

## Original Article

# Using online learning for Health Information Systems (HIS) training in developing countries: in search of 'equity' in health professional training

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### Abstract

Health information systems (HIS) training is an integral part of HIS implementation and is a mammoth task requiring huge investments of money, other resources and sound pedagogy. Distance learning, utilizing online learning, is an alternative. However, given the enormity of the task, low resource nature of the settings and the complex nature of health care staff training, inequities could emerge, that could hamper the training and limit its ability to achieve the expected outcomes. This paper suggests a rights-based approach to resolve the issue of inequity in such training instances and utilizes the 4As (Availability, Access, Acceptability and Adaptability) framework to evaluate three instances of HIS training in developing countries which made use of online learning. The paper discusses the recognition of inequities and remedies to achieve social justice in future HIS training through a rights-based approach. The paper concludes by suggesting the same as a new approach to health professional training with a focus on social justice.

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### Introduction

In modern day education, incorporation of technology in training has become unavoidable. The increased use of terms such as technology mediated learning (TML), computer assisted learning (CAL), mobile learning (m-Learning) and online learning is evidence that educators and educational designers are increasingly looking at technology as a medium to enhance or facilitate learning in relation to all types of education (e.g secondary education, higher education, in-service training... etc). Similarly, with the advent of modern technologies, the paradigm of distance learning has also shifted from its early beginnings. Therefore, what is considered as distance learning today is 'a formal learning programme taking place through the internet allowing live [synchronous] and asynchronous interactions to take place using different technologies' [1]. One of the main expectations in incorporating technology into training is to reach out to a larger audience. Online distance learning answered the call by education ethicists for increasing access and 'equity' in education [2,3]. However, online learning itself may give rise to newer ethical dilemmas in terms of access and learning, raising the question of how best to utilize these technologies to overcome the challenge of inequity in health professional

training. This paper discusses a strategy that may be utilized to deliver 'equitable' health professional training, based on our experience in conducting an online learning programme to train health staff on the use of health information systems (HIS) in four countries (Ghana, India, Sri Lanka and Kenya).

### **Health Information Systems (HIS) training in developing countries**

Training has been recognized as one of the most important aspects of HIS implementation, as it can determine the success or failure of such implementation [4]. Many researchers have pointed out the necessity to provide training for all team members for such implementation to be successful [5]. At the same time, busy schedules and varied expectations can hinder training and, therefore, acceptance of HIS in most health care settings [6]. There has been slow progress in the implementation of HIS even in developed countries, simply because of the magnitude of the training challenge [7]. Recognizing these challenges, educators have increasingly looked at distance learning as a viable delivery mode for health informatics training [7]. As pointed out by Brittain, this is particularly true when the 'core information and management issues are common across international frontiers, irrespective of funding and practice of healthcare'—HIS implementers should achieve equity in training among the large number of HIS users with diverse socio-cultural backgrounds, different learning needs and varied competencies in order to sustain and scale HIS, particularly in a low resource setting.

### **The issue of 'equity' 'Equity in education'**

As pointed out by Campbell and Storo [2], there is no clear-cut definition for the term 'equity in education' and equity advocates continue to debate the boundaries of educational equity. While everyone seems to agree that providing equal access to all learners and teachers is paramount for achieving equity in education, many believe that equity entails more than just providing equal access. In fact, as pointed out by Campbell and Storo, some advocates believe that equity in education entails providing equal treatment after access, while others believe that regardless of access and treatment, it is the gaining of equal educational outcomes that should constitute 'equity in education'.

The adoption of distance education, as in the case of blended learning initiatives, can clearly improve access to those who are deprived of education due to accessibility issues [3]. However, once they are enrolled, there can be unequal treatment. At the same time, those who are enrolled may not necessarily behave in a way where they receive equal treatment from their tutors as well as other participants. The reasons for such unequal treatment may include technology [internet], design, educational content, the presentation of such content, online tutors, the prevailing culture or even the personal characteristics of the online participants [8].

### **'Equity in training'**

Understandably, most discussion related to equity in education has centered around providing secondary education or what this paper categorizes as 'public education'. These discussions do not necessarily address issues of equity in training arising out of in-service

training provided using online technologies such as that of HIS user training. Such training may be deemed essential from the viewpoint of the person being trained, in terms of the organizations where the training takes place or even in the view of the public that gains through the use of such HIS. Bassanini et al [9] point out in their discussion paper, citing the Lisbon Strategy adopted by the European Union, that *'the accumulation of human capital does not end with schools, and training is key to augment and adapt existing skills to the changes of technology'*. In declaring the same, the Lisbon Strategy made use of 'equal opportunity' and 'social inclusion' to emphasize their commitment towards achieving equity [9].

