6

Designing Pedagogically-Driven Approaches to Technology-Enhanced Learning for Community Health Workers

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Introduction

Training and supervision of community health workers (CHWs) has traditionally relied upon face-to-face methods of delivery. However, the landscape of training and supervision is changing. Improved mobile Internet connectivity worldwide, and the rise of affordable technologies, including low-cost mobile and smartphone devices (GSMA, 2019), have potential to transform the delivery of training and supervision to CHWs. Technology has been used with beneficial results in the training and supervision of CHWs through mobile Health (mHealth) platforms that: share clinical information and multimedia resources (Florez-Arango et al., 2011); provide real-time clinical decision support to support learning (Adepoju et al., 2017); provide remote supervision (Modi et al., 2019); and support the creation of professional networks through social media groups (Henry et al., 2016). Basic mobile phones can be used to provide training and supervision through interactive voice recognition (BBC Media Action, 2015; Amref, 2020) and SMS text messages (Zurovac et al., 2011; DeRenzi et al., 2012). Advances in technology have also enabled delivery of innovative and affordable training to learners worldwide using smartphone-based educational games, virtual reality, augmented reality, and massive open access online courses (MOOCs).

Technology-enhanced learning (TEL) is the use of technology to facilitate learning. Technology may be used exclusively, or in combination with more traditional face-to-face approaches (blended learning). Blended approaches to learning have been recommended for the training of CHWs (WHO, 2018), and may be particularly useful in low-resource settings, where access to face-to-face training and supervision is challenging (Mastellos et al., 2018). A core learning curriculum for CHWs has been proposed by the World Health Organization (World Health Organization, 2018), with potential for contextual adaption to meet

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the needs of local communities, and align with best practice guidelines for CHW training and supervision (Crigler et al., 2011). CHW training is now expanding to include pre-service training, with ongoing access to supportive supervision during their career course (World Health Organization, 2018). TEL may offer opportunities for innovative delivery of such programmes. Whilst the use of technology as the main or partial component of the learner experience has expanded over the last decade, there are few examples of how existing pedagogies have influenced the design and delivery of these novel approaches (Winters et al., 2018). Technology in the training and supervision of CHWs has potential to build upon existing pedagogical approaches to health professionals' education, whilst providing greater flexibility for the learner, teacher, and health system in which they function. This chapter presents a framework, outlining six key practical steps to consider when designing a pedagogically driven approach to technology use in the training and supervision of CHWs (see Box 6.1).

Why Is a Framework for the Design of TEL-Based Interventions Needed?

Approaches to the design, delivery, and evaluation of CHW training programmes are diverse (O'Donovan et al., 2018), making it difficult to compare existing training practices. There are also significant gaps in the evidence base for the use of technology in the training of CHWs (Winters et al., 2019). The lack of evidence for educational theory-informed TEL interventions for CHWs has limited our ability to understand the mechanisms by which CHW training programmes work, and the reasons why some fail to demonstrate effective learning (Winters et al., 2018). Frameworks to support the design of TEL interventions for CHWs can thus support the expansion of the currently limited evidence base, by providing a structure and context for design and evaluation of TEL interventions (Winters et al., 2018).

Identifying the Needs of the Key Players in the Health System

In addition, to the immediate communities in which CHWs work, there are other wider societal factors influencing their training and supervision. These factors include: *macro-level* influences such as government initiatives, guidelines, and targets, which may impact the content and methods of training delivery; *meso-level* factors, including the needs of the teacher/supervisor, infrastructure available for TEL, the technological ability of the teacher, and their knowledge, confidence, and familiarity

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Box 6.1 Summary of the steps in designing a TEL-based training programme for CHWs

Steps in design of a training intervention and areas to consider

1. Identifying the needs of the key players in the health system

   Macro-level: The health system

   What are the health system's needs?

   - Understand the context of learning, the priorities of the government.
   - Ensure resources are available to deliver TEL, training, and supervision.
   - Ensure the training and supervision programmes are financially sustainable.

   Meso-level: The trainers/supervisors

   What are the teacher's needs?

   - Understand the motivations, challenges, and opportunities available for the teacher.
   - How is their time divided, do they have dedicated time for supervision and training of CHWs?

