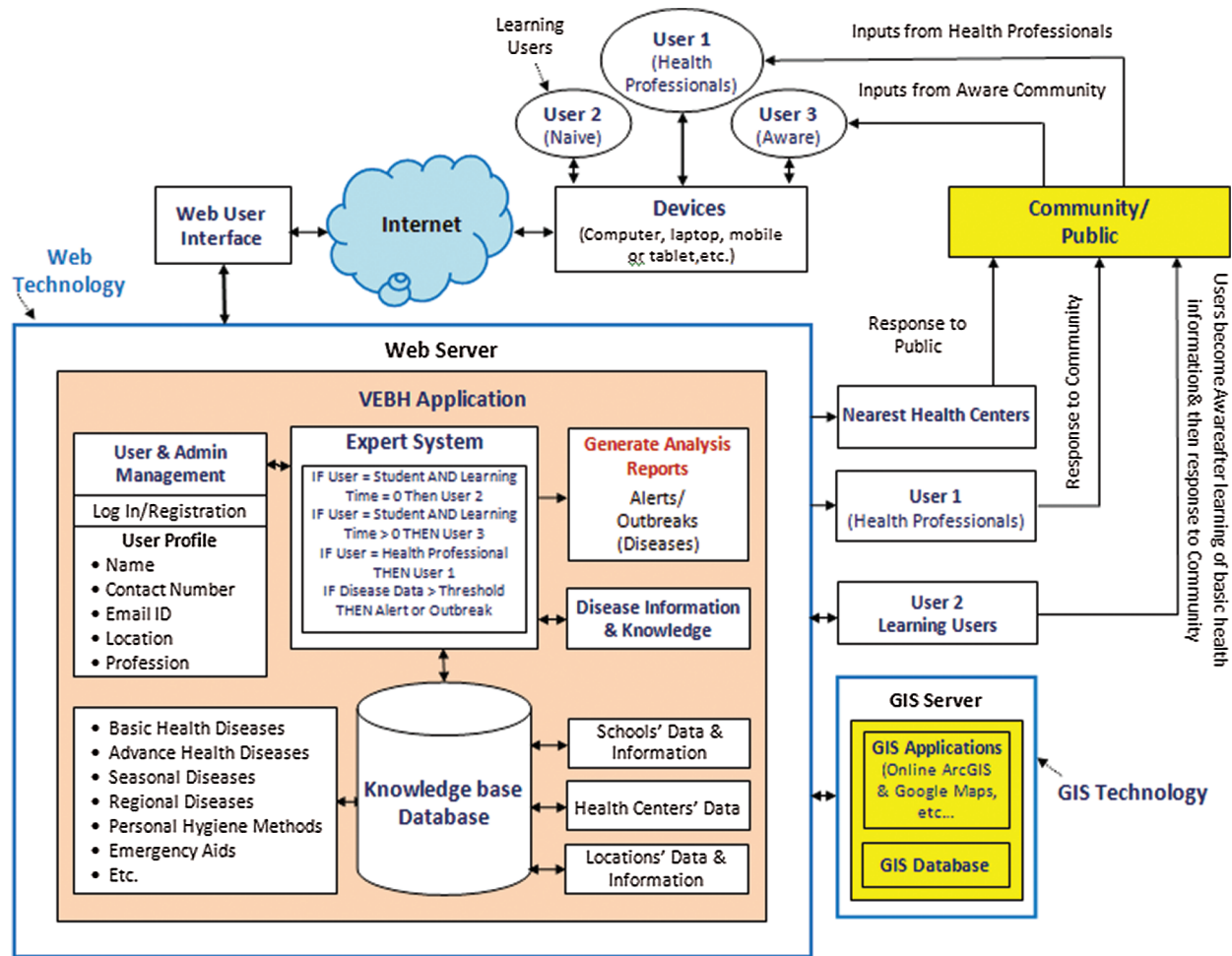


Figure 1: VEBH model and its components

4.1.2 User and Admin Management

Our proposed knowledgebase model has a new user registration module and an existing user login. It manages data profiles of users for their identity which consists of user name, contact number, email ID, occupation, location and image.

4.1.3 Users

Users mean end-users of the knowledgebase VEBH application that are being used in the VEBH Model. There are three types of users in the model (user 1, user 2, and user 3). User 1 consists of health professionals who provide inputs to the VEBH according to the information and experience of their areas, seasons and frequently occurring diseases. User 2 consists of naive users (students) who are unfamiliar with the information and knowledge about basic health conditions. They use the knowledgebase application of VEBH to learn the information and knowledge about basic health illnesses. User 3 consists of

knowledgeable users (students) and comes from user 2 who has become aware of the information and knowledge about basic health diseases.

4.1.4 Devices

Users can access our proposed VEBH knowledgebase application for basic health learning and inputs using any kind of electronic device. Use of a computer, laptop or smart phone, etc., are not limited. VEBH application is a compatible application of any electronic device.

4.1.5 Internet

It is an integral part of the functioning of the knowledgebase of VEBH and its interlinked components within the VEBH model. Our proposed model is based on the Internet to provide teaching to remote learners in a hard-rural area.

