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Blended Learning Models In Skill Education For Community Health Workers

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Abstract
Blended learning as an instructional approach also involves the combination of synchronous online units with physical classroom experiences and is a versatile, effective approach to training a community health worker (CHW) who may work in a geographically distant or rural area. The strategy aims at promoting the development of more effective acquisition, retention and use of basic health-related skills through the combination of electronic access and interactive, hands-on learning. A randomised controlled trial (RCT) recruited 100 CHWs who were deployed to blended learning or conventional training, respectively. The blended group was subjected to a six-week program whereby the face-to-face sessions were contrasted with online modules. Slackers used pre- and post-test surveys, qualitative interviews, and assessments, and the results were measured using knowledge, retention of skills, and their ability to apply them in practice. The findings were emphasised by paired t-tests and thematic analysis. The blended learning students reflected justified improvement, the communication with patients improved by 25%, up to 85%, the competency in disease prevention improved by 25%, up to 80%, and the adherence to basic healthcare practices improved by 20%, up to 90%. The retention of skills reduced slightly over time, but the biggest drops were in communication with patients and disease prevention. Blended learning has been effective in enhancing the level of healthcare skills amongst CHWs, with certain skill maintenance.

Keywords: *Blended learning, community health workers, healthcare training, skill acquisition, rural settings*

Introduction

The community health workers (CHWs) are very critical in making healthcare available to underserved communities (Singh et al., 2021). The exposure to formal professional development programs has an adverse impact on the skills at the disposal of community health workers (CHWs) (Mastellos et al. 2018). A new approach in this respect is blended learning, which is a combination of e-learning platforms and face-to-face communication, as this will be a scalable, flexible, and cost-efficient option (Bizami et al. 2023). According to empirical research findings, such a model has the potential to increase the knowledge base and expertise of healthcare staff, especially in rural areas, significantly (Dunleavy et al. 2019). Moreover, the blended learning eliminates geographical and time pressures because CHWs can receive the learning content whenever they need it. It also promotes interactive and problem-based instructional pedagogy in face-to-face sessions, which can resolve the possible shortcomings of a traditional face-to-face workshop (Cherupelly et al. 2025). The need for qualified agents it is also necessary to introduce innovative models of teaching, like blended learning, into the educational process, to reinforce training programmes of CHWs and, hence, improve their performance in respective communities (Frenk et al., 2022).

Blended learning is a learning method that combines the best features of traditional face-to-face learning and digital media, thus coming up with a consistent delivery model that has been empirically associated with better learning outcomes.(Islam et al., 2022). Among CHWs, this hybrid design allows self-guided learning of the course material, which is not required during established workshops, thus mitigating the effects of logistical and travel-related factors (Lawn et al., 2017). The digital aspect ignites the incorporation of multimedia (videos, simulations, interactive quiz games, etc.), which enhances the understanding of and retention of the complex health matters (Liu et al., 2016). In addition, blended learning will promote continuous professional growth, which is necessary among practitioners who are entrusted with the need to keep up with the changing health policies and practices

(Devi et al., 2017). The evidence also confirms that blended learning does not only enhance the level of theoretical knowledge but also increases the transfer of knowledge to practical settings (Megahed & Hassan, 2022), which makes this specific especially appropriate for CHWs as they have to strike a balance between theoretical expertise and practical proficiency in delivery of services (Atwa et al., 2022).

Effective CHWs revolve around the development of skills. The effective preparation should equip them with the ability to communicate, disease-prevention measures, basic healthcare procedures, and the ability to resolve arising issues in the field of public health (McCutcheon et al., 2018). Although traditional teaching models are useful, they do not meet the needs of a heterogeneous set of learners (CHWs) in particularly in low-resource training settings. Nevertheless, blended learning models allow an individual curriculum according to the realities of CHWs to be used, which covers both theoretical aspects and practice (Kang & Kim, 2021). Greater interaction and better retention are also linked to personalised instruction, and these two factors are central components of empowering CHWs to face the increased complexity of care needs they will encounter, especially in rural and underserved regions (Zhan et al., 2017).