   Micro-level: The learners (CHWs)

   What are the learner's needs?

   - Understand the motivations and needs of the learners.
   - Decide how best to capture this information: for example participatory methods/qualitative study.

2. Integrate learner/teacher health system needs into shared learning outcomes
   - Decide how best to marry the needs of the health system, the teacher, and learner.
   - Use Bloom's taxonomy* to build a language for shared learning outcomes.

3. Consider how best to convey the information to learners
   - What learning theories will best support the subject area?
   - Which pedagogies will best support the delivery of educational content?

4. How can technology be used to best support learning and assessment?
   - How can learning theory be embedded into the technology?
   - How might TEL be designed to avoid cognitive overload in the learners?
   - How might TEL be used to encourage critical thinking?

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5. How can technology be used to support lifelong learning?
   - What is the best way to make the learning interactive, engaging, and fun?
   - How can learning be embedded into the informal environment and/or the workplace?
   - Can design of the TEL help stimulate curiosity in the learner?

6. What is the best educational environment to create for the training and supervision?
   - Where will the training and supervision take place?
   - Who will be present?
   - Who will facilitate/lead?
   - Is the training best delivered in a small/large group or to individuals?

**Bloom's taxonomy is a hierarchical ordering of cognitive skills.*

with TEL; and *micro-level* factors of the learners (CHWs)—such as their learning style, access to mobile technology, demands on time, need for remuneration, and professional support. Negotiating the often varied, and conflicting, demands of these key players in the health system is important, both for the adoption and sustainability of TEL interventions, and to ensure that the needs of all players within the health system are met (see Figure 6.1).

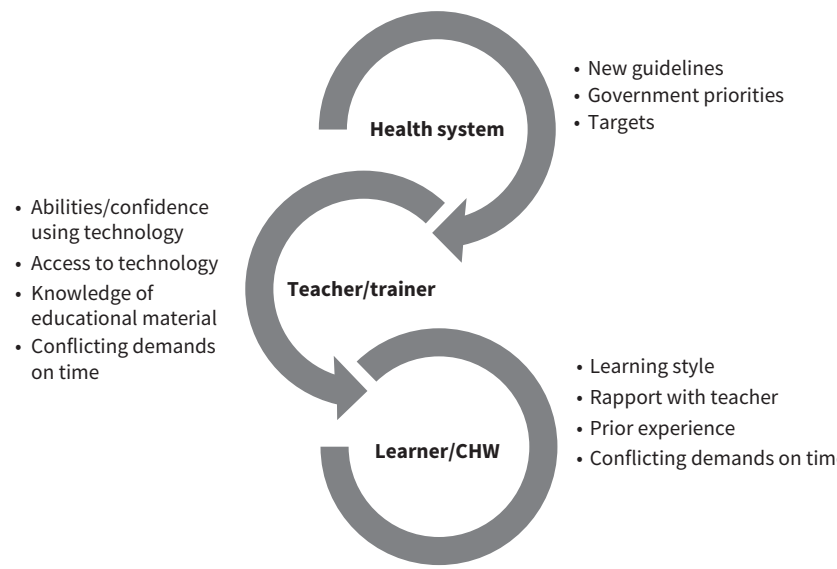

Figure 6.1 Factors affecting the needs of players within the health system.

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Integrating Learner-Needs into Shared Learning Outcomes

A key step in planning TEL interventions for CHWs as a collective group, is an in-depth understanding of CHWs' motivations for learning. The motivations of CHWs to conduct their daily work are varied, and include both financial factors (e.g. adequate remuneration), as well as non-financial factors (prestige, career progression, and free health services for their families) (Abdel-All et al., 2019). Training opportunities can sometimes be viewed by CHWs as an additional burden to their already busy schedules, and might not always be their main priority (Abdel-All et al., 2019). Providing performance-based financial incentives for CHWs, may unintentionally lead to neglect of unpaid tasks (Kok et al., 2015). Understanding the motivations of CHWs, and integrating their training and supervisory requirements with their most important needs and priorities, is one way to support their learning, and ensure training and supervision are viewed as part of their work, rather than a luxury or a burden on their time.

Tip! Know your audience: explore the CHWs' motivations for doing their job, understand the challenges they face, their time commitments, and explore how best training and supervision can fit into their priorities and be integrated into their daily work.