4.1.6 Web Technology

Our proposed VEBH knowledgebase application uses web technologies such as HTML, XML, CSS, PHP, JavaScript, MYSQL, HTTP and numerous multimedia sources such as text, audio, video, and hybrid.

4.1.7 Web Server

The VEBH information-based framework was hosted on a web server in our proposed VEBH model. A web server is a computer program that stores, processes and transmits web applications as requested by users. To request VEBH knowledgebase application from a web server, use a domain name in a web browser.

4.1.8 Web User Interface

It is a graphical user interconnection bridge between users and web servers through which users demand knowledgebase application from VEBH. Users can navigate the VEBH knowledgebase program by using Google Chrome, Mozilla, or Internet Explorer.

4.1.9 Web-based Expert System

The VEBH model has some features of an expert system for addressing multiple complex community health issues. A web-based expert system uses decision-making and problem-solving strategies. It is also linked with GIS technology to extract and analyze data and information about the location of users and the regional diseases. It is also connected with a knowledgebase for data, information collection and extraction. It gathers relevant information from the database and then analyzes it with group entries. If an alert or outbreak occurs, then the program sends notifications to health practitioners and the nearest health centers for their response to the alarm/outbreak to populations.

4.1.10 Knowledgebase

This is the main database which consists of information and knowledge about health diseases. It also contains data and information from schools and health centers. Similarly, GIS types such as location data (coordinates) from schools, health centers, users and diseases are also stored in this database. It also has information on basic health illnesses, advanced health illnesses, regional illnesses, seasonal diseases, personal hygiene practices, first aids etc. It can be edited, removed, and updated as needed.

4.1.11 General Reports

The expert system is capable to analyze the data and produce the reports. It is composed of alerts and outbreaks of any disease that has occurred within the population. These reports are forwarded to the affected community, the nearest health centers and health professionals for disease-based response.

4.1.12 GIS Technology

The GIS technology works to classify and evaluate the locations. The GIS technology uses Google maps to store, record, search, and view related school and health facility location data. The warning created to any disease

will be displayed on the map to make it easily accessible for health professionals and health centers. GIS applications such as Online ESRI ArcGIS and Google maps are used inside the repository under GIS technology.