However, the issue of 'inequity' in education and training are seen as deeply rooted problems in many societies and economies [10]. Given this understanding, this paper perceives that the equity issues arising in such settings need to be tackled according to the context in which such issues take place. By addressing the equity issues arising out of the use of distance learning for in-service training, it may be possible to design learning instances that may achieve the intended objective more effectively than when the training is deemed 'inequitable'. Although designed to illustrate governments' obligations to the right to education, a rights-based approach [11] is recognized as one way of framing educational policies, which this paper adapts to suit a micro level distance-learning environment.

### **Rights-based approach towards resolving inequities in training**

In the publication 'Right to education: Primer No 3', Tomasevski highlights governments' obligation to educating its public using a scheme of four criteria known as '4As'. These criteria include *Availability, Access, Acceptability and Adaptability*. In brief, the criterion 'availability' necessitates that the government either establishes or funds educational institutes or allows the non-state sector to establish such entities in view of making education available to all. The criterion 'access' entails that the government be sensitive to the access requirements of different levels of learners. Therefore, while compulsory education should be accessible to all children, post compulsory education should be available to those who are in need, free or for an affordable fee. Having a minimum standard of quality and appropriateness of the language used in education is captured in the criterion 'acceptability'. 'Adaptability', on the other hand, encompasses the ability of education to meet the best interests of the child as against securing the best interests of the education provider or any other party.

These criteria are laid down with regard to compulsory public education aimed at school-aged children and are used, sometimes, in secondary education. However, this paper argues that similar criteria can be used to deal with inequities arising out of using distance learning to train a user base, such as that of HIS users or health professionals, in developing countries. It cites the example of Robinson [12] who adapted the 4As scheme to formulate policies for rural teacher training (Table 1). Drawing from the conclusions made by Robinson, this paper focuses its attention on utilizing the 4As framework and the guidelines as a monitoring tool for already concluded HIS training instances. We believe that by utilizing the same, it would be possible to unearth the equity issues of

such training instances and guide future training occasions to be better focused and comprehensive in addressing issues of social justice.

### Organization of this paper

The next section will introduce the methodology adopted in delineating inequities of training arising from the three case studies of distance learning for training HIS users in developing countries. It will be followed by the case descriptions and an illustration of the inequities of training that arise, as per the rights-based framework, when utilizing such training modalities. The paper will conclude by summarizing key points and stating the importance of dealing with inequities that arise in similar training instances both in terms of HIS implementation and health professional training.

**Table 1 : Framework for teachers' rights to continuing professional development [12]**

The 4As	Guidelines for rights-based continuing professional development
<b>Availability</b>	<ul style="list-style-type: none"> <li>• Continuing education opportunities are provided beyond initial training.</li> <li>• Teachers have some freedom of choice in what and how they learn.</li> <li>• Information about the availability of learning opportunities and professional development is freely available.</li> <li>• Availability extends to all teachers, no matter where they are.</li> </ul>
<b>Accessibility</b>	<ul style="list-style-type: none"> <li>• Barriers (organisational, geographical, motivational, financial) to teachers' use of available learning resources and opportunities are removed, as far as possible.</li> <li>• Policies and practices do not exclude or discriminate unfairly against teachers.</li> <li>• Infrastructure is in place to make access to and engagement with professional development a real possibility and is sustainable. Policies and monitoring are in place to support teachers' ongoing professional learning.</li> </ul>
<b>Acceptability</b>	<ul style="list-style-type: none"> <li>• The provision is relevant, appropriate and current in content, based on teachers' and pupils' needs.</li> <li>• The provision is equitable and fair.</li> <li>• Standards of quality are explicit, monitored and maintained.</li> <li>• The provision is in accord with teachers' labour rights (according to International Labour Organisation guidelines) including rights to continued professional learning.</li> <li>• Teachers are adequately prepared in any use of technology required to access learning resources and opportunities.</li> </ul>
<b>Adaptability</b>	<ul style="list-style-type: none"> <li>• The provision responds and adapts to the needs and best interests of teachers, collectively and individually.</li> <li>• The provision and system takes account of local variation.</li> <li>• The learning resources promote core values of the teachers' role in fostering social justice (for example, the elimination of physical punishment by teachers or discrimination against disadvantaged pupils).</li> </ul>

## Methodology

The study utilized a case study methodology to analyze the potential of a rights-based approach to address inequities of training in HIS settings. The research derived data from three instances of HIS training utilizing online-distance learning. These training instances are described in Table 2.