It is equally important to capture the needs and motivations of teachers or supervisors delivering training to CHWs, to optimize the design of a TEL-based training intervention. One method to gain insights into the needs and motivations of learners and teachers, is through use of participatory approaches (see David Musoke in Chapter 8). Participatory approaches in the design of TEL-based training interventions use a non-hierarchical structure and democratic inclusion of key stakeholders in the design and delivery of training and assessment. Involving government officials, policymakers, CHW supervisors, and CHWs in the initial planning and throughout the design and delivery of TEL-based training has a number of advantages. Involvement of key stakeholders can: aid the dissemination of key government initiatives to the community-level; convey the needs and concerns of CHWs and their supervisors to policymakers; and resolve potential conflicts between key stakeholders in a timely manner.

Establishing shared learning outcomes that take into account the complexity of needs of the key players in the health system, is an important first step in the design of TEL-based training interventions. Learning outcomes are clear, measurable, and achievable statements that guide the knowledge and skills learners are expected to acquire during their training. Through involvement of key players within the health system in the design of learning outcomes, key performance and quality-indicators required by the government and policymakers might be more readily integrated with the learning needs of CHWs, ensuring a shared vision of CHW training within the wider health system.

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Conveying the Information to Learners: Understanding How Adults Learn

Effective learning is the most important outcome of training and supervision. An understanding of how adults learn is key to designing and implementing training and supervision for CHWs. Unlike children, adult learners are required to take responsibility for their learning, and be self-directed in their approach (Merriam, 2001; Knowles, 2015). Adults bring their existing background knowledge and life experiences to new learning opportunities, and require that their learning is situated, meaningful, and useful to them. It is estimated that only a small proportion of adult learning is formal (delivered through formal means such as lectures and training days), and the majority of adult learning occurs informally or in the workplace (Swanick, 2005). In addition to providing formal learning content, TEL offers potential for informal learning opportunities through the use of social media groups, online forums (Gordon, 2014), and by creating more opportunities for reflection during workplace-based encounters with patients, through e-portfolios or remote supervisory support, including SMS-text messages delivered via mobile platforms.

Theories of adult learning or *andragogy*, may be useful when planning technology-driven solutions for CHW training and supervision, to best meet their needs, contextualize learning in their workplace, and co-create learning opportunities through the development of communities of practice (Wenger, 1999; Mann, 2011).

Embedding Learning Theory into Technology-Enhanced Learning: Finding the Right Fit

Theoretical frameworks of learning conceptualize how experiences of learning are assimilated, processed, retained, and built upon during the process of adult learning. These frameworks can be used to guide the design of TEL interventions. Embedding pedagogical approaches into the design of TEL interventions for CHWs not only provides clarity during the process of intervention development, but also provides a means by which researchers and policymakers can better understand and categorize *what* learning is happening, evaluate the mechanisms which lead to learning taking place, and establish *how* the learning outcomes for CHWs are met.

Technology-Enhanced Learning for Changing Community-Level CHW Behaviours

Behaviourist approaches to learning, focus on a model of 'stimulus and response', whereby a stimulus in the learning environment causes a change in behaviour of the

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learner (Merriam, 2001; Skinner, 2011). Behaviourist approaches in applied learning can result in standardization of responses, which may be useful in the context of quality and safety in healthcare. These approaches are often taken when the needs and demands of the health system, the political context, or government guidelines are implemented at the community level. An example would include embedding of standardized practices or checklists into healthcare (World Health Organization, 2009). Critiques of behaviourist approaches have challenged the importance given to the outcomes used to guide learning. In particular, *how* these outcomes are measured and *by whom* they are determined.

Behaviourist approaches may, however, offer potential to improve performance and knowledge of clinical guidelines, safety, and supervision checklists. Immediate feedback provided by a mobile phone or tablet, through reminder and recall systems, visual alerts, and sounds may alert a CHW to key information or areas of the checklist that require completion, or to any omissions that may have been made. Technology can be used in this fashion, to initiate behaviour change in the learner, working on a model of 'reward and punishment' resulting from the completion of a standardized guideline or checklist, until the guideline becomes embedded in practice.