4.2 Algorithm for VEBH Model Workflow

The proposed VEBH model workflow algorithm is shown in Fig. 2. Step 1 initializes all variables that were included for VEBH model startup. It initializes the naïve students, knowledgeable students, health professionals, nearest health centers, high schools, basic health problems, and communities. In step 2, the students at schools begin learning and gain knowledge of basic health information. Users start VEBH model in step 3, this may be for learning or input purposes. Similarly, step 4 judges the users for health professionals who provide their inputs on information about diseases that are stored in knowledgebase. Step 5 decides the users for naïve students who begin learning the information and knowledge about basic health diseases. If the naïve students (user 2) learn, they become conscious students (user 3). The trained students will increase in step 6 and they will replicate at home or in their community. The educated students would, in future, become a stable society. These users can offer their inputs in their group regarding diseases that have occurred, as shown in step 7. When the naive students know (user 2), they become attentive students (user 3). In step 6, the educated students should increase and repeat at home or in their group. In the future, the educated students will become a prosperous society. As shown in step 7, these users may give their feedback in their community about the illnesses that have occurred. In step 8, the VEBH system generates alerts with respect to trained students' inputs and send to health professionals and nearest health centers for quick response to relevant community. Step 9 determines the new users (i.e., naive students) and start step 5 again for continues process.

```

START VEBH:
Step 1: Initialize Users:
        Naive Student as NST,
        Aware Student as AST,
        Health Professional as HP,
        Nearest Health Center as NHC,
        Public Community as PC,
        Basic Health Diseases' Information as BHI,
        High School as HS
Step 2: Start BHI at HS           //high school start learning of BH information
Step 3: User Start VEBH         //Initialization of VEBH
Step 4: IF User = HP Then
        HP Start Inputs of BHI //Inputs of basic health diseases' information

Step 5: IF User = Student AND Learning Time = 0 Then NST
        NST Start Learning of BHI //naive student will start learning
        IF NST learned BHI Then
                AST = NST           //naive student will become aware student
        End IF
Step 6: IF User = Student AND Learning Time >0 Then AST
        AST = AST +1 //aware students will increase
        PC ← AST //aware students will replicate in public community

Step 7: AST Start Inputs of Health Issues to VEBH
        CALCULATE Health Issues //analyze health issues

Step 8: IF Same Area ← Health Issues //Health Issues belong to one area
        AND Health Issues > Threshold Then //More than one case in same area & time
        Forward Health Issues to HP
        Forward Health Issues to NHC

        HP Respond to PC
        NHC Respond to PC
        END IF

Step 9: IF NST = New Then
        Go to Step 5 //End until new students

END IF
END VEBH:

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Figure 2: Algorithm for VEBH model

5 Implementation

The VEBH model's front interface consists of several sub-modules such as learning of community diseases, Google maps, school information, information on health modules, methods of personal hygiene information, seasonal diseases substantial links and videos, survey (MCQs), VEBH and My account.

An initial prototype has been developed using PHP with MySQL at the backend. It includes basic health education learning modules, a calendar and a search box as shown in Fig. 3. Initial knowledgebase was developed for COVID-19, upper Respiratory tract infection, lower respiratory tract infection, hepatitis, typhoid fever, diarrhea, skin infection and suspected malaria.

VEBH: Virtual Education For Basic Health
Knowledge & Information about Basic Health

HOME COMMUNITY DISEASES LEARNING معاشرتی امراض سیکھنا GOOGLE MAPS جات گوگل نقشہ جات

SCHOOLS INFORMATION اسکول معلومات HEALTH UNITS INFORMATION صحت مرکز کی معلومات

PERSONAL HYGIENE METHODS حفظان صحت کے ذاتی طریقے SEASONAL DISEASES موسمی امراض

IMPORTANT LINKS & VIDEOS ABOUT VEBH SURVEY MY ACCOUNT

Prevention is better than Cure احتیاط علاج سے بہتر ہے

Coronavirus Disease (COVID-19) کورونا وائرس بیماری

December 2020						
M	T	W	T	F	S	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Community Diseases Information and Knowledge Learning معاشرتی امراض سے متعلق معلومات اور علم سیکھنا

Lists and Google Maps of Government Facilities سرکاری سہولیات کی فہرستیں اور گوگل نقشہ جات

Basic Health Diseases Learning بنیادی صحت سے متعلق امراض سیکھنا

Government High Schools (Male and Female) List سرکاری اسکولوں (مرد اور عورت) کے فہرست

Advance Health Diseases Learning ایڈوانس صحت سے متعلق امراض سیکھنا

Google Map of Government High Schools سرکاری اسکولوں کے گوگل نقشہ

Different Diseases' Alerts and Outbreaks Formula مختلف امراض کے انتباہات اور وباء کا فارمولا

Government Health Centers' Facilities List سرکاری صحت مراکز سہولیات کے فہرست

Questions about basic health diseases صحت کی بنیادی بیماریوں کے بارے میں سوالات

Google Map of Government Health Centers' Facilities سرکاری صحت مراکز سہولیات کے گوگل نقشہ

Personal Hygiene Methods حفظان صحت کے ذاتی طریقے

Cleanliness is half the faith صفائی نصف ایمان ہے

Survey Questionnaire (Multiple Choice Questions) سروے سوالنامہ (ایک سے زیادہ چوائس سوالات سے)

Figure 3: VEBH Prototype (Homepage)

The prototype was presented to the students and health professionals of a rural community. Their feedback was encouraging for the development of a complete health informatics and educational portal [69].

6 Conclusions

A TEL based health education system has been proposed in this study. A literature survey was conducted to evaluate the basic health issues and the technological opportunities available. The available technology options were evaluated in the context of rural area of a developing country like Pakistan. The technology infrastructure and accessibility of Internet and mobile phones were evaluated to determine the strength and intensity of ICT. The health professionals were interviewed to highlight the basic health issues, their symptoms and remedy to deal with the challenges. The remedies were compiled to develop health tutorials for basic health education. A knowledge-base of health was prepared keeping in view the literature and opinion of health professionals.

As found in the feedback survey, the basic ICT infrastructure, i.e. computers, Internet and smart devices were available with the targeted sample. Therefore, as in the current scenario, the virtual model is much needed, especially experienced due to the recent Corona virus (COVID-19) pandemic. The virtual education model has been described as an integral model of support. As part of this research study, the model was later designed and built. It was confirmed by the health practitioners and educational experts. We used the pragmatic approach/systematic creation of knowledgebase software implementation under waterfall method. We developed a standardized model for Virtual Education, Basic Health and then the two were merged into the Virtual Education for Basic Health (VEBH). Considering the public ICT infrastructure and Internet/mobile devices, it is an effective standardized knowledgebase model for health education and information access. It was piloted for a rural area and can be extended in other localities. The model covers various aspects of basic health issues such as common inputs of information, alarms, causes, symptoms, preventive cares, primary cares, potential cures, referral to medical professionals, location of nearest health units and reports (alerts and outbreaks). It contains meta-database of information about basic health disorders, schools, and basic health units. It can be accessed from anywhere, from any Internet access device like; computer, laptop, and/or smart phone etc., at any time. Similarly, the knowledgebase includes information about common diseases in the basic health section. The VEBH model also includes an expert framework for three levels, of users. The user 1, i.e., health professional gives information about diseases. The user 2, i.e., naïve learner can access the tutorials for their learning. Finally, the user 3, the knowledgeable students can also use the system (within the community). If they find symptoms of any pandemic disease, they feed into the system. The health professionals evaluate all the inputs stored in the knowledgebase and decide on further action, i.e., generate alert/outbreak notification information within the group and forward it to nearest health centers and health professionals. In future, it may be expanded to other disease affected areas and clusters.

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