**Table 2 : Brief overview of the training sessions and settings**

<p><b>Ghana</b></p>	<p>This was the first training instance in which the e-learning tool was tested and it was attended by 38 participants. The content was aimed at beginners and not much emphasis was made on online interactions. An introduction to the e-learning tool was given at the beginning of the training session and the views of the participants were obtained during a workshop through interviews. The training lasted for 10 days.</p>
<p><b>Sri Lanka and India</b></p>	<p>The same design was tested on a group of doctors (12 in number) undergoing Masters training in Biomedical Informatics in Sri Lanka. The aim was to make them aware about the basics of DHIS2 before they participated in a face-to-face academy in India. The online training lasted for 1 week and the interactions within the discussion forums were perceived as minimal.</p> <p>The online component of the training in India, which was, again, aimed at beginners, was held 1 week before the face-to-face training in India. There were 19 registered participants for the online training from Asia including several from the group of doctors from Sri Lanka who had almost completed their Masters training in Biomedical Informatics. Online interactions did not materialize as expected, although, during the face-to-face training, the same platform was used as a repository for training material. The online academy lasted for 1 week while the face-to-face academy lasted for 10 days.</p>
<p><b>Kenya</b></p>	<p>The DHIS academies conducted in Kenya (with 38 participants) was preceded by a week-long online training using refined content aimed at beginners. These online learning instances contained a more structured online discussion forum where relatively significant participation and interaction were achieved. The online design complemented the face-to-face training and online questionnaires were used to obtain feedback regarding the design and conduct of the e-learning activity from the participants.</p>

Data collection methods included discussions taking place on the online learning platform, formal and informal interviews with HIS training participants at post-online training workshops and email communications between HIS trainers, as well as observations made during post-online face-to-face training workshops. A qualitative data analysis was carried out on the collected data in order to recognize emerging inequities that were then classified according to the broad meanings of the rights-based framework (4As).

The classifications were based on the following two definitions. An 'inequity' was defined as existing when some participants were able to comply with the training demands and the others were not. A 'right' was defined as existing when the online training made a

demand from the participants, which would affect their future participation in a subsequent face-to-face training program.

### **Case descriptions and analysis**

The author of this paper has been involved in designing and providing training for HIS users in developing countries using a 'blended' approach. The training was centered around the District Health Information Software (DHIS) and was given the name DHIS2 academy. A distance-learning platform was designed based on the 'Moodle' learning management system. The training instances were carried out in relation to West Africa, East Africa and Asia in 2013 to 2015. The online learning sessions were arranged in such a way that they preceded a face-to-face workshop that supplemented the training taking place online. The only exception to this rule was the workshop in Ghana where the online training paralleled the face-to-face training workshop. Each training session was planned to accommodate 40 to 50 participants from different countries who were considered as implementers of HIS in their own setting. However, the knowledge and the experience of these participants varied from being completely new to being seasoned. This made the participants diverse in their learning needs, in addition to many other factors that influenced their participation in online learning and their ability to relate what they learned online to their practice.

#### **DHIS2 Academy - (Ghana - West Africa)**

The West African DHIS academy was the first instance where an online learning approach was used for DHIS training. In this instance, online tools were used in parallel with face-to-face training. There were around 40 participants representing several West African countries including Ghana, Nigeria, Mali, Liberia, Bukna Faso, Gambia and Guinea where DHIS2 based HIS implementations were either ongoing or were expected to take place.

Among these participants, not all were fluent in English and, therefore, on-the-go translations were done in French for the benefit of French speaking participants. However, the online content was largely in English, as it was perceived that the participants would be able to interact in the English language, given the nature of the subject. No translations took place for the participants speaking predominantly Portuguese, but they were grouped together and an expert participant speaking Portuguese was assigned to them for necessary translations during the face-to-face training.