This type of learning is potentially useful when the environment or context in which the CHW operates requires a certain standard of care to be implemented, such as a checklist for antenatal care or a vaccination schedule. Repetition of practice over time, leads to embedding of knowledge for the CHW. Disadvantages of this approach are that CHWs (being passive recipients of the learning), may only engage in superficial learning, and not fully appreciate the underlying reasoning for *why* the checklist questions are important to a patient or to their community. Whilst this may be helpful in situations when thinking may influence outcomes through the introduction of subjectivity, it can also lead to stagnation in the learning opportunities and personal growth of CHWs, and discourage clinical reasoning and a problem-solving approach. This may potentially impact CHW morale over time, if not met with positive reinforcements, such as incentives or rewards.

Learner-Centred Approaches to Technology-Enhanced Learning

Cognitive approaches to learning focus upon the processing of information by the learner and the formation of memories (Torre et al., 2006). The learner actively seeks to understand new information and relates this new information to previously formed memories (*schema*). Cognitive learning theory involves changes to the way in which information is processed (e.g. through repetition) and stored (organization of learning) by the learner, in addition to an outward change of

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behaviour. Cognitive approaches to learning for CHWs might involve providing a framework by which CHWs can link and categorize new information in relation to their life experiences, such as through the use of analogies, patient case studies, and anecdotes.

Technology can be used to embed cognitive approaches, by building new learning upon existing cognitive schema—otherwise known as *schema construction* (Piaget, 1952). Information may be presented to learners in increasing levels of difficulty, such as through a 'serious game', where a CHW might have to progress through increasingly complex and difficult scenarios. By presenting information in small chunks (*chunking*) and building upon existing frameworks of learning (*scaffolding*), the CHW will not get 'overloaded' with information (*cognitive overload*). In addition, technology can be creatively used by the CHW to set their own pace of learning, provide flexibility, and build upon existing knowledge. Instructional design (providing structure and meaning to learning material) is one method that can be used during the design phase of TEL approaches, to encourage schema construction, without causing cognitive overload (Gagne & Briggs, 1974). Cognitive overload refers to the amount of knowledge and sensory input the learner can process into their working memory (Young et al., 2014). If a learner is overloaded with information, their working memory and long-term memory and recall will be limited. Presenting information in small chunks and building upon existing knowledge (by understanding learner needs) is one way of ensuring cognitive overload does not occur. These factors can further be embedded into the design of TEL.

Supporting Lifelong Learning of Community Healthcare Workers and Critical Thinking

Constructivist models of learning recognize the importance of the previous experience of the learner, and build upon these experiences to construct new knowledge, often in a collaborative way (Torre et al., 2006). This model of learning is also learner-centred. As each individual CHW comes with their personal experiences and background, the way in which they interpret and create meaning from learning opportunities may differ. The CHW might start to challenge their previous model of the world and adjust their mental model of the world through learning in small groups and through creative use of patient case studies. This type of learning encourages problem solving and critical thinking, and requires the learner to take a more active approach in their learning, encouraging learning as a lifelong pursuit, rather than an activity limited to a training room.

A practical way in which constructivist learning can be embedded into TEL is through the formation of small groups for learning—such as participatory

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women's groups, and peer-assisted learning through online platforms, for example social media apps, or the creation of 'virtual teams' during online courses, and through the use of e-learning platforms. TEL may be used to provide learning materials or 'trigger material' to stimulate discussion before CHWs attend small group teaching.

An example of this might be TEL used to deliver pre-training content to the CHW through a 'flipped learning' model. Flipped learning is the use of a combination of TEL and face-to-face approaches (Gordon, 2014). For example, a CHW might be asked to watch a video online or to complete a questionnaire or pre-training quiz before attending face-to-face training. This will optimize time spent within the face-to-face environment, and build upon previous knowledge of the CHW.

Transforming and Challenging Previous Learning Using Technology

Transformative learning theory explores the learner's preconceived ideas of the world and challenges these assumptions of the world in order to trigger the learner to identify what they don't know (Mezirow, 1978; Taylor et al., 2013). The Johari window is often used to illustrate this process (Luft & Ingham, 1961) (see Table 6.1).