The aim of the study is to determine the effectiveness of blended learning as a mechanism to foster the acquisition, retention and application of the skills related to the healthcare process by community health workers. The secondary aim would be to examine swings and opportunities discovered in the realisation of blended learning, such as the topic of demand and appropriateness, availability, and cultural flexibility within different geographical backgrounds.

Materials and Methods

Study Design

An RCT study was used in the study to test the effectiveness of blended learning in community health workers (CHWs). The research participants were randomly assigned to the corresponding two parallel groups: one of the groups was subjected to the blended learning program, and the other one was exposed to the traditional training. Relatively speaking, the distribution of the participants between the two groups was undertaken to facilitate homogeneity of demographic and professional features of participants. The research examined how the blended learning model affected the development of a skill, retention, and its use over a period. Measurement of outcomes was done by assessing results before and after training, and an effective measure of the outcomes of the training was also done through survey administration.

Participants

The population included the rural CHWs who had a minimum of six months of professional experience. Those who formerly had a structured training experience in the field of healthcare were not allowed. The required sample size to reveal some considerable disparities among the various conditions of the experiment was determined with the help of the power analysis. They were recruited through local health centres, and all participants were recruited by providing informed consent, in writing.

Blended Learning Intervention

The intervention approach was a blended learning that was made up of synchronous online and real-life activities. Individual modules were online instructional videos, interactive details, and practice quizzes that were offered through a special learning environment. Face-to-face sessions consisted of practical training, role-plays and discussion to reinforce other online topics. The duration of the program was six weeks. Participants read online materials about three hours per week and had face-to-face sessions two times per week for two hours. The blended design was created to enhance the theoretical knowledge and develop the practical competence and engagement improvement.

Data Collection Methods

Knowledge and skill-related empirical data were acquired by using pre- and post-training tests. These tests included multiple items that were answered using a choice response and short answer questions. Other information was collected through surveys of the participants and questionnaires that evaluated learning experience, satisfaction and perceived applicability. A related subgroup of the participants was surveyed via in-

depth interviews to obtain qualitative answers relating to the blended learning experience. Face-to-face sessions involved observational notes, in case of monitoring the engagement and interaction within the learning environment.

Outcome Measures

Measured improvement in knowledge and skills was the major outcome variable, which was assessed by pre- and post-training knowledge and skills assessments. These secondary outcomes were preservation of skills in three and six months after training, and putting the skills into practice in clinical situations. The satisfaction of the participants was measured through surveys that aimed at determining the efficiency of the blended learning model and the possibility of using it in everyday work activities. All of these results were then used to assess the success of the intervention on the whole.

Data Analysis

To determine changes in the level of knowledge and skills, paired t-tests were used to analyse the data obtained according to the pre- and post-assessment criteria. Thematic analysis of qualitative interviews and free responses of the survey was conducted to identify the frequent themes and observations concerning the blended learning experience. In quantitative data, directional tests were carried out by use of SPSS software at the achievement level of $p<0.05$. Incomplete information was filled in to reduce the bias. The study aimed at clarifying the difference in results of a blended-learning cohort and traditional-training cohort, and accordingly present the decision-makers with fascinating data pertaining to the effectiveness of the interventions offered.

Ethical Considerations

The institutional review board granted ethical approval of the study to the preceding activities to start the study so that it is conducted ethically. The participants signed the written informed consent form, and they were promised to be treated confidentiality and informed that participation was voluntary. To ensure data and privacy protection, information was anonymised; the regulation of data protection was respected. The participants had the right to withdraw from the study without consequence.

Results

Descriptive Statistics of the Sample

The study focused on a group of community health workers (n=100), and their demographic characteristics are outlined in Table 1. Gender favor was revealed in the research, where 58 % of the respondents were women, and 42 % were male. The age distribution revealed that 50 % were aged 25-35 years, 30% were aged 36-45 years, and 20% were aged 46-55 years. Speaking of the aspect of professional experience, 25 % of the respondents had 1-3 years, 45 % had 3-5 years, and 30 % had over 5 years of working experience in the field.