When looking at the portfolios of these participants, it was noted that many of them were HIS officers with technical backgrounds, while some were medical officers and IT professionals. However, not all had the same degree of understanding regarding DHIS2 or HIS. This prompted the trainers to form groups based on countries and allocate experts from among the participants themselves to each of the groups to facilitate group work activities.

Around 4 to 5 trainers also attended the academy, representing Health Information Systems Programme (HISP), Oslo and these trainers held positions such as developer,

implementer or researcher within the HISP. The participants made use of their own computers and were provided with internet facilities by the organizers. However, the technical infrastructure at the site did not allow an uninterrupted service. The online training was designed in a way to allow participants to re-cap the teaching that took place in the face-to-face training and to gain additional understanding about the topics using online learning tools. The training material used in the face-to-face academy were also uploaded to the online platform at the end of each day to facilitate these activities. They were also encouraged to interact in the discussion forums although no formal guidelines were provided to indicate the degree of interaction expected from the participants. However, it was noted that internet services were not available at the site where participants were accommodated and, therefore, most of them were only able to access online learning during the face-to-face sessions.

During the academy, one area within which inequity seemed to manifest was in accessing the internet, and, thereby, the online training. Statements such as "internet access is always a problem in [country name 1] and I have to wait until I get to my office to check my email and even then, I am not sure whether the internet will work" and "sometimes we record data in the local machines and upload to [country name 2] web system if and when the internet connection is available" indicate that accessing the internet is a general issue in the lower middle income country (LMIC) context.

In most instances, it emerged that the issue is the lack of communication infrastructure at national or regional level. Furthermore, even when internet access was freely available, the speed and the continuity of the connection was highly unpredictable. This meant that there was a real chance of some participants not being able to utilize instructional content such as high definition videos as their internet connection did not provide sufficient capacity to download and view such content.

Secondly, the language barrier made it impossible for some participants to interact in the online environment, even when they were able to gain access. This seemed to be also the case during the face-to-face training as lack of translation hindered some participants from fully engaging with the training activities. Comments such as "..if it had been in French we would have made more use of the online content" and "translating the content to Portuguese would have been useful for us to follow" indicate the negative impact made by the language barrier throughout the learning activity.

Another area where inequity manifested was with regard to the training needs of different participants. For instance, among those who participated in the online activity, some expressed their unhappiness regarding the learning content by stating "we expected more complex topics to be handled in the online learning" and "I gained nothing new from the readings or the videos...", as it did not cater to their learning needs. Some believed that the instructional content was disassociated from their true work environments as pointed out during one-on-one interviews in statements such as "it would have been better if you gave us examples or scenarios from our own setting...so

we could relate what has been taught with our work” and “we did not understand the scenarios given by you”. However, via the online questionnaire, it was revealed that participants accepted online learning to be beneficial and effective when training high-level DHIS users and health data managers, as they were in possession of the skills and the technologies to access the internet as well as to follow the training program.

While the academy attracted many participants from the region, it was clear that it would have liked to accommodate more. This was emphasized by the trainers through statements such as, “if we had more funding, there are lot more who require training” and “we may have to have another academy in West Africa soon to train the others”. The inability of national health systems to support their staff to gain the desired training was also apparent in statements such as “unless [the funding organization] provides us with money we cannot gain training such as this” and from questions such as “..can my colleagues back home use the online learning?” and “..can you post the presentations in Moodle [the learning management system used for online training] so that my colleagues can access them during the academy?”, made by the participants.

Lastly, it was observed that not all participants received the same experience handling data sets, which was one of the key learning outcomes of the academy. One reason for this was that participants of each country were asked to bring their own data sets and not all countries had such data sets to practice on. This may have prevented some participants from gaining vital analytical skills and understanding with regard to handling their own data as expressed by one participants by stating “..it takes time for me to grasp a foreign data set as I am not used to it. I know the technique will be the same but it is difficult for me to understand its application in [country name 3]”. In a way, the organizers of the academy seem to have inadvertently created an inequity, although the idea was to give a better and a more contextual learning experience.

### **DHIS2 Academy – Sri Lanka and India**

The Asian academy was attended by participants from countries such as India, Nepal, Sri Lanka, Afghanistan and Bangladesh, in addition to experts from India and Norway. The arrangement of the online and face-to-face training in Asia was somewhat different to the West African academy as the online training preceded the face-to-face training. Thus, all the participants registering for the academy were invited through email to attend the online training and were sent log-in information and instructions to navigate the system. While many participants logged-in, not many contributed to the discussion forum, which was the last activity of the online learning.