By challenging the learner through Socratic method (asking questions which stimulate co-operative argument and critical thinking), learners identify limits to their knowledge and view of the world. The learner is encouraged to critically reflect upon their preconceived ideas, challenge these ideas, and transform their perspective of the world. This form of learning may be very powerful, and creatively designed TEL can stimulate changes in world views through introducing new concepts. For example, by using evidence-based practices to highlight limitations to existing procedures; introducing narratives from people outside the CHW's direct community; and presenting a variety of views on one subject, in order to stimulate discussion, using media such as video, radio, photo-diaries, and documentaries.

Table 6.1 The Johari window

Open area: • known to self • known to others	Hidden area: • known to self • unknown to others
Blind spot: • unknown to self • known to others	Unknown: • unknown to self • unknown to others

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Experiential Learning

The cycle of experiential learning by Kolb is used as one way of modelling how adults learn, and may be used as a framework for developing TEL interventions. Kolb's cycle of experiential learning involves concrete experience of a particular subject, followed by observation and reflection upon the experience (Kolb, 2014). From these observations and reflections, adults formalize concepts and make generalizations about the learning, and then test their findings out in practice (active experimentation). The cycle repeats as learners try out new experiences, reflect, and learn from these experiences (see Figure 6.2).

Kolb's conceptual model of adult learning, builds upon constructivist's theories of learning, whereby the prior knowledge and experience of an individual act as a foundation for creating learning opportunities between a new experience and building upon prior experiences. It may be particularly useful when designing TEL for the supportive supervision of CHWs, to guide CHWs through the cycle of experiential learning by observing their practice, reflecting upon their learning, and considering what they might do differently in the future.

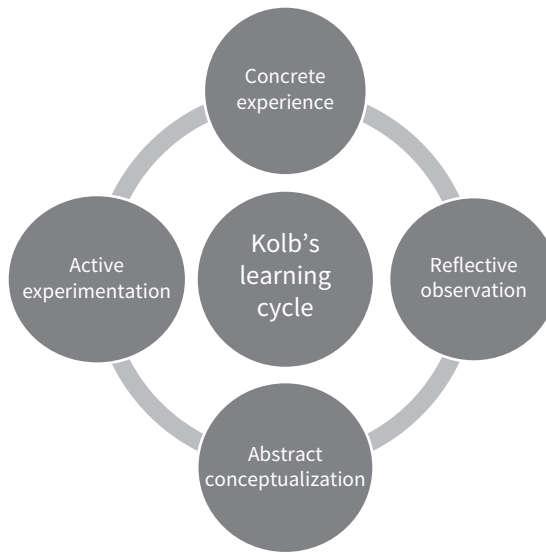

Figure 6.2 Kolb's cycle of experiential learning.

Source: Data from Kolb, D.A. 2014. Experiential learning: Experience as the source of learning and development. Upper Saddle River, FT Press.

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Embedding Learning Within the Social Context: The Educational Environment

All of the pedagogical approaches explored in this chapter are implemented and embedded within a social context. Social theories of learning recognize the importance of the context of learning (the educational environment) and the community in which learning occurs (communities of practice) (Taylor et al., 2013). Learning and thinking are considered social activities, whereby learning is influenced by the environment and context in which the learning takes place. Social learning may be very powerful, in particular for groups of professionals such as CHWs, to encourage peer support and supervision. TEL interventions can be designed in a way to facilitate and promote a particular educational environment. For example, outdoor women's learning groups, might simulate a more informal environment compared to highly structured classroom-based learning. Considering the wider social context in which learning occurs is important, to decide which environment is most conducive to learning for a given group of CHWs.

Conclusion

TEL is a method of teaching delivery which may offer more flexibility to learners and teachers, particularly those working in environments where there are workforce constraints. Embedding pedagogical theory into TEL initiatives is important, and should be considered at an early stage during the design and implementation phases of training and supervision programmes. This chapter has outlined a six-step framework for approaching the design of TEL-based interventions for CHWs. Some examples of creative pedagogies for TEL have been presented, which build upon learning theory and take into account the social context of learning. The most important first step in designing a TEL training and supervision intervention is to understand the needs of the learners and marry these with the needs and capacities of the teachers and health system. This is best achieved by using participatory methods in design, including the principles of human-centred design, as discussed in this volume.

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