Table 1. Demographic Characteristics of Participants

Characteristic	Frequency (%)
Gender	
Female	58%
Male	42%
Age Range	
25-35 years	50%
36-45 years	30%
46-55 years	20%
Experience	
1-3 years	25%
3-5 years	45%
5+ years	30%
Region	
Rural	75%
Urban	25%

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Pre- and Post-Training Knowledge and Skill Scores

There were knowledge and Skill pre- and post-training assessments, which proved significant improvement in all domains as shown in Table 2. The results in patient communication changed by 25% as the mean score rose by 25% from the pre-training criteria score of 60% to the post-training score of 85 % as shown in Table 2. Knowledge with regard to disease prevention also increased to 25% (55-80 %). There was an increase of 20% in basic healthcare practices, which moved from 70% to 90%.

Table 2. Pre- and Post-Training Knowledge and Skill Scores

Skill Area	Pre-Training Mean Score	Post-Training Mean Score	Improvement (%)
Patient Communication	60%	85%	+25%
Disease Prevention	55%	80%	+25%
Basic Healthcare Practices	70%	90%	+20%

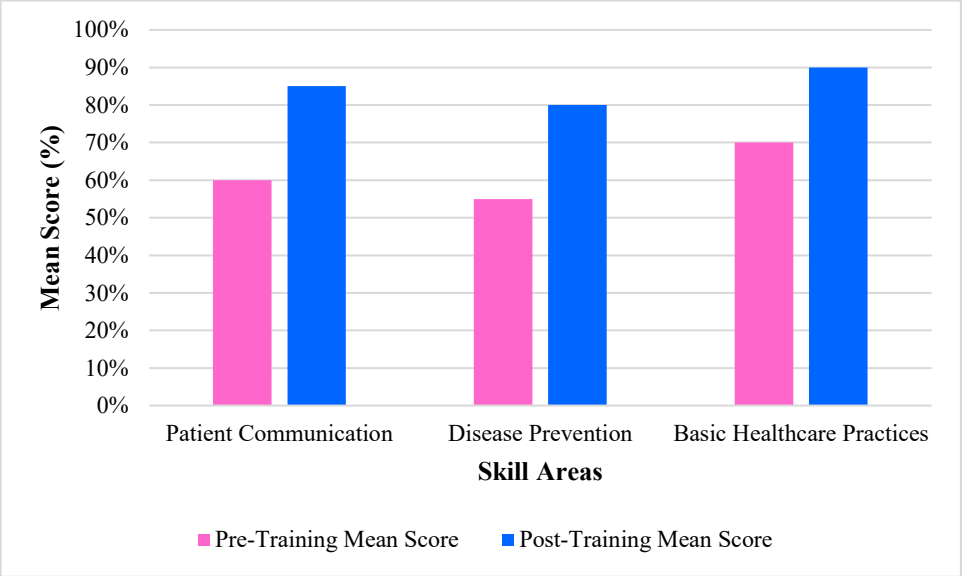

Figure 1. Comparison of Pre- and Post-Training Skill Scores

This was reflected in the post- and pre-test assessment results on enhancing the competencies of the participants. Patient communication had increased by 25%, where the mean score went up to 85%, as compared to 60% before the intervention, as shown in Figure 1. The same increase (+ 25%) can be found, as far as disease prevention is concerned, where their means of success went up to 80% after training, compared to 55% before the training. The largest improvement has been in the category of basic healthcare practices, with an increase of 20% in the final result, taking the initial scores to 90%. The current research compiles evidence that blended learning systems can be used to enhance knowledge and technical skills, which are part of the effectiveness of community health work.