From the informal discussions carried out with the participants during the face-to-face training session, it was evident that some had trouble logging in with the issued usernames and passwords. However, none made any complaint regarding the same before or during the online training. On inquiry, one participant mentioned that “I did not think it was important to inform the inability to log-in” while another mentioned that “I didn’t have time to send an email to you [the interviewer] to get the log-in corrected”. For some, the language used had been an issue, as they were not competent in the English

language. As with the previous case, some indicated that the content in the online learning platform did not meet their learning needs while certain others indicated that while engaging in work practices, it was nearly impossible for them to access the online learning platform. This was evident in statements such as “it’s hard to keep up with online activity when I work full-time during the entire week” , “there are many others using the same computer for different work and I had to wait for my turn” and “it is only in the weekends that I can think of doing an online training because of work.” Meanwhile, a few mentioned that the scheduling of the online training was too close to the face-to-face training workshop, as they had to make the travel arrangements to attend the face-to-face training workshop during the last few days of the online training.

Furthermore, it was also evident that some did not receive the invitation sent for the online learning activity, either because they did not access email regularly (“When I saw the invitation for the distance learning it was too late”) or they expected the organizers to follow their usual channels of communication [official letters sent through the organizations hierarchy] (“I was waiting for an official letter from the DHIS academy”, “why was the distance learning not mentioned in the official invitation given to us by the DHIS academy to obtain leave?”).

Another interesting finding during the Asian academy was that some of the participants shared their log-in with some of their colleagues in the hope of enabling them, too, the chance to gain some insights related to DHIS2. It was also recognized that not all academy participants recognized the importance of online learning or were motivated enough to follow the online training as a precursor to the face-to-face training. Thus, it could be said that not all participants were on the same footing when it came to their preparation for the face-to-face training, creating an element of inequality.

Furthermore, given the limited time available, different learning needs and the significant amount of content to cover, the academy made use of parallel sessions which provided the participants an opportunity to select what they would prefer to do. However, inadvertently, it may have created an inequality as some may have preferred to attend all the sessions. While accommodating all learning needs would be impossible in face-to-face learning, it may have been possible to accommodate it within the online mode.

### **DHIS2 Academy - Kenya**

The Kenyan academy utilized the learning from the two previous academies. It consisted of an online training component preceding the face-to-face training and thus followed a similar structure to the Asian academy. The content, however, was modified according to the participant profiles provided by the local organizers of the academy. At the same time, the discussions forums were structured under different themes and were embedded in the daily training activities. The academy was attended by participants from Tanzania, Uganda, Kenya, Rwanda, and Mozambique and, in contrast to other academies, participants of the East African academy were recognized as competent in the English language and no translations were required.

Email addresses used to communicate with the participants were first verified to make sure that every participant received the messages sent to the said email address. The participants were then clearly educated about the online instructional content, its usefulness, its relatedness to the face-to-face training and the need to participate actively in the discussion forums in order to gain certification.

During training, it was observed that many participants logged-in to the online learning platform and interacted in the discussion forums. Some of the participants were eager to share their experiences in DHIS2 related activities and to help other participants with their own issues. It was observed that the said interaction was encouraged by an initial activity that requested all participants to introduce themselves by posting their own experience with DHIS2. Thus, the fact that local organizers were consulted in formulating the instructional content and that participants were given the opportunity to express themselves can be viewed as instances of enhancing the power of the stakeholders of the training program by allowing their voices to be heard.

At the same time, the online feedback-form, embedded within the online training, captured participants' opinion regarding many different aspects of the program. Some of the feedback included comments such as "we were unable to make full use the learning material due to inadequate time", "I wasn't able to complete the tasks within the given time frame" and "I was a beginner and felt like I was learning an alien language due to fast paced learning". Thus, it became evident that the duration of the online training and the expectations were too intense for some participants who had to simultaneously engage in other work.

The participants also pointed out the necessity to provide different types of learning material including videos, presentations, pdf's and audio to clarify what is being taught ("it would have been better if we had presentations and more videos in order to learn DHIS 2 through the online system"). They cited their inability to grasp information through text based reading materials only as the reason for these suggestions. The decision we had taken to remove some of the videos, as they did not serve much purpose in previous occasions as the internet connections were too slow, might have prompted the participants to make such comments.

Having said that the participation was 'good' in the East African workshop, it was also noted that there were many face-to-face training participants who did not participate in the online training and that there were other participants who logged-in into the online learning platform but did not participate in the discussion forums. On inquiry, some of these participants mentioned that "I did not thought the online discussions were an essential part of the online activity", "none of the discussions caught my interest" and "I was waiting for the face-to-face session to clarify my issues". Thus, there had been an inequity related to the perception regarding the online learning as well.

It was interesting to note, however, that the participants suggested online learning to be the major training component of the academy over the face-to-face training, as it enabled

more content to be covered and more interactions to be made. In their opinion, face-to-face learning could facilitate the hands-on aspect of the training. However, it was also noted from comments such as “..it is hard to convince someone in my country that online learning is as effective as a traditional training workshop” and “..please don't state 'online' in the certificate as it may not be equally acceptable to the administrators...”, made by the participants, that online learning as a training modality does not attract the same degree of respect as a residential training program in the LMIC contexts. From the side of the participants, this would mean that they might be disadvantaged if certification received through a predominantly online academy does not contribute to their career progression.

## **Discussion**

It is evident that many inequities emerge within distance learning, although the inequities are not necessarily the same in all instances. Let us examine these inequities and classify them in the context of the overarching 4As criteria postulated by Tomasevski [11] as well as discuss how these learning instances fared against the guidelines laid down by Robinson [12].

## **Availability**

The implementation of a distance-learning module for training HIS itself, increased the opportunity available for DHIS users of a particular setting to engage in their professional development. The training material presented through the online learning platform was made available to the DHIS users and was a previously un-available resource towards building their skills. Furthermore, these materials were made available to all the participants without any discrimination with regard to user level, geographical location or experience.

However, it was recognized that the information pertaining to the conduct of an online training program was not communicated equally due to communication breakdowns and late enrollments for the training. In addition, participation in the online training was restricted to those who were registered for the face-to-face workshop and may have not captured all those who were in need of training within the same setting. In its present form, the training does not allow the participants to gain further training throughout their professional life, which neglects their right to receive continuous professional development to build on the basic training they received through each of the training instances.

## **Accessibility**

With regard to the online learning instances, it was apparent that many participants were left idle as poor internet connectivity or absent communications infrastructure prevented them from accessing the online learning as and when they preferred. It is a failure on the part of the organizers to assume that all those who participated in the face-to-face training were able to access the online training equally and therefore would gain equally. In some instances, not catering for the participant's own language violated the right to access and not providing preferred educational material [e.g. videos, presentations,

graphs... etc] also made the participants feel that they were deprived of their preferred learning style.

### **Acceptability**

The learning content also emerged as a factor giving rise to inequity in training as not all the participants considered the learning content as relevant or useful for their practice. Not having enough examples for them to relate their learning to their everyday HIS practices made the training unacceptable for some while forcing the participants to engage in non-relevant training also violated their rights in learning. To some extent, defining the themes of the discussion forums could have also led to inequities as those who might have wanted to discuss other themes did not receive the same attention or opportunity. At the same time, over burdening the participants with online training made certain participants give-up online training as they were busy with ongoing work commitments or shifted their focus towards making travelling arrangements during the last few days of training. It can be viewed as an instance where in-service training ignored the labor rights of its participants who are already engaged in many work practices in addition to handling HIS.

### **Adaptability**

Fundamentally, the online learning system may have not considered the best interests of the participants or of the implementers of DHIS. In fact, it was a reflection of what the trainers or the organizations believed that the learners should know with regard to the actions they are required to perform. However, while acknowledging that such structured top-down training designs need to be in place when implementing large scale HIS, allowing freedom of choice to the participants should be the hallmark of equitable training.

This can be best illustrated when there are multiple levels of DHIS users, within the same group of learners, who expect training to be on par with different levels. In addition, when there are experienced and novice participants, failing to differentiate between the two groups and adapt to their learning needs might widen the inequity of the learning outcomes gained by the group. In fact, they two groups should have different learning outcomes altogether. However, in terms of adaptability, as described by Tomasevski [11], these training instances have to be looked at in terms of 'differently skilled' groups of participants in relation to their existing HIS knowledge, information technology skills, cultural influence on participating in discussions, communications practices and level of DHIS experience.