Skill Retention at Three- and Six-Month Post-Training

The retention of the skills learned in the long term was also examined by the testing at the third and sixth months following the training program, as shown in Table 3. There was a quantitative decrease in patient-communication score as the score dropped by 2 percentile points in the three months and even further to 80 percentile in the six months. Similarly, the protection of the disease with retention dropped by 2 percentage points between three and six months, 80% to 78%, but the most stable practice was basic healthcare, followed by a drop of 5 percentage points to 85% in six months. Altogether, the results indicate that the blended learning model facilitates strong skill maintenance and retention, with an attenuation effect.

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Table 3. Skill Retention at Three and Six Months Post-Training

Skill Area	Post-Training Score	3-Month Retention (%)	6-Month Retention (%)
Patient Communication	85%	83%	80%
Disease Prevention	80%	78%	75%
Basic Healthcare Practices	90%	88%	85%

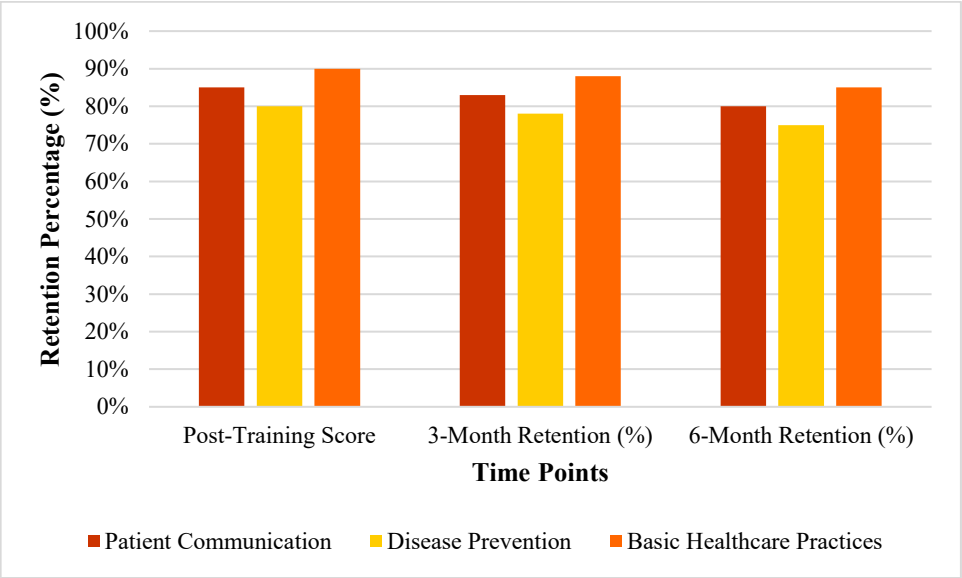

Figure 2. Skill Retention at Three and Six Months Post-Training

The retention of the post-training skill was assessed after the third and sixth months. Data indicated a slight fall in the attainment of knowledge during the duration. As an illustration, the competence of patient communication dropped to 83% and 80% after three and six months, following an initial course of 85% as shown in Figure 2. The results of disease prevention exhibited the same trend, with 80% of reduction immediately after training, followed by 78% and 75% at three and six months, respectively. The basic healthcare practices have shown the most consistent retention before reducing to 90% immediately after training and 88% three months, and 85% six months later.

Discussion

In this study, the results show that adapting blended learning helped to significantly enhance the knowledge and skills of the community health workers (CHWs), which is palpably represented in Tables 2 and 3. There was an improvement in patient communication by 25 %, which fluctuated in range between 60% to 85%, with the disease-prevention knowledge also changing by 25%, or 55% to 80%. Further, the current practice of basic healthcare was upgraded by 20 %, by increasing the practice to 90% compared to 70% initially. Taken together, these facts support the effectiveness of the blended-learning strategy in the development of the theoretical background and practical experience. Online modules coupled with in-person sessions resulted in a thorough learning experience and enabled the long-term retention of the participants. However, Table 3 shows a rather small decrease in the level of skill retention with time and patient-communication and disease-prevention skills decreasing by 5 % and 2 % three and six months after the training. The same patterns are found in other studies of blended learning with regard to retention.