Table 3 summarizes the key findings during the various training instances in relation to the four domains as described in the 4 A's framework.

**Table 3 : Summary of the key findings between the training instances**

<b>Setting</b>	<b>Availability</b>	<b>Accessibility</b>	<b>Acceptability</b>	<b>Adaptability</b>
<b>Ghana</b>	Limited coverage in terms of population in need of training	Limited due to lack of network coverage, speed and access points.	Mismatch between learning needs, context and available content. Poor acceptability due to failure to cater to language needs	Limited due to lack of insight regarding the participants and resources required for contextualization of content
<b>India and Sri Lanka</b>	Poor communication preventing user participation.  Lack of opportunities to take part in all learning sessions  Organizational and cultural expectations that resulted in limiting availability	Lack of access to computers and the internet limiting participation.  Unresolved technical issues limiting access.	Mismatch between learning needs, context and available content. Failure to cater to language needs	Sharing of log-in facilitated better use of the learning management system.
<b>Kenya</b>	Lack of ability to self-pace learning.  Inability to meet the demand due to resource constraints.	Better communication and troubleshooting of technical issues allowing better access.  Lack of access to computers and the internet limiting participation	Matching content with participant profiles results in better acceptance.  Contextualization of content and instructions perceived positively by the participants.	Lack of catering to learning styles limiting adaptability.  Need to gain recognition and institutionalization of online learning

## Conclusions and recommendations

Based on the analysis, it is possible to make recommendations for future online learning initiatives for HIS training to be more socially just by addressing the identified issues of equity. Within the broad framework of 4As, these recommendations are illustrated in Table 4.

**Table 4 : Rights-based recommendations to alleviate inequity of HIS training when using online modalities**

4As	Recommendations
<b>Availability</b>	<ol style="list-style-type: none"> <li>1. Unrestricted communication / advertising of the training sessions, schedule and training material to the intended audience.</li> <li>2. Utilize multiple communication strategies, apart from email communication, to inform the intended audience.</li> <li>3. Expand the enrollment to include more than the number accommodated at face-to-face training instances.</li> <li>4. Provide avenues for continued professional development for those who are enrolled for online training.</li> </ol>
<b>Accessibility</b>	<ol style="list-style-type: none"> <li>1. Profile the participants in terms of having internet access and the quality of such access [e.g. availability, speed, bandwidth...etc.]</li> <li>2. Provide the training material in an off-line mode to those who have poor internet connectivity</li> <li>3. Translate learning material to the working language of the participants.</li> <li>4. Allow interactions in the participants own working language.</li> <li>5. Provide responses in the language used by the participant.</li> <li>6. Include different forms [e.g. video, text, images, graphs, presentations...etc.] of the same learning content.</li> </ol>
<b>Acceptability</b>	<ol style="list-style-type: none"> <li>1. Ensure the provision of relevant content at all times.</li> <li>2. Make use of relevant examples from the participants own settings.</li> <li>3. Increase the number of discussion threads and allow the participants to decide on the themes.</li> <li>4. Provide each such discussion thread the same attention given to the structured discussion threads.</li> <li>5. Expand the duration of online learning to allow participants adequate time to complete the training.</li> <li>6. Provide a time gap between the online and face-to-face training instances to prevent overlapping with travel arrangements.</li> </ol>
<b>Adaptability</b>	<ol style="list-style-type: none"> <li>1. Accommodate a bottom-up design of training to complement the top-down design approach.</li> <li>2. Profile the users depending on their learning needs and provide suitable instructions to match various levels of training needs.</li> <li>3. Define learning outcomes depending on the trainee competence and experience.</li> <li>4. Be sensitive to the 'differently skilled' participants and provide avenues for them to interact within the online learning system through formal [e.g. discussion threads] and informal means [e.g. email communications].</li> <li>5. Keep the participants informed of the ongoing and interesting discussions even if they do not interact with the online community.</li> </ol>

A rights-based approach has the potential to provide HIS trainers with a tool to mitigate the challenges of inequity in training, which can sometimes result in failure of HIS implementation and scaling. However, the extent to which such an approach should be adopted may depend on the training setting and the context. In addition, we also point out the fact that integrating a rights-based approach towards instructional design from the beginning may prevent most of the inequities that take place when such training programs are conducted for the first time. We also encourage further research with regard to developing a specific HIS rights-based framework that would contribute to the implementation processes of HIS in the future.

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