The study has identified blended learning as an innovative tool that can be used to improve skills amongst the CHWs and particularly in marginal locations (Tang & Chaw, 2016). The model offers flexibility, increased engagement and scalability by deploying best modalities in online environments and in-person delivery (Smith et al., 2017). Scholarly reports explain that when incorporated to teach community health workers (CHWs), blended learning is essential to the provision of quality and cheaper education. The results showed that there had been substantial increases in knowledge and competencies of CHWs that support earlier literature on

blended learning ability to promote engagement and participant retention (Munro et al., 2018). These statistics also speak in favour of equipping CHWs with digital tools and the enhancement of digital literacy of CHWs, which would be important determinants of success in blended learning conditions, especially where resources are limited (Minhas et al., 2021). It is on this basis that long-term digital infrastructure investment is an absolute requirement to get the most out of blended learning in rural and underserved areas, to ensure equity and continued access to learning materials and resources (Bordoloi et al., 2021).

The outcomes of the study concur with the results of the past research on the impact of blended learning. Castro (2019) remarked that such theoretical knowledge and practical skills in the area of work, reducing the 25 % of patient communication and disease-prevention competence, which are noted in the present work. Similarly, Serrano et al. (2019) cited similar retention problems, manifested in the 5% and 2% decline of the patient-communication and disease-prevention competencies, which were reported in this study. It is also observed that the absence of reinforcement strategies decreased retention in the blended settings (Medina, 2018). Though retention is a challenge, the results demonstrate the importance of blended learning as a skill-building tool, which means that long-term competence could be encouraged through frequent reinforcement (Alamri et al., 2021).

This study presents several limitations that must be addressed in future research. To begin with, the perceived decrease in skills retention after three and six months implies that the blended-learning model does not help greatly preserve learned skills as time goes by. This challenge could be overcome by additional learning, i.e. refreshing the participants or keeping them in continuous learning. Second, the number of participants (n = 100) is quite small, which limits the generalizability of results. Increased and more variable groups would provide a more in-depth knowledge of how the model works across different groups of people. Moreover, the study failed to analyse the use of the acquired competencies in the span of employment. Future studies ought to measure the effectiveness of blended-learning interventions in the real world, hopefully expanding to CHWs who will apply to geographically and culturally diverse settings to clarify the efficacy of specific contexts.

In future studies, more emphasis ought to be placed on approaches that enhance the retention of the skills gained during the blended learning process in the long term. The decline can be compensated for by regular refresher training or a continuous learning component included in the model. It will also be good to increase the sample size so as to enhance the external validity of the study. The involvement of CHWs in different geographical and cultural environments would provide a broader picture concerning the model's applicability in disparate environments. Studies on scalability in big populations and health systems that are heterogeneous would shed light on the possibility of applying the model to varying degrees of resources and settings. Even stronger involvement of participants could be achieved by incorporating modern technologies, e.g., mobile applications and interactive simulations, which will contribute to active learning and facilitate transferability of the acquired skills to practice.

Conclusion

The study examines the effectiveness of blended learning to increase the knowledge and skills and retention of community health workers (CHWs). Significant change was remarked in areas related to communication of patients, prevention of diseases and minimum healthcare activities. Though post-training data were, on the whole, positive, there was a slight decrease observed here three and six months after the study, especially in the areas of communication with patients and disease prevention. However, the retention of basic healthcare practices remained at given levels, and this might show that some skills are more difficult to decay. These data indicate that blended learning provides a healthy approach, which combines the freedom of online courses with the reality of face-to-face classes to develop the theoretical level of learning and the applied skills level. However, the concerns associated with access equity to technology and participant interest maintenance have to be addressed, and the future work must be aimed at diversifying the model by including permanent training assistance, online materials, and personalised learning routes to strengthen long-term memory and skill implementation. This study advises the introduction of blended learning into the healthcare education plan, especially in low-resource settings, in order to promote health service delivery.

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